



**ROCKFORD BOARD OF EDUCATION
INVITATION FOR BID ON SUPPLIES, MATERIALS, EQUIPMENT OR SERVICES
FOR SCHOOL DISTRICT NO. 205
ROCKFORD, ILLINOIS**

IFB No. **16-48 Brookview Elementary School Additions and Renovations**

DATE: **March 23, 2016**

OFFERS WILL BE RECEIVED UNTIL: **3:00 P.M. (CDST) on Monday, April 11, 2016**

RE: **IFB No. 16-48 Brookview Elementary School Additions and Renovations.** The purpose of this Invitation for Bid (IFB) is to solicit bids for the additions and renovations at Brookview Elementary School, 1750 Madron Road, Rockford, IL 61107.

IFB Opening: **Monday, April 11, 2016 at 3:00 p.m., Rockford Board of Education, 6th floor Conference Room, 501 Seventh St., Rockford, IL 61104.**

If you plan to hand deliver your IFB submission on the due date, please note that you must check in on the 3rd floor prior to coming to the 6th floor. Please allow time for this as late submissions will not be accepted.

Copies of the bidding documents are available from Onvia DemandStar, by email from the Purchasing Department, BHFx Digital Imaging and Printing, DG Digital Printing, YCS Printing, Inc., or by download from the District's Purchasing Bids-RFPs webpage at www.rps205.com.

A MANDATORY PRE-BID MEETING WILL BE CONDUCTED ON, MONDAY, MARCH 28, 2016 AT 3:00 P.M. (CDST), AT BROOKVIEW ELEMENTARY SCHOOL, 1750 MADRON ROAD, ROCKFORD, IL 61107 BY OWNER'S REPRESENTATIVE. MEET IN THE LIBRARY.

Refer all questions relative to the business aspect, Instructions to Bidders, Special Conditions, and questions concerning the technical aspect of the documents to the Purchasing Process Manager by email at tamara.pugh@rps205.com.

TABLE OF CONTENTS

PAGES

VOLUME I – DIVISIONS 00-14

DIVISION 00 - BIDDING AND PROCUREMENT REQUIREMENTS

ADVERTISEMENT FOR BID

Invitation to Bid	7 -8
Statement of No Interest – BID	9
Sealed Bid Proposal Label	10

INSTRUCTIONS, TERMS AND CONDITIONS

AIA Document A701 - 1997 Instructions to Bidders	11 - 16
Supplementary Instructions to Bidders	17 - 22
General Terms and Conditions	23 - 26
Supplementary Conditions	27 - 35
Prevailing Wages	36 - 41
AIA Document A201 - 2007 General Conditions of the Contract for Construction	42 - 79
Addendum Form	80 - 86
Change Order Procedures	87 - 93

REQUIRED FORMS

Required Bid Forms Checklist	94
Section 004100 - Bid Form	95-99
Bid Rigging Certification	100
Minority and Women Owned Business Concern Representation	101
Certificate Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion	102
Certificate Regarding Lobbying	103
OFAC Compliance	104
Vendor Conflict of Interest Disclosure Form	105-106
Certified Cleared Employee List	107
Asbestos Notification	108
W-9	109
Confirmation of Called Inspection Records	110
AIA Document A305-1986 Contractor's Qualification Statement	111-114
AIA Document A101-2007 Standard Form of Agreement between Owner and Contractor	115-120
Sample Certificate of Liability Insurance Form	121
Section 004115 – References	122 - 123
Section 006000 – Forms	124

SUMMARY OF REPORTS

Section 003126 – Existing Hazardous Material Information	126
SECTION 003132 – Geotechnical Data	127
Brookview Elementary School - Geo-Technical Report	128-155
Brookview Elementary School – Phase I Environmental Assessment Report	156-192

DIVISION 01 - GENERAL REQUIREMENTS	PAGES
SECTION 011000 - SUMMARY	011000-1-011000-5
SECTION 012900 – PAYMENT PROCEDURES	012900-1-012900-4
SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION	013100-1-013100-7
SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION	013200-1-013200-4
SECTION 012000 – PROJECT REQUIREMENTS	012000-1-012000-2
SECTION 012200 – UNIT PRICES	012200-1-012200-2
SECTION 012300 – ALTERNATES	012300-1-012300-2
SECTION 012500 – SUBSTITUTION PROCEDURES	012500-1-012500-3
SECTION 012600 – CONTRACT MODIFICATION PROCEDURES	012600-1-012600-2
SECTION 012900 – PAYMENT PROCEDURES	012900-1-012900-4
SECTION 013100 – PROJECT MANAGEMENT AND COORDINATION	013100-1-013100-7
SECTION 013200 – CONSTRUCTION PROGRESS DOCUMENTATION	013200-1-013200-4
SECTION 013300 - SUBMITTAL PROCEDURES	013300-1-013300-9
SECTION 014000 - QUALITY REQUIREMENTS	014000-1-014000-7
SECTION 014200 - REFERENCES	014200-1-014200-2
SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS	015000-1-015000-7
SECTION 016000 - PRODUCT REQUIREMENTS	016000-1-016000-5
SECTION 017300 - EXECUTION	017300-1-017300-11
SECTION 017700 - CLOSEOUT PROCEDURES	017700-1-017700-8
SECTION 017823 - OPERATION AND MAINTENANCE DATA	017823-1-017823-6
SECTION 017839 - PROJECT RECORD DOCUMENTS	017839-1-017839-3
SECTION 017900 - DEMONSTRATION AND TRAINING	017900-1-017900-4
 DIVISION 02 - EXISTING CONDITIONS	
SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION	024119-1-024119-6
 DIVISION 03 - CONCRETE	
SECTION 033000 – CAST-IN-PLACE	033000-1-033000-18
 DIVISION 04 - MASONRY	
SECTION 042000 - UNIT MASONRY	042000-1-042000-19
SECTION 044200 – EXTERIOR STONE CLADDING	044200-1-044200-7
 DIVISION 05 – METALS	
SECTION 051200 – STRUCTURAL STEEL FRAMING	051200-1-051200-9
SECTION 052100 – STEEL JOIST FRAMING	052100-1-052100-5
SECTION 053100 – STEEL DECKING	053100-1-053100-5
SECTION 054000 - COLD-FORMED METAL FRAMING	054000-1-054000-6
SECTION 055000 - METAL FABRICATIONS	055000-1-055000-6
SECTION 055133.16 – INCLINES LADDERS	055133.16-1-055133.16-3
SECTION 055213 - PIPE AND TUBE RAILINGS	055213-1-055213-7

DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES

SECTION 061000 - ROUGH CARPENTRY	061000-1-061000-5
SECTION 061600 - SHEATHING	061600-1-061600-4

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

SECTION 071413 - HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING	071413-1-071413-1
SECTION 072100 - THERMAL INSULATION	072100-1-072100-5
SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS	072726-1-072726-8
SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING	075423-1-075423-9
SECTION 076200 - SHEET METAL FLASHING AND TRIM	076200-1-076200-8
SECTION 077100 - ROOF SPECIALTIES	077100-1-077100-6
SECTION 077129 - MANUFACTURED ROOF EXPANSION JOINTS	077129-1-077129-4
SECTION 078123 - INTUMESCENT MASTIC FIREPROOFING	078123-1-078123-5
SECTION 078413 - PENETRATION FIRESTOPPING	078413-1-078413-7
SECTION 079200 - JOINT SEALANTS	079200-1-079200-9
SECTION 079500 - EXPANSION CONTROL	079500-1-079500-5

DIVISION 08 - OPENINGS

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES	081113-1-081113-9
SECTION 083323 - OVERHEAD COILING DOORS	083323-1-083323-5
SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS	084113-1-084113-10
SECTION 084523 - TRANSLUCENT WALL PANEL SYSTEM	084523-1-084523-7
SECTION 085113 - ALUMINUM WINDOWS	085113-1-085113- 8
SECTION 087100 - FINISH HARDWARE	087100-1-087100-15
SECTION 088000 - GLAZING	088000-1-088000-10

DIVISION 09 - FINISHES

SECTION 090560 - MOISTURE MITIGATION FOR FLOORING	090560-1-090560-5
SECTION 092216 - NON-STRUCTURAL METAL FRAMING	092216-1-092216-5
SECTION 092900 - GYPSUM BOARD	092900-1-092900-6
SECTION 093000 - TILING	093000-1-093000-7
SECTION 095113 - ACOUSTICAL PANEL CEILINGS	095113-1-095113-7
SECTION 096466 - WOOD ATHLETIC FLOORING	096466-1-096466-9
SECTION 096513 - RESILIENT BASE AND ACCESSORIES	096513-1-096513-6
SECTION 096519.23 - RESILIENT /VINYL TILE FLOORING	096519.23-1-096519.23-6
SECTION 096813 - TILE CARPETING	096813-1-096813-5
SECTION 098433 - SOUND-ABSORBING WALL UNITS	098433-1-098433-5
SECTION 099113 - EXTERIOR PAINTING	099113-1-099113-6
SECTION 099123 - INTERIOR PAINTING	099123-1-099123-9
SECTION 099600 - HIGH-PERFORMANCE COATINGS	099600-1-099600-6

DIVISION 10 - SPECIALTIES

SECTION 104413 - FIRE EXTINGUISHER CABINETS	104413-1-104413-5
SECTION 107316 - ALUMINUM CANOPY SYSTEM	107316-1-107316-4

DIVISION 11 - EQUIPMENT

SECTION 114000 - FOOD SERVICE EQUIPMENT	114000-1-1140000-24
Food Service Equipment Cut Sheet Book	102
SECTION 116623 – GYMNASIUM EQUIPMENT	116623-1-116623-9

DIVISION 12 - FURNISHINGS

SECTION 122413 - ROLLER WINDOW SHADES	122413-1-122413-6
---------------------------------------	-------------------

DIVISION 13 - SPECIAL CONSTRUCTION

NOT APPLICABLE

DIVISION 14 - CONVEYING EQUIPMENT

SECTION 142020 – ELEVATORS AND LIFTS	142020-1-142020-7
SECTION 144233 – CURVE INCLINE WHEELCHAIR LIFT	144233-1-144233-6

VOLUME II – DIVISIONS 21-27

DIVISION 21 - FIRE SUPPRESSION

DIVISION 22 - PLUMBING

SECTION 220503 - PLUMBING PIPING	220503-1-220503-15
SECTION 223400 – PLUMBING EQUIPMENT	223400-1-223400-6
SECTION 224000 - PLUMBING FIXTURES	224000-1-224000-7
SECTION 224001 – PLUBING SPECIALTIES	224001-1-224001-5

DIVISION 23 - MECHANICAL

SECTION 230500 – BASIC MECHANICAL REQUIREMENTS	230500-1-230500-7
SECTION 230501 – MECHANICAL DEMOLITION	230501-1-230501-4
SECTION 230502 – GAGES AND METERS	230502-1-230502-5
SECTION 230503 – TESTING OF HVAC AND GAS PIPING	230503-1-230503-3
SECTION 230513 - MOTORS	230513-1-230513-6
SECTION 230516 – PIPING EXPANSION COMPENSATION	230516-1-230516-4
SECTION 230529 – SUPPORTS AND ANCHORS	230529-1-230529-8
SECTION 230548 – VIBRATION ISOLATION	230548-1-230548-11
SECTION 230553 – MECHANICAL IDENTIFICATION	230553-1-230553-4
SECTION 230593 – TESTING, ADJUSTING, AND BALANCING	230593-1-230593-9
SECTION 230700 – DUCTWORK INSULATION	230700-1-230700-7
SECTION 230701 – PIPE INSULATION	230701-1-230701-7
SECTION 230900 – INSTRUMENTATION AND CONTROL FOR HVAC	230900-1-230900-13
SECTION 230923 – DIRECT DIGITAL CONTROL SYSTEM FOR HVAC	230923-1-230923-17
SECTION 230993 – SEQUENCE OF OPERATION	230993-1-230993-14
SECTION 230995 – VARIABLE FREQUENCY SPEED CONTROL	230995-1-230995-7
SECTION 231126 – FUEL PIPING	231126-1-231126-4
SECTION 232113 - HYDRONIC PIPING	232113-1-232113-3
SECTION 233100 – DUCTWORK	233100-1-233100-9

SECTION 233300 – DUCTWORK ACCESSORIES	233300-1-233300-6
SECTION 233400 – POWER VENTILATORS	233400-1-233400-6
SECTION 233700 – AIR OUTLETS AND INLETS	233700-1-233700-6
SECTION 234000 – AIR CLEANING DEVICES	234000-1-234000-3
SECTION 236100 – REFRIGERANT PIPING AND SPECIALTIES	236100-1-236100-8
SECTION 237413 – PACKAGED ROOFTOP AIR CONDITIONING UNITS	237413-1-237413-10
SECTION 237423 – PACKAGED ROOFTOP MAKE-UP AIR UNITS FOR KITCHENS	237423-1-237423-10
SECTION 238300 – TERMINAL HEAT TRANSFER UNITS	238300-1-238300-5
SECTION 238310 – HEAT PUMP HEAT RECOVERY SYSTEM	238310-1-238310-11

DIVISION 26 - ELECTRICAL

SECTION 260500 – BASIC ELECTRICAL REQUIREMENTS	260500-1-260500-16
SECTION 260503 - EQUIPMENT WIRING	260503-1-260503-4
SECTION 260519 – BUILDING WIRE AND CABLE	260519-1-260519-8
SECTION 260526 - GROUNDING AND BONDING	260526-1-260526-5
SECTION 260529 – SUPPORTING DEVICES	260529-1-260529-4
SECTION 260532 – CONDUIT	260532-1-260532-10
SECTION 260533 - BOXES	260533-1-260533-6
SECTION 260539 – SURFACE RACEWAYS	260539-1-260539-4
SECTION 260553 – ELECTRICAL IDENTIFICATION	260553-1-260553-4
SECTION 260810 – OCCUPANCY SENSORS	260923-1-260923-6
SECTION 262413 – FUSES	262413-1-262413-5
SECTION 262415 - SWITCHBOARDS	262415-1-262415-8
SECTION 262416 - PANELBOARDS	262416-1-262416-9
SECTION 262726 - WIRING DEVICES	262726-1-262726-7
SECTION 262819 - ENCLOSED SWITCHES	262819-1-262819-4
SECTION 263100 – FIRE ALARM AND DETECTION SYSTEMS	263100-1-263100-8
SECTION 265100 - INTERIOR LUMINARIES	265100-1-265100-13

DIVISION 27 – BUILDING AUTOMATION SYSTEM

SECTION 270533 – CONDUIT ROUGH-IN FOR SPECIAL SYSTEMS	270533-1-270533-3
SECTION 271443 – DATA AND VOICE CABLING	271443-1-271443-10

DIVISION 28 -30 NOT USED

DIVISION 31 - EARTHWORK

SECTION 312000 – EARTH MOVING	312000-1-312000-8
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END OF TABLE OF CONTENTS

INVITATION TO BID

Project	Brookview Elementary School Additions and Renovations
Location	Brookview Elementary School 1750 Madron Road Rockford, Illinois 61107
Owner	Rockford Public School District 205 501 Seventh Street Rockford, Illinois 61104
Architect	Hagney Architects LLC 4615 East State Street, Suite 206 Rockford, Illinois 61108 815/397-3330 Fax: 815/397-0243
Project Manager	Ragnar Benson Construction, LLC 250 S. Northwest Highway Park Ridge, Illinois 60068 815/489-7260
Bid Scope	Project includes additions and renovations
Bid Due Date	3:00 P.M. (CDST), Monday, April 11, 2016
Pre-Bid Meeting	Mandatory Meeting: 3:00 PM (CDST), Monday, March 28, 2016; at Brookview Elementary School, 1750 Madron Road, Rockford, IL 61107, meet in library.
Other Key Dates	Tuesday, April 26, 2016; RPS Board Meeting Wednesday, April 27, 2016; Award / Notice to Proceed

INVITATION TO BID

Bid Security	5% of Base Bid.
Obtain Bid Documents By	<p>Emailing the District's Purchasing Department, by downloading from the on District's Purchasing Bids-RFPs webpage at www.rps205.com, or by contacting the following:</p> <p>Onvia Demandstar</p> <p>BHFX Digital Imaging and Printing 1404 21st Street Rockford, IL 61108 P. (815) 397-8800 F. (815) 397-8844 rockford@bhfx.net</p> <p>DG Digital Printing 214 N. Rockton Avenue Rockford, IL 61103 P. (815) 961-0000 F. (815) 961-0004 http://www.dgdplanroom.com/</p> <p>YCS Printing, Inc. 305 E. Riverside Blvd. Loves Park, IL 61111 P. (815) 636-2058 F. (815) 636-2059 print@ycsprinting.com</p>
Performance Bond and Labor And Material Payment Bond	Furnish in the amount of 100% of the Contract after award.
Rights Reserved by Owner	The Owner reserves the right to waive any irregularities and/or reject any or all bids when, in the opinion of the Owner, such action will serve the best interests of the Owner.
Withdrawal of Bids	No bid may be withdrawn for a period of 60 days after the opening of bids without written consent of the Owner.

STATEMENT OF NO INTEREST - BID

NOTE: If you are unable to submit a bid for this work, please complete and return this form immediately.

The Purchasing Department of the Rockford School District wishes to keep its vendors list file current. If for any reason you cannot supply the commodity/service noted on the attached solicitation, this form must be completed and returned to remain on the particular vendor list for future projects of this type.

We, the undersigned, have declined to submit a proposal on:

Bid No. & Name: Bid 16-48 Brookview Elementary School Additions and Renovations

We are unable to submit a proposal for this work due to the following:

____ Too busy at this time ____ Unable to meet specifications

____ Bond requirement ____ Not engaged in this type work

____ Insurance requirement ____ Site location too distant

____ Length of time required to obtain payment

____ Project is ____ too large ____ too small

____ Remove us from your bidder's list for this commodity/service

____ Other (specify below)

____ Do you wish to be considered in the future for similar projects? ____ Yes ____ No

REMARKS:

Signature: _____ Name & Title: _____

Firm: _____ Phone: _____

Fax: _____ E-mail: _____

Address: _____
(Street Address) (City) (State) (Zip-Code)

Date: _____

Return to: Executive Director of Budgeting and Purchasing
Rockford Public School District
501 7th Street
Rockford, IL 61104

LATE BIDS CANNOT BE ACCEPTED!

SEALED BID PROPOSAL

BID NO.: 16-48
OPENING DATE: April 11, 2016
OPENING TIME: 3:00 PM (CDST)
DESCRIPTION: Brookview ES Additions and Renovations

ATTN: PURCHASING DEPT. _____

DATED MATERIAL-DELIVER IMMEDIATELY

PLEASE CUT OUT AND AFFIX THIS BID LABEL TO THE
OUTERMOST ENVELOPE OF YOUR PROPOSAL TO HELP ENSURE
PROPER DELIVERY!

LATE OFFERS CANNOT BE ACCEPTED!



AIA[®] Document A701[™] – 1997

Instructions to Bidders

for the following PROJECT:

(Name and location or address)

MFP Bid docs boilerplate

THE OWNER:

(Name, legal status and address)

Board of Education

Rockford School District No. 205

Winnebago and Boone Counties, Illinois

501 Seventh Street

Rockford, Illinois 61104

THE ARCHITECT:

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

TABLE OF ARTICLES

- | | |
|---|--|
| 1 | DEFINITIONS |
| 2 | BIDDER'S REPRESENTATIONS |
| 3 | BIDDING DOCUMENTS |
| 4 | BIDDING PROCEDURES |
| 5 | CONSIDERATION OF BIDS |
| 6 | POST-BID INFORMATION |
| 7 | PERFORMANCE BOND AND PAYMENT BOND |
| 8 | FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR |

ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201 as revised by Owner, or in other Contract Documents are applicable to the Bidding Documents.

§ 1.3 Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.

§ 1.4 A Bid is a complete and properly executed proposal to do the Work for the sums stipulated therein, submitted in accordance with the Bidding Documents.

§ 1.5 The Base Bid is the sum stated in the Bid for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids.

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

§ 1.7 A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the Work as described in the Bidding Documents.

§ 1.8 A Bidder is a person or entity who submits a Bid and who meets the requirements set forth in the Bidding Documents.

§ 1.9 A Sub-bidder is a person or entity who submits a bid to a Bidder for materials, equipment or labor for a portion of the Work.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

§ 2.1.2 The Bid is made in compliance with the Bidding Documents and all required information required by Owner in the Bidding Documents has been furnished by Bidder..

§ 2.1.3 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 COPIES

§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents.

§ 3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

§ 3.1.3 Bidders shall use complete sets of Bidding Documents in preparing Bids; neither the Owner nor Architect assumes responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

§ 3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

§ 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall submit inquiries to the Director of Purchasing for Owner, 501 Seventh Street, Rockford, Illinois 61104.

§ 3.2.3 Interpretations, corrections and changes of the Bidding Documents will be made by Addendum. Interpretations, corrections and changes of the Bidding Documents made in any other manner will not be binding, and Bidders shall not rely upon them.

§ 3.3 SUBSTITUTIONS

§ 3.3.1 The materials, products and equipment described in the Bidding Documents establish a standard of required function, dimension, appearance and quality to be met by any proposed substitution.

§ 3.3.2 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect and Program Manager at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

§ 3.3.3 If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner.

§ 3.3.4 No substitutions will be considered after the Contract award unless specifically provided for in the Contract Documents.

§ 3.4 ADDENDA

§ 3.4.1 Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.

§ 3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

§ 3.4.3 Addenda will be issued no later than four days prior to the date for receipt of Bids except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

§ 3.4.4 Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

§ 4.1.1 Bids shall be submitted on the forms included with the Bidding Documents.

§ 4.1.2 All blanks on the bid form shall be legibly executed in a non-erasable medium.

§ 4.1.3 Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

§ 4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid.

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change."

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

§ 4.2 BID SECURITY

§ 4.2.1 Each Bid shall be accompanied by a bid security in the form and amount required if so stipulated in the Instructions to Bidders. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Section 6.2.

§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

§ 4.2.3 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

§ 4.3 SUBMISSION OF BIDS

§ 4.3.1 All copies of the Bid, the bid security, if any, and any other documents required to be submitted with the Bid shall be enclosed in a sealed opaque envelope. The envelope shall be addressed to the party receiving the Bids and shall be identified with the Project name, the Bidder's name and address and, if applicable, the designated portion of the Work for which the Bid is submitted. If the Bid is sent by mail, the sealed envelope shall be enclosed in a separate mailing envelope with the notation "SEALED BID ENCLOSED" on the face thereof.

§ 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

§ 4.3.3 The Bidder shall assume full responsibility for timely delivery at the location designated for receipt of Bids.

§ 4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.

§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the

signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

§ 4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

§ 4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

ARTICLE 5 CONSIDERATION OF BIDS

§ 5.1 OPENING OF BIDS

This bid is form a project for the Rockford Public Schools. All bids advertised, submitted, and selected for award by Owner and other matters relating to the bidding process shall adhere to the provisions of Illinois law, in particular the provisions of the School Code, including without limitation, the provisions of 105 ILCS 5/10-20.21.

At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

§ 5.2 REJECTION OF BIDS

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way nonresponsive, incomplete or irregular is subject to rejection.

§ 5.3 ACCEPTANCE OF BID (AWARD)

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest responsible Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

§ 5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

§ 6.2

(Paragraphs deleted)

SUBMITTALS

(Paragraphs deleted)

§ 6.2.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner through the Architect in writing:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and
- .3 names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work.

§ 6.2.2 The Bidder will be required to establish to the satisfaction of the Architect, Program Manager and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner, Program Manager or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity. The Owner may accept the substitute person or entity or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

§ 6.3.4 Persons and entities proposed by the Bidder and to whom the Owner and Architect have made no reasonable objection must be used on the Work for which they were proposed and shall not be changed except with the written consent of the Owner and Architect.

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 BOND REQUIREMENTS

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder's usual sources.

§ 7.1.2 If the furnishing of such bonds is stipulated in the Bidding Documents, the cost shall be included in the Bid. If the furnishing of such bonds is required after receipt of bids and before execution of the Contract, the cost of such bonds shall be added to the Bid in determining the Contract Sum.

§ 7.1.3 If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.

§ 7.2 TIME OF DELIVERY AND FORM OF BONDS

§ 7.2.1 The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this Section 7.2.1.

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

§ 7.2.3 The bonds shall be dated on or after the date of the Contract.

§ 7.2.4 The Bidder shall require the attorney-in-fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of the power of attorney.

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

The Agreement for the Work will be written on AIA Document A101-2007 as revised by Owner and be accompanied by General Conditions on AIA Document A201-2007, as revised by Owner and further revised by Supplementary Conditions issued by Owner all as included in the Bidding Documents.

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

1. SPECIAL NOTICE TO BIDDERS:

- A. Proposals shall be submitted in duplicate on the forms provided. The sample proposal form bound into these Specifications is for reference only and shall not be detached. Proposals shall be enclosed in a sealed envelope, with name of the project clearly identified, and bearing the words "SEALED BID ENCLOSED".
- B. Proposals shall be based upon the drawing and specifications and each bidder shall acknowledge the receipt and inclusion of any further instruction or addenda which may be issued prior to receipt of proposal.
- C. Bids shall be opened publicly by the Owner, immediately after bid closing time at the office of the Board of Education, 501 Seventh Street, Rockford, Illinois.

2. METHOD OF BIDDING

Bids will be received for a single contract.

3. SIGNING BIDS:

- A. Bids which are signed for a partnership shall be signed by all partners or by an Attorney-In-Fact. If signed by an Attorney-In-Fact, there shall be attached to the bid, a Power of Attorney evidencing such authority.
- B. Bids which are signed for a corporation shall have the correct corporation name thereon and the signature of the president or other authorized officer of the corporation.
- C. Proposals shall be made on the form provided and shall not be altered in any way.

4. QUALIFICATIONS:

Statement as to whether the bidder has adequate equipment to do the work properly and expeditiously.

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

5. AWARD (SEE ARTICLE 5.3)

The Contract shall be deemed as having been awarded when formal written notice shall have been duly served by an officer or agent of the Owner duly authorized to give such notice.

6. TAXES:

The bidder shall not include any Illinois Retailers Occupation or use taxes on tangible property purchased in the State of Illinois in his bid. Exemption Certificates for these taxes will be furnished by the Board of Education to the Contractor when requested by him/her in writing. See Section 17 regarding sales of tangible property into the State of Illinois.

7. FORM OF CONTRACT:

The Owner-Contractor agreement shall be the Standard Form of Agreement between Owner and Contractor, AIA Document A101-2007 as revised by Owner, (form included in bidding documents), including the General Conditions AIA A201-2007 as revised by Owner (form included in Invitation for Bid), the Addendum included in the Invitation for Bid, the Invitation for Bid, all amendments and addenda to the Invitation for Bid issued by the Owner, and the successful bidders bid.

8. ACCEPTANCE OR REJECTION OF BIDS:

The Owner reserves the right to reject any or all bids and to waive informalities in order to accept the bid that in his judgment will be best for the interest of the School District. Any bidder may withdraw his bid either personally or by telephone written request at any time prior to the scheduled closing time for receipt of bids.

9. QUESTION ON BIDDING DOCUMENT:

Refer all questions relative to the business aspect, Instructions to Bidders, Special Conditions, and questions concerning the technical aspect of the documents to the Executive Director of Budget and Purchasing by email at stacie.scott@rps205.com.

10. BID DEPOSIT:

Each bidder shall provide a Bid Bond, a Certified Check or Bank Draft in the amount of 5% of the bid total. Bid deposits will be returned to unsuccessful bidders within (30) days after award. Bid deposits will be returned to successful bidder as soon as Contract is accepted for the work outlined in this proposal.

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

11. EXAMINATION OF SITE:

Bidder shall examine the sites of the work prior to bidding. He shall satisfy himself/herself as to existing conditions, local facilities and governing factors under which he will be obliged to operate in performing his part of the work, or that may in any manner affect the work under this contract. No allowance shall be subsequently made in this connection in behalf of the Bidder for any error or negligence on his/her part due to this failure to fully examine the sites or the work prior to bidding.

12. PREVAILING WAGE:

This Bid requires that the successful Contractor comply with all statutes, both Federal and State, governing payment of wages to employees. The Contractor certifies that by submitting his bid that he will pay the prevailing rate of wage in this area, for the particular type of labor, in accordance with State of Illinois Codes and the Illinois department of Labor. The Contractor and each Subcontractor shall keep an accurate record to show names and occupation of all workmen employed by them in connection with this contract. The actual hourly wage paid to each shall be recorded. These records shall be open for inspection during all working hours to the Owner's agent and the agent of the Illinois Dept. of Labor. In accordance with the amendment of the Illinois Prevailing Wage Act effective 1-1-90, as amended, the following clause shall be apart of this contract. *"If during the course of this contract the Department of Labor revises the prevailing rate hourly wages to be paid under this contract for any trade or occupation, Owner will notify contractor and each Subcontractor of the change in the prevailing rate of hourly wages. Contractor shall have the sole responsibility and duty to ensure that the revised prevailing rate of hourly wage is paid by Contractor and all Subcontractors to each worker to whom a revised rate is applicable. Revisions to the prevailing wage as set forth above shall not result in an increase in the contract sum."*

13. DOCUMENTS TO BE RETURNED:

Forwarded with this bidding document is one complete set of specifications and bidding forms. The bidding forms are included within the bidding document, Two copies of the bidding forms are to be returned as your Bidding Document, along with the Bid Deposit, signatures, and other required information. A self-addressed label, properly identified, is provided for your use.

It is required that the Bidder's signature appears on the following bidding forms:

- A. Statement of No Interest (if applicable)
- B. Bid-Rigging Certification
- C. Minority and Women Owned Business Form
- D. Certification Regarding Debarment Form
- E. Certificate Regarding Lobbying Form
- F. OFAC Compliance Form
- G. Vendor Conflict of Interest Disclosure Form
- H. Bid Offer Form

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

14. ILLINOIS FAIR EMPLOYMENT PRACTICES

The bidder's signature on the bid form of this Face Sheet will be construed as his/her acceptance of and willingness to comply with all provisions of the Acts of the General Assembly of the State of Illinois relating to wages of laborers, preferences and discrimination and intimidation of employees. This bid and the resulting Contract are specifically subject to the Equal Employment Opportunity requirements of the Illinois Fair Employment Practices Commission and the policies of the Rockford Board of Education. Bidder agrees to comply in all respect with Federal, State and local laws and ordinances pertaining to this bid and to the performance of the Contract in the event bidder is awarded the bid. Provisions of applicable acts are hereby incorporated by reference and become a part of this proposal and specifications.

15. EMPLOYMENT OF ILLINOIS WORKERS ON PUBLIC WORKS ACT

Pursuant to the Employment of Illinois Workers on Public Works Act, during any time of excessive unemployment (defined as any month immediately following 2 consecutive calendar months during which the level of unemployment in the State of Illinois has exceeded 5% as measured by the United States Bureau of Labor Statistics in its monthly publication of employment and unemployment figures) any person or entity charged with the duty, either by law or contract, of (1) constructing or building any public works, as defined in this Act, or (2) the clean-up and on-site disposal of hazardous waste for the State of Illinois or any political subdivision of the State, and that clean-up or on-site disposal is funded or financed in whole or in part with State funds or funds administered by the State of Illinois, then that person or entity shall employ at least 90% Illinois laborers on such project. Persons or entities entering into a contract with the Rockford Public Schools in which they are obligated to construct or build any public works (defined any fixed work construction or improvements funded in whole or part by the State of Illinois) agree to abide by the requirements of the Employment of Illinois Workers on Public Works Act.

16. TAX IDENTIFICATION NUMBER:

Under Federal Law and in accordance with instructions from the Department of Treasury and the Internal Revenue Service, our School District is required to have on file appropriated tax identification information concerning you or your firm. This information will be a Federal Employer's Identification Number, but in some instances of independent contractors, it might be a Social Security Number. This information is needed to determine on which vendors we must file a Form 1099.

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

BEFORE A BID CAN BE CONSIDERED BY THE SCHOOL DISTRICT, THE ABOVE REFERENCED TAX IDENTIFICATION NUMBER MUST BE ON THE BID FORM IN THE SIGNATURE SECTION. WE ALSO SPECIFICALLY REQUIRE THAT YOU IDENTIFY THE LEGAL ORGANIZATIONAL STATUS OF YOUR FIRM IN THE SIGNATURE SECTION AS TO WHETHER IT IS A CORPORATION, PARTNERSHIP, PROPRIETORSHIP, ETC., SHOULD YOU HAVE ANY QUESTIONS CONCERNING THIS TAX IDENTIFICATION NUMBER, PLEASE CONTACT US.

17. **CONTRACTOR RESPONSIBILITY TO COLLECT AND REMIT ILLINOIS USE TAX**

The bidders acknowledge and understand that any resulting contract for goods and services awarded to a bidder requires that as a contractor the person or entity and all affiliates of the person or entity will collect and remit Illinois Use Tax on all sales of tangible personal property into the State of Illinois in accordance with the provisions of the Illinois Use Tax Act (35 ILCS 105/1 et seq.) regardless of whether the person/entity or affiliate is a “retailer maintaining a place of business within this State” as defined by the Use Tax Act (35 ILCS 105/2). (Reference the School Code of Illinois; 105 ILCS 5/10-20.21(b))

18. **PERFORMANCE BOND:** Shall be submitted on AIA Document 312-2010, “Performance Bond” and “Labor & Material Payment Bond”.

The successful bidder will be required to furnish a Performance Bond and a Labor & Materials Bond satisfactory to the Board of Education. The amount of said bond shall be equal to 100% of the contract award and the cost of any said bond shall be included in the Contractor’s proposal.

19. **PREQUALIFICATION OF MATERIALS:**

Approval of other “or equal” materials shall be pre-qualified by the Architect’s at least five (5) working days before the bid opening. Proposals may be offered on more than one manufacturer.

20. **PREQUALIFICATION OF BIDDER:**

A bidder may be required to furnish evidence satisfactory to the Owner that he/she and his/her proposed subcontractors have sufficient means and experience in the types of work call for to assure completion of the contract in a satisfactory manner. A new bidder may be required to properly execute AIA Document A305, “Contractor’s Qualification Statement” before submitting his bid.

SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

21. MINORITY AND FEMALE OWNED BUSINESSES

District #205 supports the policy of the State of Illinois to support Minority Owned Business Enterprise (MBE) and Female Owned Business Enterprise (FBE). The District seeks to identify and encourage the amount of minority and female involvement in each of the construction-related contracts issued by the District. A bidder will be required to submit the minority certification form enclosed with the bid documents. Additionally, in the event and to the extent State of Illinois funds in excess of \$250,000.00 are awarded to and used by the District for capital construction costs and design services on a school construction project, and goals are established for MBE and FBE participation in such school construction project involving the use of State of Illinois funds, and to the extent such goals are not inconsistent with Federal guidelines the District will follow such goals unless waived. The successful bidder agrees to cooperate with the District to provide necessary information to meet state funding requirements and on participation by MBE and WBE and to assist in meeting goals through certification as a MBE or WBE or certification of subcontractors.

GENERAL TERMS AND CONDITIONS

“District” means Rockford School District No. 205, Winnebago and Boone Counties, Illinois.

“IFB” means an Invitation for Bid issued by the District at any time or times, identified by a unique bid number.

“Bidder” means a person or entity submitting a bid to the District in response to an IFB; including successful Bidders.

1. BID OPENING. Sealed bids will be received at the District Purchasing Department until the date and time specified at which time they shall be opened in public. No other bids will be considered after this date and time unless it is evidenced and determined that the bid was in the District’s possession prior to the scheduled bid opening time and date. Late bids shall be rejected and shall remain unopened. The District does not prescribe the method by which bids are to be transmitted; therefore, it cannot be held responsible for any delay, regardless of the reason, in transmission of the bids. All bids delivered in person shall be deposited with the District Purchasing Department, 6th Floor, 501 Seventh Street, Rockford, IL, 61104.

2. BID PREPARATION. Bids must be submitted on this form and all information and certifications called for must be furnished. Bids submitted in any other manner, or which fail to furnish all information or certificates required, may be summarily rejected. Bids may be modified or withdrawn prior to the time specified for the opening of the bids. Bids shall be filled out legibly in ink or typewritten with all erasures, strikeovers and corrections initialed in ink by the person signing the bid. The bid shall include the legal name of the bidder, the complete mailing address, and be signed in ink by a person or persons legally authorized to bind the bidder to a contract. Name of person signing should be typed or printed below the signature.

3. BID ENVELOPES. Envelopes containing bids must be sealed and addressed to the District Purchasing Department. The name and address of the Bidder and the bid number must be shown on the envelope.

4. ERRORS IN BIDS. Bidders are cautioned to verify their bids before submission. Negligence on the part of the Bidder in preparing the bid confers no right for withdrawal or modification of the bid after it has been opened. In case of error in the extension of prices in the bid, the unit prices will govern.

5. RESERVED RIGHTS. The District reserves the right at any time and for any reason to cancel an IFB, accept or reject any or all bids or any portion thereof, or to accept an alternate offer. The District reserves the right to waive any minor informality defect in any IFB. Unless otherwise specified, the District will award a bid or reject bids within 60 days. The District may seek clarification from any Bidder at any time and failure to respond promptly is cause for rejection.

6. INCURRED COSTS. The District will not be liable for any costs incurred by Bidders in responding to an IFB.

7. AWARD. The District will evaluate bids and will award a contract to the lowest responsive and responsible bidder whose bid, conforming to the solicitation and specifications will be most advantageous to the District. Determination of the lowest responsible bidder conforming to the solicitation shall not be restricted to the price quotation alone, but will include such other factors (where applicable) as (a) adherence to all conditions and requirements of the technical specifications; (b) price; (c) qualifications of the bidder, including past performance, financial responsibility, general reputation, experience, service capabilities, and facilities; (d) delivery or completion date; (e) product appearance, workmanship, finish, taste, feel, overall quality, and results of product testing; (f) maintenance costs and warranty provisions; (g) repurchase or residual value; and (h) other such related items. The District is interested in obtaining the best overall value and reserves the right to make a selection based on its judgment of the bid that is best suited for the purpose intended. The District may (1) reject any or all bids, (2) accept other than the lowest bidder, and (3) waive informalities or minor irregularities in bids received. The District may accept any item or group of items of an offer, unless the bidder qualifies the bid by specific limitations. The District reserves the right to determine the lowest responsible bidder on the basis of an individual item, groups of items, or in any way determined to be in the best interests of the District. A written award or acceptance of a bid mailed or otherwise furnished to the successful Bidder within the time for acceptance specified in the bid shall result in a binding contract without further action by either party.

8. PRICING. The price quoted for each item is the full purchase price, **including delivery to destination**, and includes all transportation and handling charges, premiums on bonds, material or service costs, patent royalties and all other overhead charges of every kind and nature. Unless otherwise specified, prices shall remain firm for the contract period.

If at any time after a contract is awarded to the successful Bidder(s) makes a general price reduction in the comparable price of any material covered by the contract to customers generally, an equivalent price reduction based on similar quantities and/or considerations shall apply to the contract for the duration of the contract period (or until the price is further reduced). Such price reduction shall be effective at the same time and in the same manner as the reduction in the price to customers generally. For the purpose of this provision, a “general price reduction” shall mean any horizontal reduction in the price of an article or service offered (1) to successful Bidder’s customers generally, or (2) in the successful Bidder’s price schedule for the class of customers, i.e., wholesalers, jobbers, retailers, etc., which was used as the basis for bidding on this contract. An occasional sale at a lower price, or sale of distressed merchandise at a lower price, would not be considered a “general price reduction” under this provision. The successful Bidder shall invoice the District at such reduced prices indicating on the invoice that the reduction is pursuant to the “price reduction” provision of this contract. The successful Bidder, in addition, shall within ten (10) days of any general price reduction, notify the Executive Director of Budget and Purchasing of such reduction by letter. Failure to do so may result in termination of the contract.

9. DISCOUNTS. Prices quoted must be net after deducting all trade and quantity discounts.

10. SPECIFICATIONS. Reference to brand names and numbers is descriptive, but not restrictive, unless otherwise specified. Bids on equivalent items will be considered, provided the bidder clearly states exactly what is proposed to be furnished, including complete specifications. Unless the Bidder specified otherwise, it is understood the Bidder is offering a referenced brand item as specified or is bidding as specified when no brand is referenced, and does not propose to furnish an “equal.” The District reserves the right to determine whether a substitute offer is equivalent to and meets the standard of quality and salient characteristics indicated by the brand name and number.

11. SAMPLES. Samples of items, when called for, must be furnished free of expense. Individual samples must be labeled with the Bidder’s name, bid number, item reference, manufacturer’s brand name and number. If samples are requested, they must be sent under separate cover and not included with bid. The District will not be responsible for any bid enclosed with sample boxes.

12. INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS. Bidders shall promptly notify the Rockford Public School District of any ambiguity, inconsistency or error which they may discover upon examination of the IFB documents. Interpretations, corrections and changes will be made by amendment. Each Bidder shall ascertain prior to submitting a bid that all amendments have been received and acknowledged in the offer.

13. INDEMNIFICATION. The Bidder shall indemnify and hold harmless the District, its agents, officials, and employees from and against all injuries, losses, claims, suits, costs and expenses which may accrue against the District as a consequence of granting the contract.

14. DEFAULT. If delivery of acceptable items or rendering of services is not completed by the time promised, the District reserves the right, without liability, in addition to its other rights and remedies, to terminate the contract by notice effective when received by Bidder, as to stated items not yet shipped or services not yet rendered and to purchase substitute items or services elsewhere and charge the Seller with any or all losses incurred. The District shall be entitled to recover its attorney fees and expenses in any successful action by the District to enforce this contract.

15. INSPECTION. Materials or equipment purchased are subject to inspection and approval at the District’s destination. The District reserves the right to reject and refuse acceptance of items which are not in accordance with the IFB, instructions, specifications, drawings or data or Bidder’s warranty (express or implied). Rejected materials or equipment shall be removed by, or at the expense of, the Bidder promptly after rejection and if not removed within 10-calendar days after notice, such shall be returned via collect shipping.

16. WARRANTY. Bidder warrants that all goods and services furnished hereunder will conform in all respects to the terms of this proposal, including any drawings, specification or standards incorporated herein, and that they will be free from latent and patent defects in materials, workmanship and title, and will be free from such defects in design to the best of the Bidder's knowledge. In addition, Bidder warrants that said goods and services are suitable for, and will perform in accordance with, the purposes for which they are purchased, fabricated, manufactured and designed or for such other purposes as are expressly specified in this solicitation. The District may return any nonconforming or defective items to the Bidder or require correction or replacement of the item at the time the defect is discovered, all at the Bidder's risk and expense. Acceptance shall not relieve the Bidder of its responsibility.

17. REGULATORY COMPLIANCE. Bidder represents and warrants that the goods or services furnished hereunder (including all labels, packages and container for said goods) comply with all applicable standards, rules and regulations in effect under the requirements of all Federal, State and local laws, rules and regulations as applicable, including the Occupational Safety and Health Act as amended, with respect to design, construction, manufacture or use for their intended purpose of said goods or services. Bidder shall furnish "Material Safety Data Sheets" in compliance with the Illinois Toxic Substances Disclosure to Employees Act, if applicable.

18. ROYALTIES AND PATENTS. Bidder shall pay all royalties and license fees. Bidder shall defend all suits or claims for infringement of any patent, copyright or trademark rights and shall hold the District harmless from loss on account thereof.

19. COMPLIANCE WITH LAWS AND REGULATIONS. Bidder represents and warrants that throughout the term of any contract arising from award of a bid and any extension thereof, Bidder and all products shall be and shall remain in compliance with all applicable federal, state, and local laws and regulations.

20. TERMINATION. (a) The District may terminate this contract in whole or in part, without liability, if deliveries are not made at the time and in the quantities specified, if the Bidder fails to perform any of the provisions of this contract, or so fails to make progress as to endanger performance of this contract in accordance with its terms, and in either of these circumstances does not cure such failure within such period of time as the District may direct, if it is determined the successful Bidder knowingly falsified information provided to the District, if it is determined the successful Bidder offered substantial gifts or gratuities to a District official, employee, or agent whether in their official capacity or not, or in the event of a breach or failure of the Contractor to comply with any of the other terms or conditions herein. The District shall notify the contractor in writing of the specific nature of the breach and shall request that it be cured. If the Contractor does not cure the breach within thirty (30) days of such notice, the District may immediately terminate this contract. To terminate, the District shall give notice to the Contractor in writing, and to the extent specified therein, Contractor shall immediately terminate deliveries under the contract. Termination of the contract shall not preclude the District from pursuing any and all remedies available to it at law or at equity.

(b) Any termination by the District, whether for default or otherwise, shall be without prejudice to any claims for damages or other rights of the District against Contractor.

(c) The District shall have the right to audit all elements of any termination claim and Contractor shall make available to the District on request all books, records, and papers relating thereto.

(d) The Contractor shall be paid only for the performance of work up to the date of termination if the District exercises its right to terminate.

21. TERMINATION WITHOUT CAUSE. Unless otherwise specified in the Invitation for Bid, a contract formed by award of a bid may be unilaterally terminated by the District, for any or no reason, upon sixty (60) days written advance notice to the Bidder. Bidder may submit claims for actual work performed up to and including the day of notice of termination with appropriate documentation supporting such claim for materials, labor, or acquired inventory for equitable adjustment and any such material shall become the property of the District upon settlement.

22. ASSIGNMENT. The Bidder may not assign, subcontract, delegate or otherwise transfer this contract or any of its rights or obligations hereunder, nor may it contract with third parties to perform any of its obligations hereunder except as contemplated in this contract, without the District's prior written consent.

23. FORCE MAJEURE. The obligations of the Bidder to perform under this contract will be excused during each period of delay caused by acts of God or by shortages of power or materials or government orders which are beyond the reasonable control of the Bidder obligated to perform ("Force Majeure Event"). In the event that the Bidder ceases to perform its obligations under any contract formed by award of bid due to the occurrence of a Force Majeure Event, the Bidder shall: (1) immediately notify the District in writing of such Force Majeure Event and its expected duration; (2) take all reasonable steps to recommence performance of its obligations under this contract as soon as possible. In the event that any Force Majeure Event delays Bidder's performance for more than thirty (30) days following notice pursuant to this contract, the District may terminate this contract immediately upon written notice to the Contractor.

24. BID CERTIFICATION. The Bidder's signature on a bid certifies: (a) The bid is genuine and not made in the interest of, or on the behalf of, any undisclosed persons, firms or corporation and is not submitted in conformity with any agreement or rules of any group association, or organization. (b) Bidder has not directly or indirectly induced or solicited any other Bidder to enter a false or sham bid. (c) Bidder has not solicited or induced any person, firm or group to refrain from bidding. (d) Bidder has not sought by collusion or otherwise to obtain for self-interest any advantage over any other Bidder or the Owner. The Bidder's signature on the Bid Form certifies that they have read and understand the contents of this solicitation and agree to furnish at the prices shown any or all of the items and/or services, subject to all instructions, conditions, specifications and attachments hereto. Failure to have read all the provisions of the IFB shall not be cause to alter any resulting contract, request additional compensation, or relieve Bidder from obligation to perform under this contract.

25. MODIFICATIONS. This contract can be modified only by written bi-lateral modification signed by the parties or duly authorized agents.

26. ADDENDA. If it becomes necessary to revise any part of this bid, a written addendum will be provided to all bidders. If the District issues written addenda, such addenda shall become part of the contract documents. A Bidder who fails to receive the District's addenda, and who has previously submitted an offer, shall not be relieved from any obligation in the bid submitted.

27. BINDING EFFECT. The terms, conditions, provisions, and undertakings of any contract formed by award of a bid shall be binding upon and inure to the benefit of each of the parties thereto and their respective successors and assigns.

28. EQUAL OPPORTUNITY EMPLOYER. The Rockford Public School District is an Equal Opportunity Employer and encourages bids or proposals from any company or individual regardless of race, gender, national origin, religion or age.

SUPPLEMENTARY CONDITIONS

The following supplements modify, change, delete from or add to the General Conditions of the Contract for Construction, AIA document A201 2007, as revised by Owner; hereinafter referred to as General Conditions. References herein to Owner shall mean the Board of Education of Rockford School District No. 205, Winnebago-Boone Counties, Illinois.

Where any Article of the General Conditions is modified or any paragraph, subparagraph, or clause thereof is modified or deleted by these supplements the unaltered provisions of that article, paragraph, subparagraph or clause shall remain in effect. In the event of a conflict between the General Conditions and these Supplementary Conditions, which are complementary, the Supplementary Conditions shall prevail.

1. INSURANCE

- A. Contractor's Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:
 - 1. Premises operations
 - 2. Independent Contractor's protective
 - 3. Products and completed operations
 - 4. Personal injury liability with employment exclusion deleted.
 - 5. Contractual, including specified provision for Indemnification under General Conditions paragraph 3.18.
 - 6. Owned and non-owned motor vehicles
 - 7. Broad form property damage including completed operations.
- B. The insurance required by General Conditions paragraph 11.1.1 shall be written for not less than the following limits, or greater if required by law:
 - 1. Workman's Compensation:
 - a. Statutory Workman's compensation.
 - b. Employers' liability - \$500,000.00 per accident and aggregate disease.
 - 2. Builder's Risk Insurance will be carried and covered by the Board of Education separately.

Comprehensive general liability and contractual liability limits, automobile liability and umbrella coverage will depend on the category of the project. Category 1 projects will have a contract amount in the range of \$0.00 to \$1,000,000.00 and category 2 projects will have a contract amount in excess of \$1,000,000.00. The minimum liability limits per category are as follows:

SUPPLEMENTARY CONDITIONS

3. Comprehensive general liability and contractual liability

	<u>CATEGORY 1 CONTRACTS</u>	<u>CATEGORY 2 CONTRACTS</u>
a. Bodily injury:	\$1,000,000.00 each person \$1,000,000.00 each occurrence \$1,000,000.00 aggregate	\$2,000,000.00 each person \$2,000,000.00 each occurrence \$4,000,000.00 aggregate
b. Property damage:	\$1,000,000.00 each occurrence \$1,000,000.00 aggregate	\$1,000,000.00 each occurrence \$1,000,000.00 aggregate
c.	Shall include products and completed operations insurance as above for 1 year after final payment (Category 1 AND Category 2).	

4. Comprehensive Automobile Liability Category 1 AND Category 2

- | | | |
|----|------------------|--|
| a. | Bodily Injury: | \$1,000,000.00 each person
\$1,000,000.00 each occurrence |
| b. | Property Damage: | \$1,000,000.00 each occurrence
\$1,000,000.00 aggregate |

5. If the general liability coverage is provided by a commercial liability policy, the:

- | | |
|----|--|
| a. | General aggregate shall not be less than \$2,000,000 for Category 1 and \$4,000,000.00 for Category 2 and shall apply in total, to this project. |
| b. | Fire damage limit shall be not less than \$50,000 on any one fire. |

6. Umbrella liability coverage:

<u>CATEGORY 1</u>	<u>CATEGORY 2</u>
\$3,000,000.00 each occurrence \$3,000,000.00 aggregate	\$5,000,000.00 each occurrence \$5,000,000.00 aggregate

C. Certificate of Insurance:

The insurance shall be written on the Comprehensive General Liability Policy Form. The certificate shall be submitted on current AIA Document G705. A copy of this document is included herein.

SUPPLEMENTARY CONDITIONS

- D. Cancellation Notice:
All certificates and policies shall indicate that the carrying company will not cancel without giving the Owner notice in writing thirty (30) days prior to date cancellation is to become effective.
 - E. Subcontractors Comprehensive Insurance:
Contractor should protect himself/herself by requiring his subcontractors to maintain workman's compensation insurance and insurance of the same kind in amounts specified above.
 - F. Contractors Comprehensive Insurance:
Contractor shall carry sufficient comprehensive insurance on his/her equipment at site of work and in route to and from site to fully protect him/her. Contractor shall require same coverage of his/her subcontractors. It is expressly understood and agreed that the Owner and/or Architect shall have no responsibility thereof.
 - G. At no time shall the Contractor's workers be considered employees of the Board of Education.
2. **CLEANING AND PROTECTION OF BUILDING:**
- A. The Contractor shall not allow rubbish, debris, or unused material related to the execution of this Contract to accumulate on the premises. Contractor shall on a daily basis or otherwise as directed by the Owner's representative or designee, clean or pay the cost of cleaning all debris and dirt, etc., which may accumulate on the site due to the execution of this Contract.
 - B. The Owner has contracted with an Owner's representative or designee for certain projects under the Master Facilities Plan. In the event this project is managed by the Owner's representative or designee, all communications, requests and instructions shall be copied to the Owner's representative or designee. Contractor shall follow the instructions and decisions of Owner's representative or designee as though made and issued by Owner. Owner's representative or designee shall designate the permitted hours of construction activity for this project and Contractor shall not conduct construction or other activities relating to this project at the project site outside the permitted hours without the express prior consent of the Owner's representative or designee.
3. **SCHEDULE OF VALUES:**
Contractor shall submit a schedule of values to the Architect before submitting the first payment request. Use AIA Document G703. File in accordance with Article 9 of General Conditions.

SUPPLEMENTARY CONDITIONS

4. APPLICATION FOR PAYMENTS:

- A. Payment requests shall be with 10% retainage. First request, per school, may be made when the work is substantially completed at that school. Final request for the “retainage” amount shall be after completion of “Final Acceptance of Contracted Project” form.
- B. “Request for Payment” shall be submitted to the Architect on AIA Document G702/G703. Contract’s Partial Waiver of Lien will be required, current with each payment request, in the net amount of each request. Waivers of Lien from each subcontractor and material supplier to whom payment has been made, shall be required with the following payment request. Final waiver of lien from subcontractors and material suppliers shall be submitted with final pay request.
- C. The Board of Education regular meetings generally occur on the second and fourth Tuesdays of each month as specified by Board of Education Resolution and found on the web site for the Board of Education as the Board Calendar (www.rps205.com). Architect approved payment requests must be received in the Finance Department not less than 10 calendar days prior to a scheduled Board meeting for the request to be considered at that Board meeting.
- D. The Board of Education shall comply with the provisions of the Local Government Prompt Payment Act, 50 ILCS 515/1, et. seq.
- E. The provisions of the Addendum shall govern.

5. GUARANTEES:

If within one (1) year after the date of “Final Acceptance of Contracted Project” any of the work is found to be defective or not in accordance with the contract documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition.

6. CONFLICT OF INTEREST:

The State of Illinois School Code is very explicit in its direction as to the relationship of the parties involved in contracts and transactions. Below please find a reproduction of Section 33-5 (105 ILCS 5/33-5) of said code:

No member or employee of the Board of Education shall be directly or indirectly interested in any contract, work, or business of the District, or in the sale of any article, the expense, price or consideration of which is paid by the District nor in the purchase of any real estate or property belonging to the District or which shall be sold by virtue of legal process at the suit of the District. Whoever violates any provision of this Section shall be guilty of a Class A misdemeanor. (P.A.-2267)

SUPPLEMENTARY CONDITIONS

7. **TEMPORARY USE OF FACILITIES:**

A. Utilities. Owner will allow Contractor use of Owner's existing electric, gas and water utilities conditioned on full compliance by Contractor with Architect's connection and use specifications. Owner may revoke any or all utility use at any time or times in the event such use by Contractor disrupts or interferes with the normal daily operations of Owner's schools.

B. The Contractor may NOT use Owners toilet facilities or washrooms.

8. **EMPLOYEE CONDUCT:**

All of Contractor's employees, agents, principals, and consultants shall abide by Federal, State and Local Laws and Board of Education policy while on District premises. No employee, agent or principal of Contractor and its consultants and vendors shall fraternize with any student of the school district. Any employee whose conduct is judged unfit by District shall not be permitted to work on the project. Contractor agrees to comply with and abide by all rules, regulations and policies of the District and the direction of the Owner's representative or designee relating to access to and conduct upon District Premises.

Contractor employees, agents and principals and its consultants and consultants employees and agents shall not perform work within District buildings for more than 30 school days within any school year (July 1 to June 30) unless a criminal history records check has been conducted by Contractor, the individual(s) is found to have not violated any of the drug or criminal offenses listed in the criminal history records check provisions in the School Code 105 ILCS 5/10-21.9(f) (the Act), and the Contractor so certifies the same to be true on the Certified Cleared Employee List.

Contractor employees, agents and principals and its consultants and consultant's employees and agents shall not be permitted to be present on District grounds unless a Statewide Sex Offender Database check and a Statewide Child Murderer and Violent Offender Against Youth Database check has been conducted regarding all such employees in accordance with and subject to the provisions of the Act. Contractor employees, agents and principals and its consultants and consultant's employees and agents who are found to have had convictions of the enumerated criminal or drug offenses listed in the Act or who appear in the noted databases shall not be permitted at any time to be present on school grounds.

Contractor employees accessing school grounds are required to have in their possession identification issued by the District. All such persons must check in with the school main office to receive a visitor's identification at which time the individual must present a government issued photo identification which will be used to verify the individual's name appears on the Certified Cleared Employee List. At the conclusion of the work day, plastic or hard cover identification must be returned to the school.

SUPPLEMENTARY CONDITIONS

Not less than 10 days prior to the commencement of work, Contractor shall submit to Owner, with a copy to Owner's representative or designee, a written certification on a form provided by Owner (Certified Cleared Employee List), signed by Contractor under oath that the employees listed on the certification have been the subject of a criminal history records check (for employees working more than 30 school days in District buildings), and a Statewide Sex Offender Database check and a Statewide Child Murderer and Violent Offender Against Youth Database check for all employees accessing District grounds. Contractor shall update the certification as and when necessary to keep such certification list current.

The Owner and Owner's representative or designee may from time to time and at multiple times in their discretion and without notice check the identification of all persons accessing school grounds by or through the Contractor to assure such persons appear on the certification list and have in their possession a valid District issued identification. Contractor warrants that it shall immediately notify the District if a certified cleared employee is convicted of an enumerated offense or their name appears on any of the noted Databases. A violation of this section 6 is a material breach of contract.

9. MANDATORY PRE-CONSTRUCTION CONFERENCE:

Prior to beginning the work, contractor shall meet at project site with Owner's representative or designee/Owner, installers, installers of related items, and other entities including (where applicable) Owner's insurer and Architect. A Record of discussions and agreements will be kept and a copy furnished to each participant.

The conference shall be conducted not less than 7 nor more than 21 days prior to the commencement of construction and shall be scheduled by the Owner's representative or designee. Owner's representative or designee may schedule additional mandatory conferences in its discretion. Owner's representative or designee shall provide advance notice to participants prior to convening Pre-construction Conferences.

10. COMPLETION REQUIREMENTS:

The Order to Proceed, which will be issued by the Owner at a date following the contract award, will indicate the date the work is to commence and establish the completion date.

11. MEASUREMENT AND LAYOUT:

Before ordering material or doing work, each Contractor shall be responsible for measuring the physical dimensions of the site to his/her needs sufficient to execute the work desired by the Owner. Each Contractor shall be responsible for the correctness of his/her measurements. Measurements given on the drawings are for references only, for which the Owner accepts no responsibility for accuracy.

SUPPLEMENTARY CONDITIONS

12. **SITE SECURITY.**

Contractor shall be responsible for site security including the erection of temporary construction site fencing which shall be of a chain link variety and which shall be maintained by contractor at all times from commencement of construction to final acceptance of the Work. Contractor shall take reasonable actions in order to restrict access to construction sites, both inside and outside of District buildings, 24 hours per day, 7 days per week until construction is complete. Contractor shall provide site security to assure that unauthorized persons do not access the construction site (outside of school buildings) and proper barricades and safety notices and warnings are posted within buildings to assure the integrity and safety of persons and property in buildings and on the construction site, construction activities and construction materials.

13. **CONSTRUCTION ACTIVITIES:**

No construction activities shall occur on construction sites and within school buildings outside the limits established by Owner or Owner's representative or designee. Owner's representative or designee shall issue construction time periods with proper description as to when and where construction activities may occur at each construction and school site. No construction activities shall proceed in the absence of appropriate barricades and warnings.

14. **BID PROPOSAL:**

Each Contractor is to return two (2) sets of their proposal with original signatures.

15. **HOLD HARMLESS:**

To the fullest extent permitted by applicable law, Contractor and its employees and consultants shall and do agree to indemnify and hold harmless the District, and its respective Board members, officers, directors, and employees, and Owner's representative or designee from and against all claims, damages, losses, causes of action, suits, judgments and expenses, including reasonable attorney's fees to the extent arising out of, caused by or resulting from the performance or non-performance of the Work by Contractor, anyone directly or indirectly employed by it or anyone for whose acts it may be liable even if caused in part by District. This paragraph shall be construed in accordance with the Construction Contract Indemnification for Negligence Act (740 ILCS 35/1).

School District #205 will require that any Contractor or Subcontractors performing work in connection with any Drawings and Specifications hold harmless, indemnify and defend School District #205 and each of their officers, agents and employees from any and all liability claims, losses or damage arising out of alleged to arise from the Contractor's (or Subcontractor's) negligence in the performance of the work described in the Contract Documents.

16. **ASSIGNMENT OF WARRANTIES/DELIVERY OF MANUALS**

On or before the date of substantial completion of the project, Contractor shall assign to Owner all right, title and interest in and to equipment and product warranties issued by the product manufacturer. Contractor shall provide to Owner's representative or designee a complete list of all products and equipment furnished and or installed by

SUPPLEMENTARY CONDITIONS

Contractor in and to the project along with the name of the manufacturer of each product and item of equipment and take all necessary steps to transfer warranties to the Owner. Contractor shall within the same time frame deliver to Owner all product and equipment manuals installation instructions and operating instructions and registration materials.

17. COMPLIANCE WITH FREEDOM OF INFORMATION ACT

The District is required by law to comply with the provisions of the Freedom of Information Act, 5ILCS 140/1 et seq., as amended from time to time ("Act"). The Act requires the District to provide, if requested to do so by any person, copies of documents that maybe in your possession and related to this contract. As a condition of this contract, Contractor agrees to and shall provide to the District, copies of any and all such documents when directed to do by the District. All such documents shall be delivered to the District's Legal Department NO LATER THAN five (5) working days after the date of the District's direction to provide such documents. Failure of the

Contractor to provide documents within said five (5) working days as provided above shall result in the assessment of any and all penalties, damages, and/or costs incurred by the District to the Contractor which shall be paid immediately by the Contractor upon demand of the same by the District.

18. RECORDS, RETENTION, AUDIT

- a. Records. The Contractor shall have or upon award of bid establish and maintain a reasonable accounting system that enables the District to readily identify Contractor's assets, expenses, costs of goods and use of funds related to the Project (the Records). Such Records shall include, but not limited to, accounting records, written policies and procedures; subcontractor files (including proposals of successful and unsuccessful bidders, bid recaps, etc.); all paid vouchers, including those for out-of-pocket expenses, other reimbursement supported by invoices; ledgers; cancelled checks; deposit slips, bank statements; journals; original estimates; estimating work sheets; contract amendments and change order files; backcharge logs and supporting documentation; insurance documents, payroll documents; timesheets; memoranda; and correspondence.
- b. Retention. The Contractor shall, at all times during its performance of the Project and for a period of seven years after the completion of the Project, maintain Records, together with all supporting or underlying documents and materials. The Contractor shall upon written request by the District at any time or times, whether during or after completion of the Project, and at the Contractor's expense, produce the Records for inspection, copying and audit (including copies and extracts of records as required) by the District. The Records shall be made available to the District, upon three-day written notice, during normal business hours at Contractor's principal office if located in Rockford, Illinois or at such other location specified by the District including the District offices. Upon expiration of the retention period specified in this paragraph 18b, prior to destruction of the Records, Contractor shall provide not less than 30 days written notice of its intent to destroy any part or all of the Records, specifying the nature, character and extent

SUPPLEMENTARY CONDITIONS

of Records to be destroyed and the District may at its discretion and expense obtain all Records or copies of Records intended to be destroyed. The Contractor shall ensure the District's right to access and audit the Records in the possession, created or maintained by Contractor's agents, assigns, successors, and subcontractors. Contractor shall notify in writing its agents, assigns, successors and subcontractors of the requirements of records, retention and audit as set forth in this paragraph 18. Any and all contracts or agreements between Contractor and any other party related to the Project shall expressly include the records, retention and audit provisions of this paragraph 18.

- c. The District and its authorized representatives shall have the right to audit, to examine, and to make copies of or extracts from all Records (in whatever form they may be kept, whether written, electronic, or other), including, but not limited to, those kept by the Contractor, its agents, assigns, successors, and subcontractors.

Cost of any examination or audit of Records conducted by the District will be borne by the District (excluding any cost to produce Records under paragraph 18b), except where the examination or audit identifies overpricing or overcharges (of any nature) by the Contractor to the District in excess of one-half of one percent (0.5%) of the total contract billings in which event the entire cost of the examination or audit shall be Contractor's cost and Contractor shall reimburse the District for the total cost of the examination or audit. If the examination or audit reveals substantive findings of fraud, misrepresentation, or non-performance by Contractor, its employees, agents, representatives, assigns, successors or subcontractors, the Contractor shall pay all costs of the examination or audit; and if paid by the District, reimburse the District for all such costs. In the event Contractor fails to pay such costs within 30 days of demand by the District, District may offset any such costs unpaid by Contractor from any balance due Contractor by the District or at the election of the District proceed to collect such costs by any available means including litigation in which event the costs of collection including reasonable attorney's fees shall also be paid by Contractor.

QUESTIONS

Any questions regarding this bid; may be referred to Stacie Talbert Scott, Executive Director of Budget and Purchasing at stacie.scott@rps205.com or 815-966-3097.

Winnebago County Prevailing Wage for July 2015

(See explanation of column headings at bottom of wages)

Trade Name Trng	RG	TYP	C	Base	FRMAN	M-F>8	OSA	OSH	H/W	Pensn	Vac
=====	==	===	=	=====	=====	=====	===	===	=====	=====	=====
ASBESTOS ABT-GEN 0.800		BLD		31.790	32.790	1.5	1.5	2.0	8.420	15.17	0.000
ASBESTOS ABT-MEC 0.000		BLD		18.950	0.000	1.5	1.5	2.0	2.700	3.350	0.000
BOILERMAKER 0.400		BLD		47.070	51.300	2.0	2.0	2.0	6.970	18.13	0.000
BRICK MASON 0.640		BLD		37.050	39.800	1.5	1.5	2.0	9.230	12.57	0.000
CARPENTER 0.600		BLD		37.890	42.060	1.5	1.5	2.0	9.300	12.70	0.000
CARPENTER 0.490		HWY		42.630	44.380	1.5	1.5	2.0	8.600	11.00	0.000
CEMENT MASON 0.500		ALL		35.740	38.490	1.5	1.5	2.0	9.750	14.04	0.000
CERAMIC TILE FNSHER 0.560		BLD		32.850	0.000	1.5	1.5	2.0	8.600	5.210	0.000
COMMUNICATION TECH 0.760		BLD		36.440	40.080	1.5	1.5	2.0	10.39	12.09	0.000
ELECTRIC PWR EQMT OP 0.380		ALL		37.890	51.480	1.5	1.5	2.0	5.000	11.75	0.000
ELECTRIC PWR EQMT OP 0.390		HWY		39.220	53.290	1.5	1.5	2.0	5.000	12.17	0.000
ELECTRIC PWR GRNDMAN 0.290		ALL		29.300	51.480	1.5	1.5	2.0	5.000	9.090	0.000
ELECTRIC PWR GRNDMAN 0.300		HWY		30.330	53.290	1.5	1.5	2.0	5.000	9.400	0.000
ELECTRIC PWR LINEMAN 0.450		ALL		45.360	51.480	1.5	1.5	2.0	5.000	14.06	0.000
ELECTRIC PWR LINEMAN 0.470		HWY		46.950	53.290	1.5	1.5	2.0	5.000	14.56	0.000
ELECTRIC PWR TRK DRV 0.300		ALL		30.340	51.480	1.5	1.5	2.0	5.000	9.400	0.000
ELECTRIC PWR TRK DRV 0.310		HWY		31.400	53.290	1.5	1.5	2.0	5.000	9.730	0.000
ELECTRICIAN 0.860		BLD		42.960	47.260	1.5	1.5	2.0	10.39	17.47	0.000
ELEVATOR CONSTRUCTOR 0.600		BLD		46.830	52.680	2.0	2.0	2.0	13.57	14.51	3.770
GLAZIER 1.250		BLD		35.980	37.980	1.5	1.5	1.5	10.30	8.200	0.000
HT/FROST INSULATOR 0.480		BLD		33.930	38.550	0.0	0.0	0.0	7.950	14.77	0.000
IRON WORKER 0.500		ALL		36.290	38.100	2.0	2.0	2.0	10.24	23.19	0.000
LABORER 0.800		BLD		31.790	32.790	1.5	1.5	2.0	8.420	15.17	0.000
LABORER 0.800		HWY		34.340	35.090	1.5	1.5	2.0	8.420	17.42	0.000
LABORER, SKILLED 0.800		HWY		36.990	37.740	1.5	1.5	2.0	8.420	17.42	0.000
LATHER 0.600		BLD		37.890	42.060	1.5	1.5	2.0	9.300	12.70	0.000
MACHINIST 0.000		BLD		45.350	47.850	1.5	1.5	2.0	7.260	8.950	1.850
MARBLE FINISHERS 0.560		BLD		32.850	0.000	1.5	1.5	2.0	8.600	5.210	0.000
MARBLE MASON 0.590		BLD		35.530	35.780	1.5	1.5	2.0	8.600	7.520	0.000
MATERIAL TESTER I 0.800		ALL		33.560	0.000	1.5	1.5	2.0	8.240	16.39	0.000
MATERIALS TESTER II 0.800		ALL		33.560	0.000	1.5	1.5	2.0	8.240	16.39	0.000
MILLWRIGHT 0.500		BLD		37.220	40.940	1.5	1.5	2.0	9.050	15.00	0.000
OPERATING ENGINEER 1.300		BLD	1	48.300	47.800	2.0	2.0	2.0	17.55	11.80	2.350
OPERATING ENGINEER 1.300		BLD	2	43.100	47.800	2.0	2.0	2.0	17.55	11.80	2.350

OPERATING ENGINEER 1.300	BLD	3	40.650	47.800	2.0	2.0	2.0	17.55	11.80	2.350
OPERATING ENGINEER 1.300	BLD	4	38.650	47.800	2.0	2.0	2.0	17.55	11.80	2.350
OPERATING ENGINEER 1.300	BLD	5	47.550	47.800	2.0	2.0	2.0	17.55	11.80	2.350
OPERATING ENGINEER 1.300	BLD	6	46.800	47.800	2.0	2.0	2.0	17.55	11.80	2.350
OPERATING ENGINEER 1.300	BLD	7	43.800	47.800	2.0	2.0	2.0	17.55	11.80	2.350
OPERATING ENGINEER 1.300	HWY	1	43.650	47.650	1.5	1.5	2.0	17.55	11.80	2.350
OPERATING ENGINEER 1.300	HWY	2	43.100	47.650	1.5	1.5	2.0	17.55	11.80	2.350
OPERATING ENGINEER 1.300	HWY	3	41.800	47.650	1.5	1.5	2.0	17.55	11.80	2.350
OPERATING ENGINEER 1.300	HWY	4	40.350	47.650	1.5	1.5	2.0	17.55	11.80	2.350
OPERATING ENGINEER 1.300	HWY	5	38.900	47.650	1.5	1.5	2.0	17.55	11.80	2.350
OPERATING ENGINEER 1.300	HWY	6	46.650	47.650	1.5	1.5	2.0	17.55	11.80	2.350
OPERATING ENGINEER 1.300	HWY	7	44.650	47.650	1.5	1.5	2.0	17.55	11.80	2.350
PAINTER 1.350	ALL		36.500	38.500	1.5	1.5	1.5	10.30	8.460	0.000
PILEDRIIVER 0.600	BLD		38.890	43.170	1.5	1.5	2.0	9.300	12.70	0.000
PILEDRIIVER 0.490	HWY		42.630	44.380	1.5	1.5	2.0	8.600	11.00	0.000
PIPEFITTER 1.000	ALL		43.100	46.120	1.5	2.0	2.0	8.220	11.29	0.000
PIPEFITTER 1.000	BLD		43.100	46.120	1.5	1.5	2.0	8.220	11.29	0.000
PLASTERER 0.500	BLD		34.250	37.680	1.5	1.5	2.0	9.300	12.30	0.000
PLUMBER 1.000	ALL		43.100	46.120	1.5	2.0	2.0	8.220	11.29	0.000
PLUMBER 1.000	BLD		43.100	46.120	1.5	1.5	2.0	8.220	11.29	0.000
ROOFER 0.530	BLD		41.000	44.000	1.5	1.5	2.0	8.280	10.54	0.000
SHEETMETAL WORKER 0.290	BLD		37.930	40.210	1.5	1.5	2.0	6.000	16.92	0.520
SPRINKLER FITTER 0.350	BLD		37.120	39.870	1.5	1.5	2.0	8.420	8.500	0.000
STONE MASON 0.640	BLD		37.050	39.800	1.5	1.5	2.0	9.230	12.57	0.000
SURVEY WORKER 13.95 0.000 0.800	--> NOT IN EFFECT		ALL	35.650	36.400	1.5	1.5	2.0	8.240	
TERRAZZO FINISHER 0.560	BLD		32.850	0.000	1.5	1.5	2.0	8.600	5.210	0.000
TERRAZZO MASON 0.590	BLD		35.530	35.780	1.5	1.5	2.0	8.600	7.520	0.000
TILE LAYER 0.600	BLD		37.890	42.060	1.5	1.5	2.0	9.300	12.70	0.000
TILE MASON 0.590	BLD		35.530	35.780	1.5	1.5	2.0	8.600	7.520	0.000
TRUCK DRIVER 0.200	ALL	1	35.020	0.000	1.5	1.5	2.0	8.600	8.600	0.000
TRUCK DRIVER 0.200	ALL	2	35.170	0.000	1.5	1.5	2.0	8.600	8.600	0.000
TRUCK DRIVER 0.200	ALL	3	35.370	0.000	1.5	1.5	2.0	8.600	8.600	0.000
TRUCK DRIVER 0.200	ALL	4	35.480	0.000	1.5	1.5	2.0	8.600	8.600	0.000
TUCKPOINTER 0.640	BLD		37.050	39.800	1.5	1.5	2.0	9.230	12.57	0.000

Legend: RG (Region)
TYP (Trade Type - All,Highway,Building,Floating,Oil & Chip,Rivers)
C (Class)
Base (Base Wage Rate)
FRMAN (Foreman Rate)
M-F>8 (OT required for any hour greater than 8 worked each day, Mon through Fri.
OSA (Overtime (OT) is required for every hour worked on Saturday)
OSH (Overtime is required for every hour worked on Sunday and Holidays)
H/W (Health & Welfare Insurance)
Pensn (Pension)
Vac (Vacation)
Trng (Training)

Explanations

WINNEBAGO COUNTY

The following list is considered as those days for which holiday rates of wages for work performed apply: New Years Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day, Christmas Day and Veterans Day in some classifications/counties. Generally, any of these holidays which fall on a Sunday is celebrated on the following Monday. This then makes work performed on that Monday payable at the appropriate overtime rate for holiday pay. Common practice in a given local may alter certain days of celebration. If in doubt, please check with IDOL.

EXPLANATION OF CLASSES

ASBESTOS - GENERAL - removal of asbestos material/mold and hazardous materials from any place in a building, including mechanical systems where those mechanical systems are to be removed. This includes the removal of asbestos materials/mold and hazardous materials from ductwork or pipes in a building when the building is to be demolished at the time or at some close future date.

ASBESTOS - MECHANICAL - removal of asbestos material from mechanical systems, such as pipes, ducts, and boilers, where the mechanical systems are to remain.

CERAMIC TILE FINISHER, MARBLE FINISHER, TERRAZZO FINISHER

Assisting, helping or supporting the tile, marble and terrazzo mechanic by performing their historic and traditional work assignments required to complete the proper installation of the work covered by said crafts. The term "Ceramic" is used for naming the classification only and is in no way a limitation of the product handled. Ceramic takes into consideration most hard tiles.

COMMUNICATIONS TECHNICIAN

Installing, manufacturing, assembling and maintaining sound and intercom, protection alarm (security), fire alarm, master antenna television, closed circuit television, low voltage control for computers and/or door monitoring, school communications systems, telephones and servicing of nurse and emergency calls, and the installation and maintenance of transmit and receive antennas, transmitters, receivers, and associated apparatus which operates in conjunction with above systems. All work associated with these system installations will be included EXCEPT the installation of protective metallic conduit in new construction projects (excluding less than ten-foot, runs strictly for protection of cable) and 120 volt AC (or higher) power wiring and associated hardware.

LABORER, SKILLED - HIGHWAY

Individuals engaged in the following types of work, irrespective of the site of the work: asbestos abatement worker, handling of any materials with any foreign matter harmful to skin or clothing, track laborer, cement handlers, chloride handlers, the unloading and loading with steel workers and re-bars, concrete workers wet, tunnel helpers in free air, batch dumpers, mason tenders, kettle and tar men, tank cleaners, plastic installers, scaffold workers, motorized buggies or motorized unit used for wet concrete or handling of building materials, laborers with de-watering systems, sewer workers plus depth, rod and chainmen with technical engineers, rod and chainmen with land surveyors, rod and chainmen with surveyors, vibrator operators, cement silica, clay, fly ash, lime and plasters, handlers (bulk or bag), cofferdam workers plus depth, on concrete paving, placing, cutting and tying of reinforcing, deck hand, dredge hand, and shore laborers, bankmen on floating plant, grade checker, power tools, front end man on chip spreaders, cession workers plus depth, gunnite nozzle men, lead man on sewer work, welders, cutters, burners and torchmen, chainsaw operators, jackhammer and drill operators, layout man and/or drainage tile layer, steel form setter - street and highway, air tamping hammermen, signal man on crane, concrete saw operator, screedman on asphalt pavers, laborers tending masons with hot material or where foreign materials are used, mortar mixer operators, multiple concrete duct - leadsman, lumen, asphalt raker,

curb asphalt machine operator, ready mix scalemen (permanent, portable or temporary plant), laborers handling masterplate or similar materials, laser beam operator, con-crete burning machine operator, coring machine operator, plaster ten-der, underpinning and shoring of buildings, pump men, manhole and catch basin, dirt and stone tamper, hose men on concrete pumps, haz-ardous waste worker, lead base paint abatement worker, lining of pipe, refusing machine, assisting on direct boring machine, the work of lay-ing watermain, fire hydrants, all mechanical joints to watermain work, sewer worker, and tapping water service and forced lift station mechanical worker.

MATERIAL TESTER I: Hand coring and drilling for testing of materials; field inspection of uncured concrete and asphalt.

MATERIAL TESTER II: Field inspection of welds, structural steel, fireproofing, masonry, soil, facade, reinforcing steel, formwork, cured concrete, and concrete and asphalt batch plants; adjusting proportions of bituminous mixtures.

OPERATING ENGINEERS - BUILDING

Class 1. Asphalt Plant; Asphalt Spreader; Autograde; Backhoes with Caisson Attachment; Batch Plant; Benoto (requires Two Engineers); Boiler and Throttle Valve; Caisson Rigs; Central Redi-Mix Plant; Combination Back Hoe Front End-loader Machine; Compressor and Throttle Valve; Concrete Breaker (Truck Mounted); Concrete Conveyor; Concrete Paver (over 27E cu. ft.): Concrete Paver (27 cu. ft. and under); Concrete Placer; Concrete Pump (Truck Mounted); Concrete Conveyor (Truck Mounted); Concrete Tower; Cranes, All; GCI and similar types (required two operators only); Cranes, Hammerhead; Creter Crane; Crusher, Stone, etc.; Derricks, All; Derricks, Traveling; Formless Curb and Gutter Machine; Grader, Elevating; Grouting Machines; Highlift Shovels or Front Endloader 2-1/4 yd. and over; Hoists, Elevators, outside type rack and pinion and similar machines; Hoists, one, two and three Drum; Hoists, Two Tugger One Floor; Hydraulic Backhoes; Hydraulic Boom Trucks; Hydro Vac (and similar equipment - excluding hose work and any sewer work); Locomotives, All; Lubrication Technician; Manipulators; Motor Patrol; Pile Drivers and Skid Rig; Post Hole Digger; Pre-Stress Machine; Pump Cretes Dual Ram; Pump Cretes: Squeeze Cretes - Screw Type Pumps, Gypsum Bulker and Pump; Raised and Blind Hole Drill; Rock Drill (self-propelled); Rock Drill - Truck Mounted; Roto Mill Grinder; Scoops - Tractor Drawn; Slipform Paver; Scrapers Prime Movers; Straddle Buggies; Tie Back Machine; Tractor with Boom and Side Boom; Trenching Machines.

Class 2. Bobcat (over 3/4 cu. yd.); Boilers; Brick Forklift; Broom, All Power Propelled; Bulldozers; Concrete Mixer (Two Bag and Over); Conveyor, Portable; Forklift Trucks; Highlift Shovels or Front Endloaders under 2-1/4 yd.; Hoists, Automatic; Hoists, Sewer Dragging Machine; Hoists, Tugger Single Drum; Laser Screed; Rollers, All; Steam Generators; Tractors, All; Tractor Drawn Vibratory Roller; Winch Trucks with "A" Frame.

Class 3. Air Compressor; Asphalt Spreader; Combination - Small Equipment Operator; Generators; Heaters, Mechanical; Hoists, Inside Elevators - (Rheostat Manual Controlled); Hydraulic Power Units (Pile Driving, Extracting, or Drilling - with a seat); Lowboys; Pumps, Over 3" (1 to 3 not to exceed total of 300 ft.); Pumps, Well Points; Welding Machines (2 through 5); Winches, 4 Small Electric Drill Winches; Bobcat (up to and including 3/4 cu. yd.).

Class 4. Elevator push button with automatic doors; Hoists, Inside; Oilers; Brick Forklift.

Class 5. Assistant Craft Foreman

Class 6. Mechanics; Welders.

Class 7. Gradall

OPERATING ENGINEERS - HIGHWAY CONSTRUCTION

Class 1. Asphalt Plant; Asphalt Heater and Planer Combination; Asphalt Heater Scarfire; Asphalt Silo Tender; Asphalt Spreader; Autograder; ABG Paver; Backhoes with Caisson Attachment; Ballast Regulator; Belt Loader; Caisson Rigs; Car Dumper; Central Redi-Mix Plant; Backhoe w/shear attachments; Combination Backhoe Front Endloader Machine, (1 cu. yd. Backhoe Bucket or over or with attachments); Concrete Breaker

(Truck Mounted); Concrete Conveyor; Concrete Paver over 27E cu. ft.; Concrete Placer; Concrete Tube Float; Cranes, all attachments; Cranes, Tower of all types; Creter Crane; Crusher, Stone, etc.; Derricks, All; Derrick Boats; Derricks, Traveling; Directional Boring Machine over 12"; Dredges; Formless Curb and Gutter Machine; Grader, Elevating; Grader, Motor Grader, Motor Patrol, Auto Patrol, Form Grader, Pull Grader, Subgrader; Guard Rail Post Driver Mounted; Hoists, One, Two and Three Drum; Hydraulic Backhoes; Hydro Vac, Self Propelled, Truck Mounted (excluding hose work and any sewer work); Lubrication Technician; Manipulators; Pile Drivers and Skid Rig; Pre-Stress Machine; Pump Cretes Dual Ram; Rock Drill - Crawler or Skid Rig; Rock Drill - Truck Mounted; Rock/Track Tamper; Roto Mill Grinder; Slip-Form Paver; Snow Melters; Soil Test Drill Rig (Truck Mounted); Straddle Buggies; GCI Crane; Hydraulic Telescoping Form (Tunnel); Tie Back Machine; Tractor Drawn Belt Loader; Tractor Drawn Belt Loader with attached pusher; Tractor with Boom; Tractaire with Attachments; Traffic Barrier Conveyor Machine; Raised or Blind Hole Drills; Trenching Machine (over 12"); Truck Mounted Concrete Pump with Boom; Truck Mounted Concrete Conveyor; Work Boat (no license required - 90 h.p. or above); Underground Boring and/or Mining Machines; Wheel Excavator; Widener (APSCO).

Class 2. Batch Plant; Bituminous Mixer; Boiler and Throttle Valve; Bulldozers; Car Loader Trailing Conveyors; Combination Backhoe Front Endloader Machine (less than 1 cu. yd. Backhoe Bucket or over or with attachments); Compressor and Throttle Valve; Compressor, Common Receiver (3); Concrete Breaker or Hydro Hammer; Concrete Grinding Machine; Concrete Mixer or Paver 7S Series to and including 27 cu. ft.; Concrete Spreader; Concrete Curing Machine, Burlap Machine, Belting Machine and Sealing Machine; Concrete Wheel Saw (large self-propelled - excluding walk-behinds and hand-held); Conveyor Muck Cars (Haglund or Similar Type); Drills, all; Finishing Machine - Concrete; Highlift Shovels or Front Endloader; Hoist - Sewer Dragging Machine; Hydraulic Boom Trucks (All Attachments); Hydro Blaster; All Locomotives, Dinky; Off-Road Hauling Units; Non-Self Loading Dump; Ejection Dump; Pump Cretes: Squeeze Cretes - Screw Type Pumps, Gypsum Bulker and Pump; Roller, Asphalt; Rotary Snow Plows; Rototiller, Seaman, etc., self-propelled; Scoops - Tractor Drawn; Self-Propelled Compactor; Spreader - Chip - Stone, etc.; Scraper; Scraper - Prime Mover in Tandem (Regardless of Size); Tank Car Heater; Tractors, Push, Pulling Sheeps Foot, Disc, Compactor, etc.; Tug Boats.

Class 3. Boilers; Brooms, All Power Propelled; Cement Supply Tender; Compressor, Common Receiver (2); Concrete Mixer (Two Bag and Over); Conveyor, Portable; Farm-Type Tractors Used for Mowing, Seeding, etc.; Fireman on Boilers; Forklift Trucks; Grouting Machine; Hoists, Automatic; Hoists, All Elevators; Hoists, Tugger Single Drum; Jeep Diggers; Low Boys; Pipe Jacking Machines; Post-Hole Digger; Power Saw, Concrete Power Driven; Pug Mills; Rollers, other than asphalt; Seed and Straw Blower; Steam Generators; Stump Machine; Winch Trucks with "A" Frame; Work Boats; Tamper - Form - Motor Driven.

Class 4. Air Compressor - Small and Large; Asphalt Spreader, Backend Man; Bobcat (Skid Steer) all; Brick Forklift; Combination - Small Equipment Operator; Directional Boring Machine up to 12"; Generators; Heaters, Mechanical; Hydraulic Power Unit (Pile Driving, Extracting, or Drilling); Hydro-Blaster; Light Plants, All (1 through 5); Pumps, over 3" (1 to 3 not to exceed a total of 300 ft.); Pumps, Well Points; Tractaire; Trencher 12" and under; Welding Machines (2 through 5); Winches, 4 Small Electric Drill Winches.

Class 5. Oilers and Directional Boring Machine Locator.

Class 6. Field Mechanics and Field Welders

Class 7. Gradall and machines of like nature.

SURVEY WORKER - Operated survey equipment including data collectors, G.P.S. and robotic instruments, as well as conventional levels and transits.

TRUCK DRIVER - BUILDING, HEAVY AND HIGHWAY CONSTRUCTION

Class 1. Two or three Axle Trucks. A-frame Truck when used for transportation purposes; Air Compressors and Welding Machines, including those pulled by cars, pick-up trucks and tractors; Ambulances; Batch Gate Lockers; Batch Hopperman; Car and Truck Washers; Carry-alls; Fork Lifts and Hoisters; Helpers; Mechanics Helpers and Greasers; Oil Distributors 2-man operation; Pavement Breakers; Pole Trailer, up to 40 feet; Power Mower Tractors; Self-propelled Chip Spreader; Skipman; Slurry Trucks, 2-man operation; Slurry Truck Conveyor Operation, 2 or 3 man; TTeamsters

Unskilled dumpman; and Truck Drivers hauling warning lights, barricades, and portable toilets on the job site.

Class 2. Four axle trucks; Dump Crets and Adgetors under 7 yards; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnapulls or Turnatrailers when pulling other than self-loading equipment or similar equipment under 16 cubic yards; Mixer Trucks under 7 yards; Ready-mix Plant Hopper Operator, and Winch Trucks, 2 Axles.

Class 3. Five axle trucks; Dump Crets and Adgetors 7 yards and over; Dumpsters, Track Trucks, Euclids, Hug Bottom Dump Turnatrailers or turnapulls when pulling other than self-loading equipment or similar equipment over 16 cubic yards; Explosives and/or Fission Material Trucks; Mixer Trucks 7 yards or over; Mobile Cranes while in transit; Oil Distributors, 1-man operation; Pole Trailer, over 40 feet; Pole and Expandable Trailers hauling material over 50 feet long; Slurry trucks, 1-man operation; Winch trucks, 3 axles or more; Mechanic--Truck Welder and Truck Painter.

Class 4. Six axle trucks; Dual-purpose vehicles, such as mounted crane trucks with hoist and accessories; Foreman; Master Mechanic; Self-loading equipment like P.B. and trucks with scoops on the front.

Other Classifications of Work:

For definitions of classifications not otherwise set out, the Department generally has on file such definitions which are available. If a task to be performed is not subject to one of the classifications of pay set out, the Department will upon being contacted state which neighboring county has such a classification and provide such rate, such rate being deemed to exist by reference in this document. If no neighboring county rate applies to the task, the Department shall undertake a special determination, such special determination being then deemed to have existed under this determination. If a project requires these, or any classification not listed, please contact IDOL at 217-782-1710 for wage rates or clarifications.

LANDSCAPING

Landscaping work falls under the existing classifications for laborer, operating engineer and truck driver. The work performed by landscape plantsman and landscape laborer is covered by the existing classification of laborer. The work performed by landscape operators (regardless of equipment used or its size) is covered by the classifications of operating engineer. The work performed by landscape truck drivers (regardless of size of truck driven) is covered by the classifications of truck driver.

AIA® Document A201™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:

Rockford Public Schools Master Facilities Plan Construction
General Conditions template

THE OWNER:

(Name, legal status and address)

Board Of Education of Rockford School District No.205 Winnebago and Boone Counties
Illinois

THE ARCHITECT:

(Name, legal status and address)

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

TABLE OF ARTICLES

1	GENERAL PROVISIONS
2	OWNER
3	CONTRACTOR
4	ARCHITECT
5	SUBCONTRACTORS
6	CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS
7	CHANGES IN THE WORK
8	TIME
9	PAYMENTS AND COMPLETION
10	PROTECTION OF PERSONS AND PROPERTY
11	INSURANCE AND BONDS
12	UNCOVERING AND CORRECTION OF WORK
13	MISCELLANEOUS PROVISIONS

Init.

- 14 TERMINATION OR SUSPENSION OF THE CONTRACT
- 15 CLAIMS AND DISPUTES

Init.

INDEX

(Topics and numbers in bold are section headings.)

Acceptance of Nonconforming Work

9.6.6, 9.9.3, **12.3**

Acceptance of Work

9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, **12.3**

Access to Work

3.16, 6.2.1, **12.1**

Accident Prevention

10

Acts and Omissions

3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5,
10.2.8, 13.4.2, 13.7, 14.1, 15.2

Addenda

1.1.1, 3.11.1

Additional Costs, Claims for

3.7.4, 3.7.5, 6.1.1, 7.3.7.5, 10.3, 15.1.4

Additional Inspections and Testing

9.4.2, 9.8.3, 12.2.1, **13.5**

Additional Insured

11.1.4

Additional Time, Claims for

3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.5**

Administration of the Contract

3.1.3, **4.2**, 9.4, 9.5

Advertisement or Invitation to Bid

1.1.1

Aesthetic Effect

4.2.13

Allowances

3.8, 7.3.8

All-risk Insurance

11.3.1, 11.3.1.1

Applications for Payment

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.6.3, 9.7, 9.10, 11.1.3

Approvals

2.1.1, 2.2.2, 2.4, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10,
4.2.7, 9.3.2, 13.5.1

Arbitration

8.3.1, 11.3.10, 13.1.1, 15.3.2, **15.4**

ARCHITECT

4

Architect, Definition of

4.1.1

Architect, Extent of Authority

2.4.1, 3.12.7, 4.1, 4.2, 5.2, 6.3, 7.1.2, 7.3.7, 7.4, 9.2,
9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1,
13.5.1, 13.5.2, 14.2.2, 14.2.4, 15.1.3, 15.2.1

Architect, Limitations of Authority and Responsibility

2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3,
4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4, 9.4.2,
9.5.3, 9.6.4, 15.1.3, 15.2

Architect's Additional Services and Expenses

2.4.1, 11.3.1.1, 12.2.1, 13.5.2, 13.5.3, 14.2.4

Architect's Administration of the Contract

3.1.3, 4.2, 3.7.4, 15.2, 9.4.1, 9.5

Architect's Approvals

2.4.1, 3.1.3, 3.5, 3.10.2, 4.2.7

Architect's Authority to Reject Work

3.5, 4.2.6, 12.1.2, 12.2.1

Architect's Copyright

1.1.7, 1.5

Architect's Decisions

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3,
7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1,
13.5.2, 15.2, 15.3

Architect's Inspections

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.5

Architect's Instructions

3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.5.2

Architect's Interpretations

4.2.11, 4.2.12

Architect's Project Representative

4.2.10

Architect's Relationship with Contractor

1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5,
3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18,
4.1.2, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5,
9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.4.2, 13.5, 15.2

Architect's Relationship with Subcontractors

1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3.7

Architect's Representations

9.4.2, 9.5.1, 9.10.1

Architect's Site Visits

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5

Asbestos

10.3.1

Attorneys' Fees

3.18.1, 9.10.2, 10.3.3

Award of Separate Contracts

6.1.1, 6.1.2

Award of Subcontracts and Other Contracts for Portions of the Work

5.2

Basic Definitions

1.1

Bidding Requirements

1.1.1, 5.2.1, 11.4.1

Binding Dispute Resolution

9.7, 11.3.9, 11.3.10, 13.1.1, 15.2.5, 15.2.6.1, 15.3.1,
15.3.2, 15.4.1

Boiler and Machinery Insurance

11.3.2

Bonds, Lien

7.3.7.4, 9.10.2, 9.10.3

Bonds, Performance, and Payment

7.3.7.4, 9.6.7, 9.10.3, 11.3.9, **11.4**

Building Permit

3.7.1

Init.

Capitalization

1.3

Certificate of Substantial Completion

9.8.3, 9.8.4, 9.8.5

Certificates for Payment

4.2.1, 4.2.5, 4.2.9, 9.3.3, 9.4, 9.5, 9.6.1, 9.6.6, 9.7,

9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.3

Certificates of Inspection, Testing or Approval

13.5.4

Certificates of Insurance

9.10.2, 11.1.3

Change Orders

1.1.1, 2.4.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11.1, 3.12.8, 4.2.8,

5.2.3, 7.1.2, 7.1.3, 7.2, 7.3.2, 7.3.6, 7.3.9, 7.3.10, 8.3.1,

9.3.1.1, 9.10.3, 10.3.2, 11.3.1.2, 11.3.4, 11.3.9, 12.1.2,

15.1.3

Change Orders, Definition of

7.2.1

CHANGES IN THE WORK

2.2.1, 3.11, 4.2.8, 7, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1,

11.3.9

Claims, Definition of

15.1.1

CLAIMS AND DISPUTES

3.2.4, 6.1.1, 6.3, 7.3.9, 9.3.3, 9.10.4, 10.3.3, 15, 15.4

Claims and Timely Assertion of Claims

15.4.1

Claims for Additional Cost

3.2.4, 3.7.4, 6.1.1, 7.3.9, 10.3.2, 15.1.4

Claims for Additional Time

3.2.4, 3.7.4.6.1.1, 8.3.2, 10.3.2, 15.1.5

Concealed or Unknown Conditions, Claims for

3.7.4

Claims for Damages

3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1,

11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6

Claims Subject to Arbitration

15.3.1, 15.4.1

Cleaning Up

3.15, 6.3

Commencement of the Work, Conditions Relating to

2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3,

6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.3.1, 11.3.6, 11.4.1,

15.1.4

Commencement of the Work, Definition of

8.1.2

Communications Facilitating Contract

Administration

3.9.1, 4.2.4

Completion, Conditions Relating to

3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1,

9.10, 12.2, 13.7, 14.1.2

COMPLETION, PAYMENTS AND

9

Completion, Substantial

4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2,

13.7

Compliance with Laws

1.6.1, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 10.2.2,

11.1, 11.3, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14.1.1,

14.2.1.3, 15.2.8, 15.4.2, 15.4.3

Concealed or Unknown Conditions

3.7.4, 4.2.8, 8.3.1, 10.3

Conditions of the Contract

1.1.1, 6.1.1, 6.1.4

Consent, Written

3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1,

9.10.2, 9.10.3, 11.3.1, 13.2, 13.4.2, 15.4.4.2

Consolidation or Joinder

15.4.4

CONSTRUCTION BY OWNER OR BY

SEPARATE CONTRACTORS

1.1.4, 6

Construction Change Directive, Definition of

7.3.1

Construction Change Directives

1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, 7.3,

9.3.1.1

Construction Schedules, Contractor's

3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2

Contingent Assignment of Subcontracts

5.4, 14.2.2.2

Continuing Contract Performance

15.1.3

Contract, Definition of

1.1.2

CONTRACT, TERMINATION OR

SUSPENSION OF THE

5.4.1.1, 11.3.9, 14

Contract Administration

3.1.3, 4, 9.4, 9.5

Contract Award and Execution, Conditions Relating to

3.7.1, 3.10, 5.2, 6.1, 11.1.3, 11.3.6, 11.4.1

Contract Documents, Copies Furnished and Use of

1.5.2, 2.2.5, 5.3

Contract Documents, Definition of

1.1.1

Contract Sum

3.7.4, 3.8, 5.2.3, 7.2, 7.3, 7.4, 9.1, 9.4.2, 9.5.1.4, 9.6.7,

9.7, 10.3.2, 11.3.1, 14.2.4, 14.3.2, 15.1.4, 15.2.5

Contract Sum, Definition of

9.1

Contract Time

3.7.4, 3.7.5, 3.10.2, 5.2.3, 7.2.1.3, 7.3.1, 7.3.5, 7.4,

8.1.1, 8.2.1, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 14.3.2,

15.1.5.1, 15.2.5

Contract Time, Definition of

8.1.1

CONTRACTOR

3

Contractor, Definition of

3.1, 6.1.2

Init.

Contractor's Construction Schedules

3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2

Contractor's Employees

3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1

Contractor's Liability Insurance

11.1

Contractor's Relationship with Separate Contractors and Owner's Forces

3.12.5, 3.14.2, 4.2.4, 6, 11.3.7, 12.1.2, 12.2.4

Contractor's Relationship with Subcontractors

1.2.2, 3.3.2, 3.18.1, 3.18.2, 5, 9.6.2, 9.6.7, 9.10.2, 11.3.1.2, 11.3.7, 11.3.8

Contractor's Relationship with the Architect

1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.5, 15.1.2, 15.2.1

Contractor's Representations

3.2.1, 3.2.2, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2

Contractor's Responsibility for Those Performing the Work

3.3.2, 3.18, 5.3.1, 6.1.3, 6.2, 9.5.1, 10.2.8

Contractor's Review of Contract Documents

3.2

Contractor's Right to Stop the Work

9.7

Contractor's Right to Terminate the Contract

14.1, 15.1.6

Contractor's Submittals

3.10, 3.11, 3.12.4, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3, 11.1.3, 11.4.2

Contractor's Superintendent

3.9, 10.2.6

Contractor's Supervision and Construction

Procedures

1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.5, 7.3.7, 8.2, 10, 12, 14, 15.1.3

Contractual Liability Insurance

11.1.1.8, 11.2

Coordination and Correlation

1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1

Copies Furnished of Drawings and Specifications

1.5, 2.2.5, 3.11

Copyrights

1.5, 3.17

Correction of Work

2.3, 2.4, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, 12.2

Correlation and Intent of the Contract Documents

1.2

Cost, Definition of

7.3.7

Costs

2.4.1, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.7, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.3, 12.1.2, 12.2.1, 12.2.4, 13.5, 14

Cutting and Patching

3.14, 6.2.5

Damage to Construction of Owner or Separate Contractors

3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 11.1.1, 11.3, 12.2.4

Damage to the Work

3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4.1, 11.3.1, 12.2.4

Damages, Claims for

3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6

Damages for Delay

6.1.1, 8.3.3, 9.5.1.6, 9.7, 10.3.2

Date of Commencement of the Work, Definition of

8.1.2

Date of Substantial Completion, Definition of

8.1.3

Day, Definition of

8.1.4

Decisions of the Architect

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 15.2, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.5.2, 14.2.2, 14.2.4, 15.1, 15.2

Decisions to Withhold Certification

9.4.1, 9.5, 9.7, 14.1.1.3

Defective or Nonconforming Work, Acceptance, Rejection and Correction of

2.3.1, 2.4.1, 3.5, 4.2.6, 6.2.5, 9.5.1, 9.5.2, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1

Definitions

1.1, 2.1.1, 3.1.1, 3.5, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 15.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1

Delays and Extensions of Time

3.2, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, 8.3, 9.5.1, 9.7, 10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5

Disputes

6.3, 7.3.9, 15.1, 15.2

Documents and Samples at the Site

3.11

Drawings, Definition of

1.1.5

Drawings and Specifications, Use and Ownership of

3.11

Effective Date of Insurance

8.2.2, 11.1.2

Emergencies

10.4, 14.1.1.2, 15.1.4

Employees, Contractor's

3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1

Equipment, Labor, Materials or

1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13.1, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2

Execution and Progress of the Work
 1.1.3, 1.2.1, 1.2.2, 2.2.3, 2.2.5, 3.1, 3.3.1, 3.4.1, 3.5, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.5, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.2, 14.2, 14.3.1, 15.1.3
 Extensions of Time
 3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4, 9.5.1, 9.7, 10.3.2, 10.4.1, 14.3, 15.1.5, 15.2.5
 Failure of Payment
 9.5.1.3, 9.7, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2
 Faulty Work
 (See Defective or Nonconforming Work)
 Final Completion and Final Payment
 4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.3.1, 11.3.5, 12.3.1, 14.2.4, 14.4.3
 Financial Arrangements, Owner's
 2.2.1, 13.2.2, 14.1.1.4
 Fire and Extended Coverage Insurance
 11.3.1.1
GENERAL PROVISIONS
I
Governing Law
13.1
 Guarantees (See Warranty)
Hazardous Materials
10.2.4, 10.3
 Identification of Subcontractors and Suppliers
 5.2.1
Indemnification
 3.17, 3.18, 9.10.2, 10.3.3, 10.3.5, 10.3.6, 11.3.1.2, 11.3.7
Information and Services Required of the Owner
 2.1.2, 2.2, 3.2.2, 3.12.4, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.4, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3
Initial Decision
15.2
Initial Decision Maker, Definition of
 1.1.8
 Initial Decision Maker, Decisions
 14.2.2, 14.2.4, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
 Initial Decision Maker, Extent of Authority
 14.2.2, 14.2.4, 15.1.3, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Injury or Damage to Person or Property
10.2.8, 10.4.1
 Inspections
 3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.5
 Instructions to Bidders
 1.1.1
 Instructions to the Contractor
 3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.5.2
Instruments of Service, Definition of
1.1.7
 Insurance
 3.18.1, 6.1.1, 7.3.7, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 11

Insurance, Boiler and Machinery
11.3.2
Insurance, Contractor's Liability
11.1
 Insurance, Effective Date of
 8.2.2, 11.1.2
Insurance, Loss of Use
11.3.3
Insurance, Owner's Liability
11.2
Insurance, Property
 10.2.5, 11.3
 Insurance, Stored Materials
 9.3.2
INSURANCE AND BONDS
11
 Insurance Companies, Consent to Partial Occupancy
 9.9.1
 Intent of the Contract Documents
 1.2.1, 4.2.7, 4.2.12, 4.2.13, 7.4
Interest
13.6
Interpretation
 1.2.3, 1.4, 4.1.1, 5.1, 6.1.2, 15.1.1
 Interpretations, Written
 4.2.11, 4.2.12, 15.1.4
 Judgment on Final Award
 15.4.2
Labor and Materials, Equipment
 1.1.3, 1.1.6, 3.4, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2
 Labor Disputes
 8.3.1
 Laws and Regulations
 1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13.1, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1.1, 11.3, 13.1.1, 13.4, 13.5.1, 13.5.2, 13.6.1, 14, 15.2.8, 15.4
 Liens
 2.1.2, 9.3.3, 9.10.2, 9.10.4, 15.2.8
 Limitations, Statutes of
 12.2.5, 13.7, 15.4.1.1
 Limitations of Liability
 2.3.1, 3.2.2, 3.5, 3.12.10, 3.17, 3.18.1, 4.2.6, 4.2.7, 4.2.12, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 10.2.5, 10.3.3, 11.1.2, 11.2, 11.3.7, 12.2.5, 13.4.2
 Limitations of Time
 2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3.1, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 11.3.1.5, 11.3.6, 11.3.10, 12.2, 13.5, 13.7, 14, 15
Loss of Use Insurance
11.3.3
 Material Suppliers
 1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.6, 9.10.5
Materials, Hazardous
10.2.4, 10.3

Init.

Materials, Labor, Equipment and
1.1.3, 1.1.6, 1.5.1, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13.1,
3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3,
9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2
Means, Methods, Techniques, Sequences and
Procedures of Construction
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2
Mechanic's Lien
2.1.2, 15.2.8
Mediation
8.3.1, 10.3.5, 10.3.6, 15.2.1, 15.2.5, 15.2.6, **15.3**,
15.4.1
Minor Changes in the Work
1.1.1, 3.12.8, 4.2.8, 7.1, **7.4**
MISCELLANEOUS PROVISIONS
13
Modifications, Definition of
1.1.1
Modifications to the Contract
1.1.1, 1.1.2, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7,
10.3.2, 11.3.1
Mutual Responsibility
6.2
Nonconforming Work, Acceptance of
9.6.6, 9.9.3, **12.3**
Nonconforming Work, Rejection and Correction of
2.3.1, 2.4.1, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4,
12.2.1
Notice
2.2.1, 2.3.1, 2.4.1, 3.2.4, 3.3.1, 3.7.2, 3.12.9, 5.2.1, 9.7,
9.10, 10.2.2, 11.1.3, 12.2.2.1, 13.3, 13.5.1, 13.5.2,
14.1, 14.2, 15.2.8, 15.4.1
Notice, Written
2.3.1, 2.4.1, 3.3.1, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 9.7,
9.10, 10.2.2, 10.3, 11.1.3, 11.3.6, 12.2.2.1, **13.3**, 14,
15.2.8, 15.4.1
Notice of Claims
3.7.4, 10.2.8, **15.1.2**, 15.4
Notice of Testing and Inspections
13.5.1, 13.5.2
Observations, Contractor's
3.2, 3.7.4
Occupancy
2.2.2, 9.6.6, 9.8, 11.3.1.5
Orders, Written
1.1.1, 2.3, 3.9.2, 7, 8.2.2, 11.3.9, 12.1, 12.2.2.1, 13.5.2,
14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Information and Services Required of the
2.1.2, **2.2**, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2,
9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2, 11.3, 13.5.1,
13.5.2, 14.1.1.4, 14.1.4, 15.1.3

Owner's Authority
1.5, 2.1.1, 2.3.1, 2.4.1, 3.4.2, 3.8.1, 3.12.10, 3.14.2,
4.1.2, 4.1.3, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3,
7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.1, 9.3.2, 9.5.1, 9.6.4,
9.9.1, 9.10.2, 10.3.2, 11.1.3, 11.3.3, 11.3.10, 12.2.2,
12.3.1, 13.2.2, 14.3, 14.4, 15.2.7
Owner's Financial Capability
2.2.1, 13.2.2, 14.1.1.4
Owner's Liability Insurance
11.2
Owner's Relationship with Subcontractors
1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2
Owner's Right to Carry Out the Work
2.4, 14.2.2
Owner's Right to Clean Up
6.3
Owner's Right to Perform Construction and to
Award Separate Contracts
6.1
Owner's Right to Stop the Work
2.3
Owner's Right to Suspend the Work
14.3
Owner's Right to Terminate the Contract
14.2
Ownership and Use of Drawings, Specifications
and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.2.5, 3.2.2, 3.11.1, 3.17,
4.2.12, 5.3.1
Partial Occupancy or Use
9.6.6, **9.9**, 11.3.1.5
Patching, Cutting and
3.14, 6.2.5
Patents
3.17
Payment, Applications for
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5, 9.6.3, 9.7, 9.8.5, 9.10.1,
14.2.3, 14.2.4, 14.4.3
Payment, Certificates for
4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7, 9.10.1,
9.10.3, 13.7, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.4.1, 12.3.1,
13.7, 14.2.4, 14.4.3
Payment Bond, Performance Bond and
7.3.7.4, 9.6.7, 9.10.3, **11.4**
Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3
PAYMENTS AND COMPLETION
9
Payments to Subcontractors
5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 14.2.1.2
PCB
10.3.1

Performance Bond and Payment Bond

7.3.7.4, 9.6.7, 9.10.3, 11.4

Permits, Fees, Notices and Compliance with Laws

2.2.2, 3.7, 3.13, 7.3.7.4, 10.2.2

PERSONS AND PROPERTY, PROTECTION OF

Polychlorinated Biphenyl

10.3.1

Product Data, Definition of

3.12.2

Product Data and Samples, Shop Drawings

3.11, 3.12, 4.2.7

Progress and Completion

4.2.2, 8.2, 9.8, 9.9.1, 14.1.4, 15.1.3

Progress Payments

9.3, 9.6, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3

Project, Definition of

1.1.4

Project Representatives

4.2.10

Property Insurance

10.2.5, 11.3

PROTECTION OF PERSONS AND PROPERTY

10

Regulations and Laws

1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1, 11.4, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14, 15.2.8, 15.4

Rejection of Work

3.5, 4.2.6, 12.2.1

Releases and Waivers of Liens

9.10.2

Representations

3.2.1, 3.5, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.8.2, 9.10.1

Representatives

2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.1, 4.2.2, 4.2.10, 5.1.1, 5.1.2, 13.2.1

Responsibility for Those Performing the Work

3.3.2, 3.18, 4.2.3, 5.3.1, 6.1.3, 6.2, 6.3, 9.5.1, 10

Retainage

9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3

Review of Contract Documents and Field

Conditions by Contractor

3.2, 3.12.7, 6.1.3

Review of Contractor's Submittals by Owner and Architect

3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2

Review of Shop Drawings, Product Data and Samples by Contractor

3.12

Rights and Remedies

1.1.2, 2.3, 2.4, 3.5, 3.7.4, 3.15.2, 4.2.6, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.2, 12.2.4, 13.4, 14, 15.4

Royalties, Patents and Copyrights

3.17

Rules and Notices for Arbitration

15.4.1

Safety of Persons and Property

10.2, 10.4

Safety Precautions and Programs

3.3.1, 4.2.2, 4.2.7, 5.3.1, 10.1, 10.2, 10.4

Samples, Definition of

3.12.3

Samples, Shop Drawings, Product Data and

3.11, 3.12, 4.2.7

Samples at the Site, Documents and

3.11

Schedule of Values

9.2, 9.3.1

Schedules, Construction

3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2

Separate Contracts and Contractors

1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 12.1.2

Shop Drawings, Definition of

3.12.1

Shop Drawings, Product Data and Samples

3.11, 3.12, 4.2.7

Site, Use of

3.13, 6.1.1, 6.2.1

Site Inspections

3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.4.2, 9.10.1, 13.5

Site Visits, Architect's

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5

Special Inspections and Testing

4.2.6, 12.2.1, 13.5

Specifications, Definition of

1.1.6

Specifications

1.1.1, 1.1.6, 1.2.2, 1.5, 3.11, 3.12.10, 3.17, 4.2.14

Statute of Limitations

13.7, 15.4.1.1

Stopping the Work

2.3, 9.7, 10.3, 14.1

Stored Materials

6.2.1, 9.3.2, 10.2.1.2, 10.2.4

Subcontractor, Definition of

5.1.1

SUBCONTRACTORS

5

Subcontractors, Work by

1.2.2, 3.3.2, 3.12.1, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7

Subcontractual Relations

5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 14.1, 14.2.1

Submittals

3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.7, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3, 11.1.3

Submittal Schedule

3.10.2, 3.12.5, 4.2.7

Subrogation, Waivers of

6.1.1, 11.3.7

Substantial Completion

4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, **9.8**, 9.9.1, 9.10.3, 12.2, 13.7

Substantial Completion, Definition of **9.8.1**

Substitution of Subcontractors

5.2.3, 5.2.4

Substitution of Architect

4.1.3

Substitutions of Materials

3.4.2, 3.5, 7.3.8

Sub-subcontractor, Definition of

5.1.2

Subsurface Conditions

3.7.4

Successors and Assigns

13.2

Superintendent

3.9, 10.2.6

Supervision and Construction Procedures

1.2.2, **3.3**, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3,

7.3.7, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.3

Surety

5.4.1.2, 9.8.5, 9.10.2, 9.10.3, 14.2.2, 15.2.7

Surety, Consent of

9.10.2, 9.10.3

Surveys

2.2.3

Suspension by the Owner for Convenience

14.3

Suspension of the Work

5.4.2, 14.3

Suspension or Termination of the Contract

5.4.1.1, 14

Taxes

3.6, 3.8.2.1, 7.3.7.4

Termination by the Contractor

14.1, 15.1.6

Termination by the Owner for Cause

5.4.1.1, **14.2**, 15.1.6

Termination by the Owner for Convenience

14.4

Termination of the Architect

4.1.3

Termination of the Contractor

14.2.2

TERMINATION OR SUSPENSION OF THE CONTRACT **14**

Tests and Inspections

3.1.3, 3.3.3, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 11.4.1.1, 12.2.1, **13.5**

TIME

8

Time, Delays and Extensions of

3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4, **8.3**, 9.5.1, 9.7, 10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5

Time Limits

2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 12.2, 13.5, 13.7, 14, 15.1.2, 15.4

Time Limits on Claims

3.7.4, 10.2.8, **13.7**, 15.1.2

Title to Work

9.3.2, 9.3.3

Transmission of Data in Digital Form

1.6

UNCOVERING AND CORRECTION OF WORK

12

Uncovering of Work

12.1

Unforeseen Conditions, Concealed or Unknown

3.7.4, 8.3.1, 10.3

Unit Prices

7.3.3.2, 7.3.4

Use of Documents

1.1.1, 1.5, 2.2.5, 3.12.6, 5.3

Use of Site

3.13, 6.1.1, 6.2.1

Values, Schedule of

9.2, 9.3.1

Waiver of Claims by the Architect

13.4.2

Waiver of Claims by the Contractor

9.10.5, 13.4.2, 15.1.6

Waiver of Claims by the Owner

9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.4.2, 14.2.4, 15.1.6

Waiver of Consequential Damages

14.2.4, 15.1.6

Waiver of Liens

9.10.2, 9.10.4

Waivers of Subrogation

6.1.1, **11.3.7**

Warranty

3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.4, 12.2.2, 13.7

Weather Delays

15.1.5.2

Work, Definition of

1.1.3

Written Consent

1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.4.1, 13.2, 13.4.2, 15.4.4.2

Written Interpretations

4.2.11, 4.2.12

Written Notice

2.3, 2.4, 3.3.1, 3.9, 3.12.9, 3.12.10, 5.2.1, 8.2.2, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 12.2.2, 12.2.4, **13.3**, 14, 15.4.1

Written Orders

1.1.1, 2.3, 3.9, 7, 8.2.2, 12.1, 12.2, 13.5.2, 14.3.1, 15.1.2

ARTICLE 1 GENERAL PROVISIONS

§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. The Contract Documents include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor's bid or proposal, or portions of Addenda relating to bidding requirements.

§ 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Architect or the Architect's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's duties.

§ 1.1.3 THE WORK

The term "Work" means the construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

§ 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

§ 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, schedules and diagrams.

§ 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

§ 1.1.7 INSTRUMENTS OF SERVICE

Instruments of Service are representations, in any medium of expression now known or later developed, of the tangible and intangible creative work performed by the Architect and the Architect's consultants under their respective professional services agreements. Instruments of Service may include, without limitation, studies, surveys, models, sketches, drawings, specifications, and other similar materials.

§ 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

§ 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

§ 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Owner shall be deemed the owner of the respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

§ 1.5.2 The Contractor, Subcontractors, Sub-subcontractors and material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them solely and exclusively for execution of the Work. All copies made under this authorization shall bear the copyright notice, if any, shown on the Instruments of Service. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific prior written consent of the Owner.

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization except where otherwise required by law or Owners policy or practice. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

§ 2.1.2 The Owner shall furnish to the Contractor within fifteen days after receipt of a written request, information necessary and relevant for the Contractor to evaluate, give notice of or enforce mechanic's lien rights. Such information shall include a correct statement of the record legal title to the property on which the Project is located, usually referred to as the site, and the Owner's interest therein.

§ 2.1.3 Owner has procured and contracted with a Program Manager for this project. Program Manager is responsible to the Owner for overall project management. In all cases where notice is required or permitted to be given under the Agreement, a copy is to be furnished to Program Manager. The Program Manager is the Owner's agent (provided, the Owner does not delegate to Program Manager any statutory powers and authority nor the authority to bind the Owner absent express consent in each instance approved by the Owner's Board of Education). Contractor will interact with the Program Manager in the same manner as with the Owner.

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.2 The Owner may furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

§ 2.2.3 The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish any other information or services under the Owner's control and relevant to the Contractor's performance of the Work with reasonable promptness after receiving the Contractor's written request for such information or services.

§ 2.2.4 Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2.

(Paragraph deleted)

§ 2.3 OWNER'S RIGHT TO STOP THE WORK

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the actual cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner upon Owner's demand.

ARTICLE 3 CONTRACTOR

§ 3.1 GENERAL

§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

§ 3.1.2 The Contractor shall perform the Work in accordance with the Contract Documents.

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.

§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

§ 3.2.1 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become generally familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents.

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall

promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

§ 3.2.3 The Contractor is not required to ascertain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, but the Contractor shall promptly report to the Architect and Program Manager any nonconformity discovered by or made known to the Contractor as a request for information.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner, Manager and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

§ 3.3.2 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its Subcontractors.

§ 3.3.3 The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

§ 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive.

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

§ 3.5 WARRANTY

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further warrants that the Work will conform to the requirements of the Contract Documents and will be free from defects. Work, materials, or equipment not conforming to these requirements may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Architect or Program Manager, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.6 TAXES

The Contractor shall pay consumer, use and similar taxes for the Work provided by the Contractor, as and when due, whether or not yet effective or merely scheduled to go into effect.

§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

§ 3.7.4 **Concealed or Unknown Conditions.** If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

§ 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

§ 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent full-time superintendent and necessary assistants who shall be in attendance at each Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner, Program Manager and Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner, Program Manager or Architect has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

§ 3.10.2 The Contractor shall prepare a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.

§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

§ 3.12.1 Shop Drawings are drawings, diagrams, schedules and other data specially prepared for the Work by the Contractor or a Subcontractor, Sub-subcontractor, manufacturer, supplier or distributor to illustrate some portion of the Work.

§ 3.12.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

§ 3.12.3 Samples are physical examples that illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

§ 3.12.5 The Contractor shall review for compliance with the Contract Documents, approve and submit to the Architect Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness and in such sequence as to cause no delay in the Work or in the activities of the Owner or of separate contractors.

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has (1) reviewed and approved them, (2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

§ 3.12.7 The Contractor shall perform no portion of the Work for which the Contract Documents require submittal and review of Shop Drawings, Product Data, Samples or similar submittals until the respective submittal has been approved by the Architect.

§ 3.12.8 The Work shall be in accordance with approved submittals except that the Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples or similar submittals unless the Contractor has specifically informed the Architect in writing of such deviation at the time of submittal and (1) the Architect has given written approval to the specific deviation as a minor change in the Work, or (2) a Change Order or Construction Change Directive has been issued authorizing the deviation. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples or similar submittals by the Architect's approval thereof.

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written notice, the Architect's approval of a resubmission shall not apply to such revisions.

§ 3.12.10 The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Owner and the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

§ 3.13 USE OF SITE

The Contractor shall confine operations at the site to areas permitted by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.14 CUTTING AND PATCHING

§ 3.14.1 The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

§ 3.15 CLEANING UP

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

§ 3.15.2 If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

§ 3.16 ACCESS TO WORK

The Contractor shall provide the Owner, its administrators and Board Members, the Program Manager and Architect access to the Work in preparation and progress wherever located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner, Program Manager and Architect harmless from loss on account thereof, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect and Program Manager.

§ 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Program Manager Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

§ 3.18.2 In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

ARTICLE 4 ARCHITECT

§ 4.1 GENERAL

§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the Owner.

§ 4.1.3 If the employment of the Architect is terminated, the Owner may employ a successor architect whose status under the Contract Documents shall be that of the Architect.

§ 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Architect, except to the extent inconsistent with the responsibility of the Program Manager, will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Program Manager about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner or Program Manager.

§ 4.2.5 Based on the Architect's evaluations of the Contractor's Applications for Payment, the Architect will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and

completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Architect agree, the Architect will provide one or more project representatives to assist in carrying out the Architect's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

§ 4.2.12 Interpretations and decisions of the Architect will be consistent with the intent of, and reasonably inferable from, the Contract Documents and will be in writing or in the form of drawings. When making such interpretations and decisions, the Architect will endeavor to secure faithful performance by both Owner and Contractor, will not show partiality to either and will not be liable for results of interpretations or decisions rendered in good faith.

§ 4.2.13 The Architect's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS

§ 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

§ 5.1.2 A Sub-subcontractor is a person or entity who has a direct or indirect contract with a Subcontractor to perform a portion of the Work at the site. The term "Sub-subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Sub-subcontractor or an authorized representative of the Sub-subcontractor.

§ 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Program Manager with a copy to the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such

proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Architect has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Architect has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Architect has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Architect makes reasonable objection to such substitution.

§ 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

§ 5.4.1 Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and obligations under the subcontract.

§ 5.4.2 Upon such assignment, if the Work has been suspended for more than 30 days, the Subcontractor's compensation may, in the sole discretion of the Owner, be equitably adjusted for increases in cost resulting from the suspension.

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

§ 6.1.2 When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

§ 6.1.3 The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

§ 6.1.4 Unless otherwise provided in the Contract Documents, when the Owner performs construction or operations related to the Project with the Owner's own forces, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

§ 6.2 MUTUAL RESPONSIBILITY

§ 6.2.1 The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

§ 6.2.2 If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

§ 6.2.3 The Contractor shall reimburse the Owner for costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Owner shall be responsible to the Contractor for costs the Contractor incurs because of a separate contractor's delays, improperly timed activities, damage to the Work or defective construction.

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

§ 6.2.5 The Owner and each separate contractor shall have the same responsibilities for cutting and patching as are described for the Contractor in Section 3.14.

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up the actual cost of which to the Owner shall be deducted from monies due Contractor at any time under the Agreement.

ARTICLE 7 CHANGES IN THE WORK

§ 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

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§ 7.1.2 A Change Order shall be based upon agreement among the Owner, Contractor and Architect; a Construction Change Directive requires agreement by the Owner and Architect and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Architect alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Architect and signed by the Owner and Architect, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.7.

§ 7.3.4 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed in a proposed Change Order or Construction Change Directive so that application of such unit prices to quantities of Work proposed will cause substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 7.3.5 Upon receipt of a Construction Change Directive, the Contractor shall promptly proceed with the change in the Work involved and advise the Architect of the Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum or Contract Time.

§ 7.3.6 A Construction Change Directive signed by the Contractor indicates the Contractor's agreement therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

- .1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- .2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;
- .3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;
- .4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and
- .5 Additional costs of supervision and field office personnel directly attributable to the change.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Architect. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.4 MINOR CHANGES IN THE WORK

The Architect and Program Manager have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

ARTICLE 8 TIME

§ 8.1 DEFINITIONS

§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

§ 8.1.2 The date of commencement of the Work is the date established in the Agreement.

§ 8.1.3 The date of Substantial Completion is the date certified by the Architect in accordance with Section 9.8.

§ 8.1.4 The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

§ 8.1.5 The term "School Day" when used in any Contract Documents including documents issued following execution of the Agreement shall mean those student attendance days during the Owner's "School Year" which is defined as the period of July 1 to the following June 30 of any year.

§ 8.2 PROGRESS AND COMPLETION

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

§ 8.2.2 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

§ 8.3 DELAYS AND EXTENSIONS OF TIME

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

§ 8.3.2 Claims relating to time shall be made in accordance with applicable provisions of Article 15.

§ 8.3.3 This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 CONTRACT SUM

The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

§ 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 The Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

(Paragraph deleted)

§ 9.3.2 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

(Paragraph deleted)

§ 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Architect will, within ten days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part at the Owner's request, or to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Architect agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the agreed amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a separate contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

§ 9.5.2 When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld upon Contractor's application for payment in due form for which the Architect issues an approved certificate for payment and subject to the payment procedures identified in the Addendum attached hereto..

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

§ 9.6 PROGRESS PAYMENTS

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

§ 9.6.2 The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Architect will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Architect and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within seven days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

§ 9.6.6 A Certificate for Payment, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

§ 9.6.7 Unless the Contractor provides the Owner with a payment bond in the full penal sum of the Contract Sum, payments received by the Contractor for Work properly performed by Subcontractors and suppliers shall be held by the Contractor for those Subcontractors or suppliers who performed Work or furnished materials, or both, under contract with the Contractor for which payment was made by the Owner. Nothing contained herein shall require money to be placed in a separate account and not commingled with money of the Contractor, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.7

(Paragraphs deleted)

SUBSTANTIAL COMPLETION

§ 9.7.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

§ 9.7.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Architect a comprehensive list of items to be completed or corrected prior to final payment. Failure to include an item on such list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

§ 9.7.3 Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

§ 9.7.4 When the Work or designated portion thereof is substantially complete, the Architect will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

§ 9.7.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

§ 9.8 PARTIAL OCCUPANCY OR USE

§ 9.8.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the

Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

§ 9.8.2 Immediately prior to such partial occupancy or use, the Owner, Contractor and Architect shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

§ 9.8.3 Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

(Paragraphs deleted)

§ 9.9 FINAL COMPLETION AND FINAL PAYMENT

§ 9.9.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.9.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.9.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

(Paragraphs deleted)

§ 9.9.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or

Init.

- .3 terms of special warranties required by the Contract Documents.

§ 9.9.5 Acceptance of final payment by the Contractor, a Subcontractor or material supplier shall constitute a waiver of claims by that payee except those previously made in writing and identified by that payee as unsettled at the time of final Application for Payment.

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

§ 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

§ 10.2.3 The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, reasonable safeguards for safety and protection, including posting danger signs and other warnings against hazards, promulgating safety regulations and notifying owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing and accepted by Owner and Architect.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

§ 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.3 HAZARDOUS MATERIALS

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing.

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

§ 10.3.5 The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, except to the extent that the cost and expense are due to the Owner's fault or negligence.

(Paragraph deleted)

§ 10.4 EMERGENCIES

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

ARTICLE 11 INSURANCE AND BONDS

§ 11.1 CONTRACTOR'S LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

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- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, Program Manager, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.2

(Paragraphs deleted)

PROPERTY INSURANCE

(Paragraphs deleted)

§ 11.2.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.

(Paragraphs deleted)

§ 11.2.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without

duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

(Paragraph deleted)

§ 11.2.1.2 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

(Paragraph deleted)

§ 11.2.1.3 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

(Paragraph deleted)

§ 11.2.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

(Paragraphs deleted)

§ 11.2.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

(Paragraph deleted)

§ 11.2.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

(Paragraph deleted)

§ 11.2.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.2.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

§ 11.2.7 WAIVERS OF SUBROGATION

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the

Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.2.8 A loss insured under the Owner's property insurance shall be adjusted by the Owner as fiduciary and made payable to the Owner as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.2.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.2.10 The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder in an amount equal to 100.00% of the bid award of bid number 13-16.

§ 11.4.2 The Contractor shall furnish a copy of the bonds at the time of execution of the Agreement.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

§ 12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it must, if requested in writing by the Architect, be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

§ 12.1.2 If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

§ 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

ARTICLE 13 MISCELLANEOUS PROVISIONS

§ 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

§ 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project, if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

§ 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.

§ 13.4 RIGHTS AND REMEDIES

§ 13.4.1 Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

§ 13.4.2 No action or failure to act by the Owner, Architect or Contractor shall constitute a waiver of a right or duty afforded them under the Contract, nor shall such action or failure to act constitute approval of or acquiescence in a breach there under, except as may be specifically agreed in writing.

§ 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner unless otherwise specified in the Contract documents shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

§ 13.5.4 Required certificates of testing, inspection or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor and promptly delivered to the Architect.

§ 13.5.5 If the Architect is to observe tests, inspections or approvals required by the Contract Documents, the Architect will do so promptly and, where practicable, at the normal place of testing.

§ 13.5.6 Tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

§ 13.6 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

(Paragraphs deleted)

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ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;

(Paragraphs deleted)

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion. § 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon thirty days' written notice to the Owner, Program Manager and Architect, terminate the Contract and recover from the Owner payment for Work completed.

(Paragraphs deleted)

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The Contract Sum and Contract Time may be adjusted by Owner in Owner's sole discretion for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

- .1 that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or

- .2 that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

§ 14.4.1 The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause.

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work completed.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

§ 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

Init.

- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.2.9, and 11.2.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation (provided that neither party hereto is bound to proceed to mediation) of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties; provided that the parties may each independently agree to submit the claim to mediation and or arbitration however, such agreement must be mutual by all parties to the Agreement. The claim may also be submitted by either party to a court of competent jurisdiction for enforcement of the Agreement terms.

§ 15.2.6 Either party may request voluntary mediation of an initial decision at any time.

(Paragraph deleted)

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

§ 15.3 MEDIATION

§ 15.3.1 The parties may by their independent agreement on a case by case basis agree to submit any one or more claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 to mediation. Each party must agree in writing to the submission of any claim, dispute or other matter in controversy to mediation. Notwithstanding anything to the contrary set forth in this Agreement, no party to this Agreement is required or mandated to submit to mediation. Submission to mediation is not a prerequisite to voluntary arbitration nor to submission of claims, disputes or other matters in controversy to a court of competent jurisdiction.

§ 15.3.2 If the parties independently agree to mediation, mediation shall be conducted by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement and shall be conducted in Rockford, Illinois. The parties shall jointly submit a mediation request if both agree to mediation.

§ 15.3.3 The parties shall share the mediator's fee and any filing fees equally. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.

§ 15.4 ARBITRATION

§ 15.4.1 If the parties have selected, The parties may, but are not required, to agree to submit a dispute to binding arbitration. Any agreement to arbitrate must be the subject of an agreement to proceed to arbitration in writing signed by all parties to this Agreement. The agreement to arbitrate shall set forth with specificity all matters in controversy being submitted to arbitration. Arbitration if agreed to by the parties hereto shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement.

(Paragraph deleted)

§ 15.4.2 The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

(Paragraph deleted)

§ 15.4.4 SUBMISSION TO COURT

The parties agree, absent the express agreement of the parties to submit a matter to mediation or arbitration, the means of dispute resolution shall be submission to a court of competent jurisdiction. This Agreement shall be interpreted in accordance with the laws of the state of Illinois and venue for all purposes shall lie in the Circuit court of the 17th Judicial Circuit, Winnebago County Illinois.

(Paragraphs deleted)

FORM FOR REFERENCE

ADDENDUM

**ADDENDUM TO A CERTAIN CONTRACT FOR CONSTRUCTION BY AND BETWEEN _____
[CONTRACTOR] _____ AND THE BOARD OF EDUCATION OF
ROCKFORD SCHOOL DISTRICT No. 205, WINNEBAGO AND BOONE COUNTIES, ILLINOIS**

THIS ADDENDUM IS ATTACHED TO AND MADE A PART OF SUCH CONTRACT

This Addendum is attached to and made a part of the contract for construction (Agreement) dated ____
_____ between _____ (Contractor) (_____
_____ Project-IFB____-____) and the Board of Education of Rockford School
District No. 205, Winnebago and Boone Counties, Illinois (District).

1. Conflict.

In the event of conflict between the terms of the Agreement and this Addendum, the terms of this Addendum shall govern.

2. Certifications.

Upon or prior to execution of this Addendum, Contractor shall deliver to the District the following fully executed Certifications in the form as advertised by the District or as otherwise required by the District:

1. Certificate regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion;
2. Bid Rigging Certification;
3. Certificate Regarding Lobbying;
4. Certification regarding the Office of Foreign Asset Control;
5. Certified Cleared Employee List;
6. Vendor Conflict of Interest Disclosure Form.

By execution of this Addendum, Contractor represents and warrants that the certifications set forth in certificates 1, 2, 3, 4, 5 and 6 shall remain true at all times during the existence of this Addendum and the Agreement and shall immediately notify the District in the event Contractor becomes subject to debarment, suspension, ineligibility, or voluntarily excludes itself from federal programs; or, becomes barred from participation in public contracts due to a violation of the bid-rigging or bid-rotating statutes of the State of Illinois, or in the event an employee of Contractor becomes ineligible to be present on District grounds.

Contractor further certifies by execution of this Agreement that it shall comply, if the Project is funded in whole or in part with federal grant funds, with the Pilot Program for Enhancement of Employee Whistleblower Protection applicable to Contractors under federal grant funded programs as specified in the National Defense Authorization Act (NDAA) for Fiscal Year (FY) 2013 (Pub. L. 112-239, enacted January 2, 2013). Contractor shall comply with the following requirements of such Act if providing services funded by federal grants:

1. Inform its employees working on the Projects they are subject to the Whistleblower rights and remedies of the pilot program;
2. Inform its employees in writing of employee whistleblower protections under 41 U.S.C. §4712 in the predominantly native language of the workforce; and
3. Include such requirements in and agreements made with any subcontractor.

Whistleblower rights include that an employee of a Consortium may not be discharged, demoted, or otherwise discriminated against as a reprisal for "Whistleblowing"; and such rights cannot be waived by

FORM FOR REFERENCE

agreement, policy, form or condition of employment. Whistleblowing is defined as making a disclosure to an authorized person or entity that the employee reasonably believes is evidence of:

1. Gross mismanagement of a federal contract or grant;
2. A gross waste of federal funds;
3. An abuse of authority relating to a federal contract or grant;
4. A substantial and specific danger to public health or safety; or
5. A violation of law, rule, or regulation related to a federal contract or grant (including competition for, or negotiation of, a contract or grant).

3. Conflict of Interest.

Contractor and its officers, employees and agents shall at all times during the duration of this Addendum and the Agreement refrain from violation of conflict of interest statutes in the state of Illinois.

4. Illinois Use Tax.

Contractor shall require in applicable circumstances that all vendors who supply goods or services to Contractor in the performance of its obligations under the Addendum and Agreement will comply with the terms of 105 ILCS 5/10-20.21(b) relating to Illinois Use Tax.

5. Employment Costs and Compliance with Laws.

Contractor shall keep and perform and be solely responsible for all the duties and responsibilities of an employer in the state of Illinois including without limitation providing and paying for Unemployment Compensation coverage and Workers Compensation coverage for its employees. Contractor herewith stipulates and agrees that all persons acting by and through Contractor are employees of Contractor or its consultants, and not the District, and Contractor shall keep and hold harmless the District from and against any and all claims relating to employment matters of Contractor employees. Contractor herewith expressly stipulates and agrees that it will adhere to and abide by all Federal, State and local laws, ordinances, regulations and rules applicable to its performance under the Addendum and Agreement. Contractor is an "independent contractor" and the Agreement and this Addendum shall not create nor infer an employer/employee relationship between the District and Contractor. Contractor shall bear all risk of loss and remain liable for any Federal or State Income, Social Security, Unemployment Compensation and Workers Compensation taxes, contributions or deductions and shall indemnify the District, its Board members, agents, officers, employees, successors and assigns for any liability including interest and penalties and attorney's fees, if any, assessed against the District as a result of any violation of this provision.

6. Access to School Grounds, Activities and Conduct.

All of Contractor's employees, agents, principals, and consultants shall abide by Federal, State and Local Laws and Board of Education policy while on District premises. No employee, agent or principal of Contractor and its consultants and vendors shall fraternize with any student of the school district. Any employee whose conduct is judged unfit by District shall not be permitted to work on the Projects. Contractor agrees to comply with and abide by all rules, regulations and policies of the District and the direction of any District representative relating to access to and conduct upon District Premises.

Contractor employees, agents and principals and its consultants and consultants employees and agents shall not perform work within District buildings for more than 30 school days within any school year (July 1 to June 30) unless a criminal history records check has been conducted by Contractor, the individual(s) is found to have not violated any of the drug or criminal offenses listed in the criminal history records check provisions in the School Code 105 ILCS 5/10-21.9(f) (the Act), and the Contractor so certifies the same to be true on the Certified Cleared Employee List. Contractor employees, agents and principals and its consultants and consultant's employees and agents shall not be permitted to be present on District

FORM FOR REFERENCE

grounds unless a Statewide Sex Offender Database check and a Statewide Child Murderer and Violent Offender Against Youth Database check has been conducted regarding all such employees in accordance with and subject to the provisions of the Act. Contractor employees, agents and principals and its consultants and consultant's employees and agents who are found to have had convictions of the enumerated criminal or drug offenses listed in the Act or who appear in the noted databases shall not be permitted at any time to be present on school grounds.

All persons accessing school grounds pursuant to this Addendum and the Agreement are required to have in their possession identification issued by the District. All such persons must check in with the school main office to receive a visitor's identification at which time the individual must present a government issued photo identification which will be used to verify the individual's name appears on the Certified Cleared Employee List. At the conclusion of the work day, plastic or hard cover identification must be returned to the school.

Not less than 10 days prior to the commencement of work, Contractor shall submit to the District a written certification on a form provided by the District (Certified Cleared Employee List), signed by Contractor under oath that the employees listed on the certification have been the subject of a criminal history records check (for employees working more than 30 school days in District buildings), and a Statewide Sex Offender Database check and a Statewide Child Murderer and Violent Offender Against Youth Database check for all employees accessing District grounds. Contractor shall update the certification as and when necessary to keep such certification list current.

The District and Program Manager, if any, may from time to time and at multiple times in their discretion and without notice check the identification of all persons accessing school grounds by or through the Contractor to assure such persons appear on the certification list and have in their possession a valid District issued identification. Contractor warrants that it shall immediately notify the District if a certified cleared employee is convicted of an enumerated offense or their name appears on any of the noted Databases. A violation of this section 6 is a material breach of contract.

7. Certifications of Hours Worked.

In all circumstances where Contractor seeks payment based upon an hourly rate for itself or its consultants, time cards or time records of such person or persons for whom such hourly rate compensation is requested shall be kept and maintained by Contractor. At any time or times, at the election of the District, the District may inspect and audit all time records kept by Contractor. Each submission of requests for payment of hourly rate amounts shall be accompanied by a certification under oath that the payment requested is for time actually worked which has been verified by Contractor.

8. Drugs, Alcohol and Smoking.

The District maintains a drug and alcohol free workplace. Contractor shall prohibit the use of drugs and alcohol on District premises at all times. The District also maintains all its properties as smoke free, tobacco free environments. Smoking and tobacco use (including chewing tobacco and snuff) is not permitted on any District property; Contractor shall require all its employees, agents and representatives and its consultants to refrain from smoking and tobacco use on District property.

8.01 No Contractor employee, agent, representative, consultant and consultant's employees, agents and representatives may use, possess, distribute, deliver, or be under the influence of a drug, or use or be under the influence of alcohol, while performing work on a public works project. An employee is considered to be under the influence of alcohol for purposes of this Act (820 ILCS 265) if the alcohol concentration in his or her blood or breath at the time alleged as shown by analysis of the employee's blood or breath is at or above 0.02.

8.02 Contractor acknowledges and agrees that the provisions and requirements established by the Substance Abuse Prevention on Public Works Projects Act has been complied with and

FORM FOR REFERENCE

Contractor has in place all requirements for testing of its employees suspected of or challenged to be tested by the District as provided under the Act (820 ILCS 265).

9. Contract Payments.

All contract payments shall be processed in the manner specified in the Agreement. The Board of Education regular meetings generally occur on the second and fourth Tuesdays of each month as specified by the Board Calendar. The Board Calendar may be accessed at the District web site www.rps205.com. Payment applications by the Contractor must be received in the District Finance Department not less than 10 calendar days prior to a scheduled Board meeting for the approved application for payment to be considered at that Board meeting.

The Board of Education will comply with the provisions of the Local Government Prompt Payment Act, 50 ILCS 515/1.

10. Records Maintenance and Security.

A. Records. The Contractor shall establish and maintain a reasonable accounting system that enables the District to readily identify Contractor's assets, expenses, costs of goods and use of funds related to the Project (the Records). Such Records shall include, but not limited to, accounting records, written policies and procedures; all paid vouchers, including those for out-of-pocket expenses, other reimbursement supported by invoices; ledgers; cancelled checks; deposit slips, bank statements; journals; original estimates; estimating work sheets; contract amendments and change order files; back-charge logs and supporting documentation; insurance documents, payroll documents; timesheets; memoranda; and correspondence.

B. Retention. The Contractor shall, at all times during its performance of the Project and for a period of seven years after the completion of the Project, maintain Records, together with all supporting or underlying documents and materials. The Contractor shall upon written request by the District at any time or times, whether during or after completion of the Project, and at the Contractor's expense, produce the Records for inspection, copying and audit (including copies and extracts of records as required) by the District. The Records shall be made available to the District, upon three-day written notice, during normal business hours at Contractor's principal office if located in Rockford, Illinois or at such other location specified by the District including the District offices. Upon expiration of the retention period specified in this paragraph 10B, prior to destruction of the Records, Contractor shall provide not less than 30 days written notice of its intent to destroy any part or all of the Records, specifying the nature, character and extent of Records to be destroyed and the District may at its discretion and expense obtain all Records or copies of Records intended to be destroyed. The Contractor shall ensure the District's right to access and audit the Records in the possession of, created or maintained by Contractor and Contractor's agents and representatives. Contractor shall notify in writing its agents and representatives of the requirements of records, retention and audit as set forth in this paragraph 10. Any and all contracts or agreements between Contractor and any other party related to the Project shall expressly include the records, retention and audit provisions of this paragraph 10.

C. Audit. The District and its authorized representatives shall have the right to audit, to examine, and to make copies of or extracts from all Records (in whatever form they may be kept, whether written, electronic, or other), including, but not limited to, those kept by the Contractor, its agents and representatives. Cost of any examination or audit of Records conducted by the District will be borne by the District (excluding any cost to produce Records under paragraph 10B), except where the examination or audit identifies overpricing or overcharges (of any nature) by the Contractor to the District in excess of one-half of one percent (0.5%) of the total contract billings in which event the entire cost of the examination or audit shall be Contractor's cost and Contractor shall reimburse the District for the total cost of the examination or audit. If the examination or audit reveals substantive findings of fraud, misrepresentation, or non-performance by Contractor, its employees, agents or representatives, the Contractor shall pay all costs of the examination or audit; and if paid by the District, reimburse the District for all such costs. In the

FORM FOR REFERENCE

event Contractor fails to pay such costs within 30 days of demand by the District, District may offset any such costs unpaid by Contractor from any balance due Contractor by the District or at the election of the District proceed to collect such costs by any available means including litigation in which event the costs of collection including reasonable attorney's fees shall also be paid by Contractor.

D. Records ownership and security. Contractor hereby acknowledges and agrees that all records and documents, whether in electronic or written form or otherwise, received by Contractor from the District and all records, whether in electronic or written form or otherwise, created by Contractor in performance of its obligations under the Agreement shall be and remain owned by the District. Contractor shall use all reasonable and timely means to protect and preserve all such records and to deliver the same to the District upon demand. The Records are subject to access and examination by the District and any federal agency with relevant responsibility for any federal grant funds providing funding for the Project. Contractor shall cooperate and produce all records of the Project for inspection and examination by any governmental agency, including District, providing funding for the Program.

E. Confidentiality. The Records and all documents and information received, accessed or observed by Contractor in performance of the Agreement shall be and remain confidential. In the performance of its obligations under the Agreement Contractor may acquire access to certain information, including but not limited to, information concerning students and/or school personnel, and other confidential and/or proprietary information (collectively, "Confidential Information"). Contractor will not, without the prior written consent of the Board, and regarding student record information, without the express prior written consent of the parent/guardian, disclose, re-disclose or make available to anyone, at any time, either during Contractor's engagement with the Board or following termination of this Agreement, for any reason whatsoever, any of the Confidential Information. The provisions of this Section shall survive the termination of the Agreement.

11. Miscellaneous.

11.1 To the fullest extent permitted by applicable law, Contractor and its employees and consultants shall and do agree to indemnify and hold harmless the District, and its respective Board members, officers, directors, and employees from and against all claims, damages, losses, causes of action, suits, judgments and expenses, including reasonable attorney's fees, to the extent arising out of, caused by or resulting from the performance or non-performance of the Contractor regarding work under the Agreement caused in whole or in part by any negligent act or omission of Contractor, anyone directly or indirectly employed by it or anyone for whose acts it may be liable even if caused in part by District. This paragraph shall be construed in accordance with the Construction Contract Indemnification for Negligence Act (740 ILCS 35/1).

11.2 Notwithstanding any other provision in any document, the District shall not, in any manner, be deemed or intended to have waived any claim by making a payment of any amount.

11.3 The Certificate of Insurance and all insurance policies required to be obtained by Contractor shall provide that coverages afforded under the policies will not be cancelled, reduced or allowed to expire without at least thirty (30) days prior written notice to the District.

11.4 Under no circumstances shall the District be deemed to have waived any of the insurance requirements of this Agreement by any action or omission.

11.5 Subject to the waiver of subrogation as may otherwise apply by agreement, nothing contained in the insurance requirements of the Agreement is to be construed as limiting the liability of Contractor or any of its insurance carriers. District does not represent that the coverages or limits of insurance specified is sufficient or adequate to protect the District or Contractor's interest or liabilities but are mere minimums. The obligation of Contractor to purchase insurance shall not limit its obligations to the District in the event the District should suffer an injury or loss in excess of the amount recoverable through insurance, or any loss or portion of loss which is not covered by insurance.

FORM FOR REFERENCE

11.6 Contractor shall notify District, in writing, of any actual or potential claim for personal injury or property damage relating to the Project and of any occurrence which might give rise to such claim, promptly upon receiving first knowledge of same.

11.7 Contractor agrees to fully comply with the requirements of the Illinois Human Rights Act, 775 ILCS 5/1-101 et. seq. including but not limited to the provisions regarding sexual harassment policies and procedures under Section 2-105 of said Act. Contractor further agrees to comply with all federal Equal Employment Opportunity laws including, without limitation, the American's with Disabilities Act and the rules and regulations promulgated thereunder. Pursuant to the requirements of the regulations of the Illinois Department of Human Rights (Department), Title 44, Part 750 of the Illinois Administrative Code and to the extent applicable Contractor will comply with Illinois human rights laws. In the event of non-compliance with the provisions of this Equal Employment Opportunity Clause, the Illinois Human Rights Act or the rules and regulations of the Illinois Department of Human Rights, this Agreement may be cancelled or voided in whole or in part, and Contractor acknowledges that it may be subject to further sanctions or penalties imposed by the Illinois Human Rights Commission, as provided for in the Illinois Human Rights Act, and to such other sanctions or penalties may be imposed or remedies invoked as provided by statute or regulations. During the performance of this Agreement, Contractor agrees:

A. It will not discriminate against any employee or applicant for employment because of race, color, religion, creed, sex, marital status, national origin or ancestry, age, citizenship, physical or mental handicap or disability, military status, or an unfavorable discharge from military service or arrest record status; and further that it will examine all job classifications to determine if minority persons or women are underutilized and will take appropriate affirmative action to rectify any such underutilization.

B. If it hires additional employees in order to perform this Agreement it will determine the availability (in accordance with applicable agency rules) of minorities and women in the areas(s) from which it may reasonably recruit and it will hire for each job classification for which employees are hired in such a way that minorities and women are not underutilized.

C. In all solicitations or advertisements for employees placed by it or on its behalf, it will state that all applicants will be afforded equal opportunity without discrimination because of race, color, religion, sex, marital status, national origin, ancestry, age, physical or mental handicap unrelated to ability, or an unfavorable discharge from military service.

D. It will send to each labor organization or representative of workers with which it has or is bound by a collective bargaining agreement or understanding, a notice advising such labor organization or representative of Contractor's obligation under the Illinois Human Rights Act and the Rules of the Department. If any such labor organization or representative fails or refuses to cooperate with Contractor in its efforts to comply with such Act and Rules, Contractor will promptly so notify the Department and the contracting agency and will recruit employees from other sources when necessary to fulfill its obligations thereunder.

E. Contractor will submit reports as required by the District's rules, furnish all relevant information as may, from time to time, be requested by the Department or the District, and in all respects comply with the Illinois Human Rights Act and the Department rules.

F. Contractor will permit access to all relevant books, records, accounts and work sites by personnel of the contracting agency and the Department for purposes of investigation to ascertain compliance with the Illinois Human Rights Act and Department rules.

G. Contractor will include verbatim or by reference the provisions of this clause in every subcontract it awards under which any portion of the Agreement obligations are undertaken or assumed. In the same manner as with other provisions of the Agreement, Contractor will be liable for compliance with applicable provisions of this clause by its consultants or contractors; and further it will promptly notify the contracting agency and the Department in the event any consultant or contractor fails or refuses to comply therewith. In addition, Contractor will not utilize any consultant or contractor

FORM FOR REFERENCE

declared by the Illinois Human Rights Commission to be ineligible for contracts or subcontracts with the State of Illinois or any of its political subdivisions or municipal corporations.

11.8 Weapons. Neither Contractor nor any of its employees, officers, agents or representatives shall be in possession of any firearm or weapon (as defined by the District's designated representative) while on District premises, including on the person or within any vehicle parked on or adjacent to any District property. Violation of this section may result in immediate removal from District premises and referral to local law enforcement.

12. Federal Funds Contract.

The Agreement provides for the construction of certain improvements on behalf of the District identified as the Projects. If the Projects are funded in whole or in part by federal grant funds the Projects are subject to certain rules and regulations as may be contained in the regulations of the funding agency, in the federal common rule as set forth in 45 CFR Part 92, and in the grant award. Contractor agrees to abide by all such rules and regulations as part of its basic services.

13. No Waiver.

No failure of either party to exercise any powers granted in this Agreement or to insist upon strict compliance by the other party with any obligation hereunder and no custom or practice of the District or Contractor at variance with the terms hereof shall constitute a waiver of the right of either party to demand exact compliance with the terms of this Agreement.

14. Representation of Authority.

Contractor herewith covenants, represents and warrants that the person executing this Addendum and the Agreement and any and all amendments hereto and thereof, as and if such may occur, are fully empowered to execute this Addendum, the Agreement and any amendments thereto in such fashion as to fully and completely bind Contractor to these agreements and undertakings; the signature on this Addendum and the Agreement further serves to assure the District that any and all action necessary by law, and under the terms of Contractor's by-laws, and pursuant to the policies of Contractor have been taken prior to execution of this document on behalf of Contractor; the signatures on the Agreement and this Addendum are a representation that the Contractor is a corporation in good standing in the state of Illinois. This representation, covenant and warranty are made by Contractor with the intent that the District fully rely hereon and as an inducement to the District to execute this Addendum and the Agreement.

15. Entire Agreement.

The Agreement together with all its Exhibits and this Addendum shall constitute the complete understanding between the parties and no other or further agreement shall be or constitute an amendment to or modification of this Agreement absent the same being reduced to writing and executed by both parties hereto.

DISTRICT:
BOARD OF EDUCATION OF ROCKFORD
SCHOOL DISTRICT NO. 205, WINNEBAGO
AND BOONE COUNTIES, ILLINOIS

BY: _____
Its President

Attest: _____
Its Secretary

CONTRACTOR:

BY: _____
Its President

ATTEST: _____
Its Secretary

CHANGE ORDER PROCEDURES

In order to process change orders it is important that procedures are followed and documentation provided in a manner that allows timely processing.

Field Orders will be issued for all changes that occur on the project. Changes are typically associated with a response to a RFI, Bulletins, or Field Conditions.

This document contains information needed for Field Orders, processing changes from RFIs, Bulletins and Field Conditions. Requirements for Change Order Requests are also provided.

FIELD ORDERS

A Field Order will be issued for all change conditions. It is a document that tracks changes to the project and will provide directions for processing.

The Field Order heading contains the following tracking information, it is important that this information is contained in all change order requests:

1. Field Order Number
2. RFQ Number
3. PCO Number

The Field Order provides direction on how to proceed.

1. You are authorized to proceed with the change, subject to the method of payment listed in the following section, or
2. You are directed not to proceed until you have submitted all cost and schedule information within 7 days and the costs have been approved by RPS.

There are 4 methods of payment listed.

1. No Cost
2. Lump Sum
3. Time and Materials
4. Submit Quotations

NO COST CHANGE

If this box is selected, it means that the information that you have received is a clarification of information contained in your contract and will not require a change to your contract.

LUMP SUM

If this box is selected, it means that an agreement exists on a lump sum amount for a contract modification. This is rarely used as a way to process contract changes.

CHANGE ORDER PROCEDURES

TIME & MATERIALS

If this box is selected, tickets will need to be submitted to Ragnar Benson on a daily basis. Tickets that are not submitted on a daily basis will be subject to rejection.

If a ticket is signed by a Ragnar Benson representative, it does not guarantee additional payment or acceptance of pricing. The signature is only to confirm that the time spent on a particular task has been accepted. The only authority that can accept, approve, and or modify changes to the contract is a RPS project representative. A RPS employee that is not a project representative is not authorized to commit the district for additional work. This would include but not be limited to school administrators, teachers, or maintenance personnel.

SUBMIT QUOTATIONS

If this box is checked then you will need to submit a Change Order Request subject to the change order requirements listed in a subsequent section of this document.

Please note that you are not to proceed with any additional work unless you have a signed field order. If you proceed with extra work without a signed field order you do so at your own risk.

CHANGE CONDITIONS

RFI's

All RFI's will be submitted by the general contractor to the Architect of Record with a copy sent to Ragnar Benson. The response will include a field order will direct you on how you are to proceed.

BULLETINS

When a Bulletin is issued, a Field Order will be included and it will direct you on how to proceed.

FIELD CONDITIONS

If you encounter unknown conditions and think that you are entitled to additional compensation, notify the Architect of Record and Ragnar Benson immediately and include all appropriate documentation. A Field Order will provide direction on how you are to proceed.

CHANGE ORDER REQUESTS

To aid in the processing of change orders, we will need certain information included in each of the change order requests.

A detailed cost breakdown that includes quantities, man hours, labor and material costs needs to be included for each trade that is requesting additional compensation. Please use the Cost Proposal Worksheet that is included in this document.

Include all backup that is needed to evaluate the change order request. Examples of this would be quotes received from subcontractors , material suppliers, sketches that identify how quantities were calculated, worksheets, and pictures may also be appropriate for our analysis.

CHANGE ORDER PROCEDURES

FEES

The fees shall be calculated as a lump sum to all changes. The fees are to be calculated per the information provided below.

GENERAL CONTRACTOR FEES

12% allowed for self-performed work- this includes overhead, profit, bond and insurance.

5% allowed for subcontracted work - this includes overhead, profit, bond and insurance.

SUBCONTRACTOR FEES

12% allowed for self-performed work - this includes overhead, profit, bond and insurance.

Please see a sample change order request that is included with this attachment.



FIELD ORDER
#: 4

Project: 10101- CSX - Worcester IMF Expansion	Date: 11/07/2011
To: David Marois MAROIS BROS 115 Blackstone River Road Worcester, MA 01697	From: Carl Zeigler RAGNAR BENSON CONSTRUCTION LLC 250 South Northwest Highway Park Ridge, IL 60068
Phone: 508-791-8134	Phone: 847-698-4900
Fax: 508-754-4214	Fax: 847-692-9320
Email: dmarois@maroisbrothers.com	Email: carl.zeigler@rbic.com
	RBRFQ#: 6 PCO#: 109

CC: Tim Brown - ARCADIS - Phone: 508-421-8307 - Fax: 508-421-8305,
Keith Goldberg - ARCADIS - Phone: 508-421-8307 - Fax: 508-421-8305,
Dennis Dunn - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
Stephen Groh - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
Fred Jewel - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
Steven Kehm - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
Knut Olberg - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
Paul Poolini - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
Randy Perdue - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
Greg Stambaugh - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
Chris Swanson - WILLIAM CHARLES CONSTRUCT COMPANY LLC - Phone: 815-654-4700 - Fax: 8156544736

Description: Foundation Removal at Franklin and Plastic Streets

- ☐ You are hereby authorized to proceed with the following terms of work on the above project. All work shall be performed in accordance with the requirements of the Contract Documents.
- ☒ Do not proceed with the modifications or clarifications. Please submit your proposal listing both schedule and cost impact of the modifications or clarifications with 7 days. If we do not receive a proposal within 7 days, we will assume there are no schedule or cost impacts associated with this work.

Item	PCO Description	Detail Notes:
2	WCC - Foundations found at underground detention pipes	
3	Marois - Foundations found at underground detention pipes	

Notes:

Method of Payment:

- | | |
|---|---|
| <input type="checkbox"/> No Cost | <input checked="" type="checkbox"/> Submit quotations promptly for the above described work. The cost of the work will be determined from the Subcontractor Proposal, subject to review, and will be resolved to be mutually agreeable. |
| <input type="checkbox"/> Lump Sum | |
| <input type="checkbox"/> Time and materials | |

Schedule: The effect of this order on the contract completion date is as follows:

- | | |
|--|--|
| <input checked="" type="checkbox"/> No Change. | <input type="checkbox"/> Completion Date is estimated at days. |
| <input type="checkbox"/> Impact is unknown at this time. | <input type="checkbox"/> Subcontractor to submit a revised schedule listing duration changes to specific activities. |

250 SOUTH NORTHWEST HIGHWAY, PARK RIDGE, IL 60068 • PHONE: 847-698-4900 • FAX: 847-692-9320
Page 1 of 2

DOT 15.2.01-11



FIELD ORDER
#: 4

		Date
David Marois	MAROIS BROS	11/07/2011
Carl Zeigler	RAGNAR BENSON CONSTRUCTION LLC	11/07/2011
Keith Goldberg	Arcadis	
In Scope Change N		

DATE _____

ROCKFORD PUBLIC SCHOOLS #205 - FACILITIES UPGRADES PROJECT COST SUMMARY FORM

LOCATION & PROJECT NAME

CONTRACT INFORMATION

C.O.R. #: #

REASON FOR CHANGE \ CLARIFICATIONS

Descripton

Field Condition _____ Value Engineering
Owner Requested Change _____ Design Modification

COST BREAKDOWN SUMMARY

UNIT PRICE including Sub-Contractor & Self-Performed Work Markups: (): \$ -

GRAND TOTAL: \$ -

ATTACHMENTS

Pages

TOTAL Number of Pages Attached: 1

APPROVALS

Engineer Approval: _____

COST PROPOSAL WORKSHEET

Project:

Project No.:

Change Order Request No.:

[illegible]

ROCKFORD PUBLIC SCHOOLS
REQUIRED BID FORMS CHECK LIST
Bid/RFP/RFQ No.: 16-48 Brookview ES Additions and Renovations

Listed below are the REQUIRED forms all bidders are REQUIRED to submit with sealed bids on or before the bid due date and time. Failure to submit ALL required forms may result in bidder being deemed non-responsive.

Required Forms	Yes	Comments
Bid Security Bond	<input type="checkbox"/>	5% of Base Bid
Section 004100 – Bid Form	<input type="checkbox"/>	
Bid Rigging Certification	<input type="checkbox"/>	
Minority and Women Owned Business Concern Representation	<input type="checkbox"/>	
Certificate Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion	<input type="checkbox"/>	
Certificate Regarding Lobbying	<input type="checkbox"/>	
OFAC Compliance	<input type="checkbox"/>	
Vendor Conflict of Interest Disclosure Form	<input type="checkbox"/>	
Certified Cleared Employee List	<input type="checkbox"/>	Complete, sign, and notarize the form. If you are uncertain of which employees will be working on the project, note this information on the form that the employee information will be forth coming BEFORE you start on the project, if awarded the contract.
Asbestos Notification	<input type="checkbox"/>	
AIA Document A305-1986 Contractor's Qualification Statement	<input type="checkbox"/>	
Section 004115 – References	<input type="checkbox"/>	

Listed below are REQUIRED FORMS/DOCUMENTS that must be submitted prior to starting work, if awarded the contract. Failure to submit forms below may result in project start delay.

<input type="checkbox"/> Certificate of Liability Insurance	<input type="checkbox"/> Performance Bond (100% of contract)
<input type="checkbox"/> AIA Document A101-2007 Standard Form of Agreement between Owner and Contractor	<input type="checkbox"/> Labor and Material Payment Bond (100% of contract)

SECTION 004100 BID FORM

TO:

Director of Purchasing
Rockford Board of Education
School District No. 205
501 Seventh Street, 6th Floor Conference Rm.
Rockford, Illinois 61104

FROM:

Operating as (strike out conditions that do not apply) (an Individual,) (a Corporation, organized and existing under the law of the State of _____,) (a Partnership,) (a Joint Venture consisting of the firm of:)

BASE PROPOSAL:

In response to your invitation to submit a proposal for the execution of all work described by the Drawings and Specifications dated 03-11-16 and titled: RPS 205 - New Gymnasium, Kitchen and Lift at Brookview Elementary School, located in Rockford, IL and having examined the sites where the work is to be executed; and having become familiar with local conditions as they might in any way affect the cost and/or execution of the work; and having carefully examined the aforesaid drawings, specifications and other related documents and addenda thereto, the undersigned Bidder hereby proposes and agrees to provide all labor, materials, plant, equipment, transportation, and other facilities as necessary and/or required for the complete and satisfactory execution of the work for which this proposal is submitted, for the lump-sum consideration as stated hereinafter:

Bidders must show bid amount in both words and figures. In case of discrepancy, amount shown in words shall govern.

BASE PROPOSAL:

Base Bid: For New Gymnasium, Kitchen and Lift at **Brookview Elementary School**, Bidder agrees to perform all work described and shown on the drawings for the sum of:

Bid _____ Dollars _____
(in writing) (in figures)

ALTERNATE BID:

For complete Work shown on Drawing and specified in the Bidding Documents for Alternate Bids. State the amount to be added to the Base Bid Amount if the work of the Alternate Bid is included in the Contract. Include costs of related coordination, revision, or adjustment.

ALTERNATE NO. A-1: For the installation of four (4) new windows in the current new Cafeteria and Office 130 as indicated on Sheet A1.0.0, Detail 3 of A1.0.2, A1.3.1 and A3.1.1 add the sum of:

_____ DOLLARS
(\$ _____)

The Owner has the right to accept the Base Bid within thirty days, and to accept any of the Alternate Bids within sixty days from the Bid Due Date, with no increase to the costs stated herein.

UNIT PRICE:

UNIT PRICE NO. U-1:

Provide unit price for over excavation of unsuitable soil, off-site removal of unsuitable soil and replacement with compacted engineered fill. The Bidder shall assume that an estimated quantity of 200 C.Y.'s are included in the Base Bid Amount at the following Unit Price:

_____ Dollars/cu. yd. (\$ _____)/cu. yd.
(in writing)
x 200 cu. yds. = _____ Dollars (\$ _____)
(in writing)

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

ADDENDA ACKNOWLEDGEMENT:

The undersigned acknowledges receipt of the following addenda:

(List by number and date appearing on each addenda. If all addenda are not acknowledged, the bid will be considered irregular).

ADDENDUM No.	Date

The undersigned agrees to complete all work at the school, as required by the contract as follows:

	New Gymnasium, Kitchen, and Lift Brookview Elementary School
Contract Award:	
Commence Work on:	
New Entry:	08-08-2016
West Lifts/South Chair Incline Lift:	08-08-2016
New Kitchen - Owner Occupancy	08-31-2016
Gym Addition - Substantial Completion	12-23-2016
Final Completion:	

Refer also to Project Milestone document sheet.

BID SECURITY:

Bid Security is attached, without endorsement, in the sum of (5% of Bid Amount):

_____ Dollars _____

GENERAL STATEMENT:

The undersigned has checked all of the figures contained in this proposal and further understands that the Owner will not be responsible for any errors or omissions made therein by the undersigned

The undersigned agrees to assist and cooperate with the Owner in preparing the formal Contract, and shall execute same and return it to the Owner along with surety bonds and insurance certificates, as may be required by the specifications and other Contract Documents, within 10 days following its receipt.

The undersigned further agrees to begin work on said contract as soon as practicable after date of "Contract" or "Notice to Proceed," whichever is earlier; or, in any case the undersigned fails or neglects to appear within the specified time to execute the Contract, the undersigned will be considered as having abandoned it, and the Bid Security accompanying this proposal will be forfeited to Owner as liquidated damages for delay and loss caused to Owner by reason of such failure on the part of the undersigned.

It is understood that the right is reserved by Owner to reject any or all proposals, to waive all informalities and irregularities in connection therewith, and to award a contract for any part of the work or the project as a whole. It is agreed that this proposal may not be withdrawn for a period of 60 days after it has been opened, without permission to the Owner.

The undersigned declares that the person(s) signing this proposal is/are fully authorized to sign on behalf of the named firm and to fully bind the named firm to all the conditions and provisions thereof.

It is agreed that no person(s) or company other than the firm listed below or as otherwise indicated hereinafter has any interest whatsoever in this proposal or the Contract that may be entered into as a

result thereof, and that in all respects the proposal is legal and fair, submitted in good faith, without collusion or fraud.

It is agreed that the undersigned has complied or will comply with all requirements concerning licensing and with all other local, state, and national laws, and that no legal requirements has been or will be violated in making or accepting this proposal, in awarding the Contract to him, or in the prosecution of the work required thereunder.

The contractor certifies that the contractor is not barred from bidding on the contract as a result of a conviction for either bid-rigging or bid rotating under Article 33E of the Criminal Code of 1961.

Name of Contractor (Typed)

Contractor's Signature

SUBCONTRACTOR LISTING: (By Bidders of General Construction category of work):

RPS 205 is requesting the following breakdown of the bids. The amounts provided are for information only and will not be used for the purpose of determining the low bidder; **however, all \$ amounts shall equal the amount of the entire bid entered above.**

This proposal has been prepared using sub bids received from the firms listed below:

New Gymnasium, Kitchen and Lift **Brookview Elementary School:**

Classification of Work	Name of Sub-Bidder	Total Bid Amt. (\$\$)
General Conditions & Fee		\$
Sitework		\$
Concrete		\$
Masonry		\$
Structural Steel & Erection		\$
Roofing		\$
Windows		\$
Wood Flooring		\$
Lifts		\$
Plumbing		\$
HVAC		\$
Low Voltage		\$
Total Bid Amount		\$\$ _____

BIDDER SIGNATURE:

Respectfully submitted this _____ day of _____

Legal Name of
Firm: _____

Federal Tax Identification Number: _____

BY: _____

CERTIFICATE OF ELIGIBILITY TO CONTRACT

_____, Contractor, Pursuant to section 33E-11 of the Illinois Criminal Code of 1961 as amended, hereby certifies that neither (he, she, it) nor any of (his, her, its) partners, officers, or owners of (his, her, its) business has been convicted in the past five (5) years of the offense of bid-rigging under section 33E-3 of the Illinois Criminal Code of 1961 as amended; that neither (he, she, it) nor any of (his, her, its) partners, officers or owners has ever been convicted of the offense of bid-rotating under section 33E-4 of the Illinois Criminal Code of 1961 as amended; and that neither (he, she, it) nor any of (his, her, its) partners, officers or owners has ever been convicted of bribing or attempting to bribe an officer or an employee of the State of Illinois, or has made an admission of guilt of such conduct which is a matter of record.

Date: _____

SUBSCRIBED and SWORN TO before me

This _____ day of _____

NOTARY PUBLIC

END OF BID FORM

ROCKFORD PUBLIC SHOOOLS
BID-RIGGING CERTIFICATION

I, _____, a duly authorized agent of
(Agent)

_____, do hereby certify that neither
(Contractor)

_____ nor any individual presently
(Contractor)

affiliated with _____ has been barred from bidding on a
(Contractor)

public contract as a result of a violation of either Section 33E-3 (bid-rigging) or Section 33E-4 (bid rotating) of the Illinois Criminal Code, contained in Chapter 750, Article 5 of the Illinois Compiled Statutes.

Authorized Agent

Contractor

ROCKFORD PUBLIC SCHOOLS

MINORITY, WOMEN and DISABLED-OWNED BUSINESS CONCERN REPRESENTATION

Minority-Owned Business: a minority-owned business concern means a business concern that: (1) is at least 51 percent unconditionally owned by one or more individuals who are considered to be a member of a minority group, or a publicly owned business having at least 51 percent of its stock unconditionally owned by one or more members of a minority group; and (2) has its management and daily business controlled and operated by one or more such individuals. Individuals who certify that they are members of minority groups (African Americans, Hispanic Americans, Native Americans, Asian-Pacific Americans, Asian-Indian Americans, and other minorities) are to be considered minority-owned enterprises.

Women-Owned Business: a business that is at least 51 percent owned by a woman or women who also control and operate it.

Disabled Owned Business: a business that is at least 51 percent owned by a person or persons with severe physical or mental disabilities which substantially limits one or more of the person's major life activities and which person or persons control and operate such business.

"Control" in this referenced context means exercising the power to make policy decisions. "Operate" means being actively involved in the day- to-day management of the business.

The District shall rely on written representations of concerns regarding their status as minority/women/disabled-owned businesses. Offeror agrees to submit information regarding the minority ownership of its subcontractors on request of District.

COMPLETE THE SECTION BELOW AND RETURN THIS FORM WITH BID. FAILURE TO DO SO MAY RENDER THE OFFEROR'S BID UNACCEPTABLE.

A. Representation. The offeror represents that it is (), is not () a minority-owned business concern.

B. Representation. The offeror represents that it is (), is not () a women-owned business concern.

C. Representation. The offeror represents that it is (), is not () a disabled-owned business concern.

Please Check Appropriate Box/Boxes

☐ African American (AFRAM)

☐ Caucasian (CAUC)

☐ Native American (NAAM)

☐ Hispanic American (HISP)

☐ Asian-Pacific (ASIAP)
American

☐ Asian-Indian (ASIAI)
American

☐ Other _____

☐ Woman Owned (W)

☐ Disabled Owned (D)

Please identify

The offeror has ☐/ has not ☐ used the following procedures in searching for and obtaining suppliers and subcontractors:

- Place qualified Minority-Owned Businesses on solicitation lists
- Ensure that Minority-Owned Businesses are solicited whenever they are potential sources
- Consider contracting with consortia of Minority-Owned Businesses when an intended contract is too large for any one such firm to handle on its own or, if economically feasible, divide larger requirements into smaller transactions for which such organizations might compete
- Make information on contracting opportunities available and establish delivery schedules that encourage participation by Minority-Owned Businesses
- Use the services and assistance of the SBA and Department of Commerce Minority Business Development Agency, as appropriate.

Company Name _____ Address _____

City _____ State _____ Zip _____

Phone # _____ Fax # _____ FEIN # _____

Signature of Company Official _____ Title _____

Date _____

ILLINOIS STATE BOARD OF EDUCATION

100 North First Street
Springfield, IL 62777-0001

**CERTIFICATION REGARDING DEBARMENT, SUSPENSION, INELIGIBILITY, AND VOLUNTARY
EXCLUSION LOWER TIER COVERED TRANSACTIONS**

This certification is required by the regulations implementing Executive Orders 12549 and 12689, Debarment and Suspension, 2 CFR 417 Subpart C Responsibilities of Participants Regarding Transactions. The regulations were published in the May 25, 2010 Federal Register (pages 29183-29189). Copies of the regulations may be obtained by contacting the Illinois State Board of Education.

BEFORE COMPLETING CERTIFICATION, READ INSTRUCTIONS BELOW.

CERTIFICATION

The prospective lower tier participant certifies, by submission of this Certification, that:

- (1) Neither it nor its principals are presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency;
- (2) It will provide immediate written notice to whom this Certification is submitted if at any time the prospective lower tier participant learns its certification was erroneous when submitted or has become erroneous by reason of changed circumstances;
- (3) It shall not knowingly enter any lower tier covered transaction with a person who is debarred, suspended, declared ineligible, or voluntarily excluded from participation in this covered transaction, unless authorized by the department or agency with which this transaction originated;
- (4) It will include the clause titled Certification Regarding Debarment, Suspension, Ineligibility, and Voluntary Exclusion—Lower Tier Covered Transactions, without modification, in all lower tier covered transactions and in all solicitations for lower tier covered transactions;
- (5) The certifications herein are a material representation of fact upon which reliance was placed when this transaction was entered into; and
- (6) Where the prospective lower tier participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this Certification.

Organization Name

PR/Award Number or Project Name

Name of Authorized Representative

Title

Original Signature of Authorized Representative

Date

Instructions for Certification

1. By signing and submitting this Certification, the prospective lower tier participant is providing the certifications set out herein.
2. If it is later determined that the prospective lower tier participant knowingly rendered an erroneous certification, in addition to other remedies available to the Federal government, the department or agency with which this transaction originated may pursue all available remedies, including suspension and/or debarment.
3. Except for transactions authorized under paragraph 3 above, if a participant in a covered transaction knowingly enters into a lower tier covered transaction with a person who is suspended, debarred, ineligible, or voluntarily excluded from participation in this transaction, in addition to other remedies available to the Federal government, the department or agency with which this transaction originated may pursue all available remedies, including suspension and/or debarment.
4. The terms covered transaction, debarred, suspended, ineligible, lower tier covered transaction, participant, person, primary covered transaction, principal, proposal, and voluntarily excluded, as used herein, have the meanings set out in the Definitions and Coverage sections of the rules implementing Executive Order 12549 and Executive Order 12689. You may contact the person to which this Certification is submitted for assistance in obtaining a copy of those regulations.
5. A participant in a covered transaction may rely upon a certification of a prospective participant in a lower tier covered transaction that it is not debarred, suspended, ineligible, or voluntarily excluded from the covered transaction, unless it knows the certification is erroneous. A participant may decide the method and frequency by which it determines the eligibility of its principals. Each participant may, but is not required to, check the "GSA Excluded Parties List System" at <http://epls.arnet.gov/>.
6. Nothing contained in the foregoing shall be construed to require establishment of a system of records in order to render in good faith the certification required herein. The knowledge and information of a participant is not required to exceed that which is normally possessed by a prudent person in the ordinary course of business dealings.

ILLINOIS STATE BOARD OF EDUCATION
100 North First Street
Springfield, IL 62777-0001

CERTIFICATE REGARDING LOBBYING

The undersigned certifies, to the best of his or her knowledge and belief, that:

- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of an agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit ISBE 85-37, "Disclosure of Lobbying Activities," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by Section 1352, Title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000 and not more than \$100,000 for each such failure.

Organization Name

PR/Award Number or Project Name

Name of Authorized Representative

Title

Original Signature of Authorized Representative

Date

OFAC Compliance

BID No.: _____

The undersigned hereby certifies and represents that products and/or services provided under any contract with the Rockford Public Schools resulting from this bid shall be in compliance with economic or trade sanctions or restrictions implemented by the United States government such as those administered by the Office of Foreign Assets Control (“OFAC”) of the U.S. Department of the Treasury and shall not utilize or engage, for performance of any activities related to the products and/or services, any persons or entities that, (i) appear on OFAC's Specially Designated Nationals and Blocked Persons List (“SDN List”), as that list may be updated from time to time or any other similar list maintained by OFAC; (ii) are owned or controlled by any person or entities appearing on OFAC's SDN List, as that list may be updated from time to time or any other similar list maintained by OFAC; or (iii) are located in any country subject to U.S. economic or trade sanctions, such as those administered by OFAC.

Organization Name

Name of Authorized Representative

Title

Original Signature of Authorized Representative

Date

ROCKFORD PUBLIC SCHOOLS

VENDOR CONFLICT OF INTEREST DISCLOSURE FORM

DISCLOSURE STATEMENT:

All businesses ("Vendors" or "Vendor" or "Vendor's") that wish to conduct business with the Rockford Public Schools "RPS" must complete this form. Please note that all contracts with RPS are subject to RPS Code of Ethics which prohibits RPS employees and Board of Education members from having certain relationships with persons or entities conducting (or proposing to conduct) business with RPS and which limits the acceptance of gifts from Vendors. The entire Board Member Conflict of Interest Board Policy 2.100 and Board Policy 5.120 may be viewed at <http://www2.rps205.com/District/BOE/Pages/GP-200.aspx>. The Code and its definitions are incorporated by reference into this Disclosure Form. If a Vendor has a disclosable relationship, the Vendor should assume the relationship may pose a conflict of interest until notified to the contrary in writing by a RPS administrative staff member authorized to confirm that a determination has been made that a conflict does not exist. A principle of the Code of Ethics is to ensure that relationships do not influence any official decision or judgment of RPS employees or Board of Education members. Accordingly, disclosure also should be made for any person connected with Vendor (e.g., officer, director, partner, shareholder, employee,) that is likely to: (i) materially contribute to Vendor's preparation, drafting, or presentation of a proposal or bid for services and/or supplies, (ii) materially contribute to Vendor's negotiation of a contract with RPS, or (iii) perform material services under a contract with RPS. Below, these persons are referred to as "Disclosable Persons."

CERTIFICATION:

I hereby certify that, except as disclosed below, to Vendor's knowledge, there is no conflict of interest involving the Vendor named below that would violate the RPS Code of Ethics, including that: (a) after inquiry, neither Vendor nor any Disclosable Person is involved or engaged in any private business venture or enterprise, directly or indirectly, with any RPS employee or Board of Education member or his or her family member; (b) no RPS employee or Board member or his or her family member owns or has a material personal financial interest (directly or indirectly) in Vendor or is engaged in a material personal business transaction with Vendor; and (c) no RPS employee or board of Education member or his or her family is employed by Vendor.

I further certify that neither the Vendor nor anyone acting on its behalf has requested that any RPS employee or RPS Board of Education member exert any influence to secure the award of this bid to the Vendor. Furthermore, no RPS Board of Education member, employee or agent has offered to influence to secure the award of this bid to the Vendor

VENDOR INFORMATION:

Vendor Name: _____

Vendor Address: _____

Vendor Phone Number _____

Vendor Email: _____

Vendor FEIN: _____

ROCKFORD PUBLIC SCHOOLS

VENDOR CONFLICT OF INTEREST DISCLOSURE FORM

DISCLOSURE STATEMENT:

I BELIEVE THE VENDOR NAMED ABOVE DOES have a potential conflict(s) of interest with a current RPS employee(s), or RPS Board of Education member(s).

☐ YES, the above statement is true.

☐ NO, the above statement is **NOT** true.

If you checked “**YES**” above, please provide the following information:

List all the Name(s) of RPS employee(s), RPS Board of Education member(s), or RPS employees’ or RPS Board of Education’s family member(s) with whom there may be a conflict of interest:

1. _____

2. _____

3. _____

Provide a brief description of the nature of the potential conflict(s) of interest:

SIGNATURE:

By my signature below, I certify that I am the Authorized Representative of the VENDOR named above and that all of the information provided above by signor is true and complete to the best of the signor’s knowledge:

Print the Name of the Vendor’s Authorized Representative

Print the Position Title of the Vendor’s
Authorized Representative

Print the Name of the Vendor’s Authorized Representative

Date

CERTIFIED CLEARED EMPLOYEE LIST

The undersigned _____, a vendor, supplier, professional services firm or contractor, hereby certifies under oath as follows:

1- a criminal history records check, a Statewide Sex Offender Database check and a Statewide Child Murderer and Violent Offender Against Youth Database check has been conducted for all employees as indicated by a check mark in the appropriate box in accordance with 105 ILCS 5/10-21.9 (the Act); and

2- that such employees have not been convicted of any of the enumerated criminal or drug offenses listed in the Act and their name does not appear on the noted Databases; and

3-the undersigned is an owner (if sole proprietor) or officer, member or partner of the undersigned authorized to execute this document binding the undersigned.

No.	Last Name	M.I.	First Name	SS # (last four)	Crim. Hst.	Databases

By:_____

This certificate Subscribed and Sworn to before me this ____ day of _____, 20____.

Notary Public

Commission Expires :_____

Vendor Cert. Employee List No.____

ROCKFORD PUBLIC SCHOOLS

ASBESTOS NOTIFICATION

DATE: _____

I, _____, (Person/Company) understand that

_____ School Building contains asbestos-containing building material and have been informed of the types and locations of this material by the Building Engineer. Furthermore, I will not disturb these materials without written permission from one of the following Building Services Department Officials.

Todd Schmidt, Chief Operating Officer

Rockford Public Schools Project Manager, Operations and Facilities

Signature

cc: Building Engineer

Contractor

ROCKFORD BOARD OF EDUCATION
SCHOOL DISTRICT #205
501 7TH Street
Rockford, Illinois 61104
Phone: Area Code 815-966-3098
Fax: Area Code 815-966-3088

W - 9

SUBSTITUTE IRS FORM W-9 – IMPORTANT TAX INFORMATION

IRS regulations require our School District to have on file appropriate taxpayer identification data concerning you or your firm. This information consists of either a Federal Employer Identification Number (F.E.I.N.) or Social Security Number (S.S.N.) and will have their payments reported to the IRS on form #1099–Misc.

Below is the legal name and address for you or your firm as shown on our official records. Please make any necessary corrections. Space is also provided to enter the appropriate tax identification number and to indicate (by checking a box) the correct legal status. Failure to complete and return this form could result in a \$50,000 IRS penalty. In addition, we would be required to withhold 20% of payments due and remit this amount to the IRS until we receive the correct tax data.

For your convenience we request you fax this form back to sender (or to Purchasing at 815-966-3088). Please do this today so we can both fulfill our reporting obligations and ensure prompt payments.

Reminder: If LEGAL STATUS is “Sole Proprietorship”, the Taxpayer Identification Number must be either the Social Security Number of the owner or assigned FEIN.

LEGAL STATUS: (Check One)

☐ Corporation

☐ Limited

☐ Partner(ship) _____ (one owner)

☐ Religious, Charitable, Educational or
Governmental Agency (**circle one**)

☐ Sole Proprietorship (legal owner's name):

☐ Individual

☐ Other – Please identify: _____

TAXPAYER (federal) ID# -- FEIN or Soc Sec

(use the line corresponding to your legal status line)

FEIN: _____ - _____

FEIN: _____ - _____

FEIN: _____ - _____

FEIN: _____ - _____

FEIN: _____ - _____ or
SSN: _____ - _____

Owner's Social Security Number

SSN: _____ - _____

FEIN: _____ - _____

UNDER PENALTIES OF PERJURY, I CERTIFY THE INFORMATION PROVIDED ON THIS FORM IS TRUE, CORRECT, AND COMPLETE.

Signature: _____ Title: _____ Date: _____

Phone: (_____) _____ Fax: (_____) _____

Website & Email address: _____

If minority/women owned business, list here: _____

Vendor: Enter Name and Address Below

Vendor #: _____

School: _____

CONFIRMATION OF CALLED INSPECTION RECORDS

☐ 2009 International Building Code Called Inspection Records

	Called Inspection Type	Approval to Proceed Date	A/E or Qualified Inspector Signature	ISBE ID Number or A/E License Number
1.	Footing			
2.	Foundation			
3.	Concrete Slab / Under-floor			
4.	Lowest Floor Elevation			
5.	Framing			
6.	Lathe and Gypsum Board			
7.	Fire Resistant Penetrations			
8.	Energy Efficiency			
9.	Special Inspection			
10.	Final IBC			

☐ 2009 International Electrical Code (Appendix K) Called Inspection Records

	Called Inspection Type	Approval to Proceed Date	A/E or Qualified Inspector Signature	ISBE ID Number or A/E License Number
1.	Prefabricated Assembly Evaluation Report			
2.	Underground			
3.	Rough-in			
4.	Final IEC			

☐ 2009 International Energy Conservation Code Called Inspection Records

	Called Inspection Type	Approval to Proceed Date	A/E or Qualified Inspector Signature	ISBE ID Number or A/E License Number
1.	Foundation (thermal envelope)			
2.	Framing (thermal envelope)			
3.	Insulation (thermal envelope)			
4.	Rough-in "Okay to Cover" (mechanical, service water heating, electrical, lighting)			
5.	Final (mechanical, service water heating, electrical, lighting)			
6.	Final IECC			

☐ 2009 International Fire Code Called Inspection Records

	Called Inspection Type	Approval to Proceed Date	A/E or Qualified Inspector Signature	ISBE ID Number or A/E License Number
1.	Final IFC			

☐ 2009 International Mechanical and Fuel Gas Code Called Inspection Records

	Called Inspection Type	Approval to Proceed Date	A/E or Qualified Inspector Signature	ISBE ID Number or A/E License Number
1.	Prefabricated Assembly Evaluation Report			
2.	Underground Piping			
3.	Rough-in			
4.	Final IMC & IFGC			

AIA® Document A305™ – 1986

Contractor's Qualification Statement

The Undersigned certifies under oath that the information provided herein is true and sufficiently complete so as not to be misleading.

SUBMITTED TO:

ADDRESS:

SUBMITTED BY:

NAME:

ADDRESS:

PRINCIPAL OFFICE:

- ☐ Corporation
- ☐ Partnership
- ☐ Individual
- ☐ Joint Venture
- ☐ Other

NAME OF PROJECT: *(if applicable)* Sample

TYPE OF WORK: *(file separate form for each Classification of Work)*

- ☐ General Construction
- ☐ HVAC
- ☐ Electrical
- ☐ Plumbing
- ☐ Other: *(Specify)*

§ 1 ORGANIZATION

§ 1.1 How many years has your organization been in business as a Contractor?

§ 1.2 How many years has your organization been in business under its present business name?

§ 1.2.1 Under what other or former names has your organization operated?

§ 1.3 If your organization is a corporation, answer the following:

§ 1.3.1 Date of incorporation:

§ 1.3.2 State of incorporation:

§ 1.3.3 President's name:

ADDITIONS AND DELETIONS:

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

This form is approved and recommended by the American Institute of Architects (AIA) and The Associated General Contractors of America (AGC) for use in evaluating the qualifications of contractors. No endorsement of the submitting party or verification of the information is made by AIA or AGC.

§ 1.3.4 Vice-president's name(s)

§ 1.3.5 Secretary's name:

§ 1.3.6 Treasurer's name:

§ 1.4 If your organization is a partnership, answer the following:

§ 1.4.1 Date of organization:

§ 1.4.2 Type of partnership (if applicable):

§ 1.4.3 Name(s) of general partner(s)

§ 1.5 If your organization is individually owned, answer the following:

§ 1.5.1 Date of organization:

§ 1.5.2 Name of owner:

§ 1.6 If the form of your organization is other than those listed above, describe it and name the principals:

§ 2 LICENSING

§ 2.1 List jurisdictions and trade categories in which your organization is legally qualified to do business, and indicate registration or license numbers, if applicable.

§ 2.2 List jurisdictions in which your organization's partnership or trade name is filed.

§ 3 EXPERIENCE

§ 3.1 List the categories of work that your organization normally performs with its own forces.

§ 3.2 Claims and Suits. (If the answer to any of the questions below is yes, please attach details.)

§ 3.2.1 Has your organization ever failed to complete any work awarded to it?

§ 3.2.2 Are there any judgments, claims, arbitration proceedings or suits pending or outstanding against your organization or its officers?

§ 3.2.3 Has your organization filed any law suits or requested arbitration with regard to construction contracts within the last five years?

§ 3.3 Within the last five years, has any officer or principal of your organization ever been an officer or principal of another organization when it failed to complete a construction contract? (If the answer is yes, please attach details.)

§ 3.4 On a separate sheet, list major construction projects your organization has in progress, giving the name of project, owner, architect, contract amount, percent complete and scheduled completion date.

§ 3.4.1 State total worth of work in progress and under contract:

§ 3.5 On a separate sheet, list the major projects your organization has completed in the past five years, giving the name of project, owner, architect, contract amount, date of completion and percentage of the cost of the work performed with your own forces.

§ 3.5.1 State average annual amount of construction work performed during the past five years:

§ 3.6 On a separate sheet, list the construction experience and present commitments of the key individuals of your organization.

§ 4 REFERENCES

§ 4.1 Trade References:

§ 4.2 Bank References:

§ 4.3 Surety:

§ 4.3.1 Name of bonding company:

§ 4.3.2 Name and address of agent:

§ 5 FINANCING

§ 5.1 Financial Statement.

§ 5.1.1 Attach a financial statement, preferably audited, including your organization's latest balance sheet and income statement showing the following items:

Current Assets (e.g., cash, joint venture accounts, accounts receivable, notes receivable, accrued income, deposits, materials inventory and prepaid expenses);

Net Fixed Assets;

Other Assets;

Current Liabilities (e.g., accounts payable, notes payable, accrued expenses, provision for income taxes, advances, accrued salaries and accrued payroll taxes);

Other Liabilities (e.g., capital, capital stock, authorized and outstanding shares par values, earned surplus and retained earnings).

§ 5.1.2 Name and address of firm preparing attached financial statement, and date thereof:

§ 5.1.3 Is the attached financial statement for the identical organization named on page one?

§ 5.1.4 If not, explain the relationship and financial responsibility of the organization whose financial statement is provided (e.g., parent-subsidiary).

§ 5.2 Will the organization whose financial statement is attached act as guarantor of the contract for construction?

§ 6 SIGNATURE

§ 6.1 Dated at this day of

Name of Organization:

By:

Title:

§ 6.2

M being duly sworn deposes and says that the information provided herein is true and sufficiently complete so as not to be misleading.

Subscribed and sworn before me this day of

Notary Public:

My Commission Expires:

AIA® Document A101™ – 2007

Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum

AGREEMENT made as of the ____ day of _____ in the year 20__.

BETWEEN the Owner:

Board of Education of Rockford School District No.205
Winnebago and Boone Counties, Illinois
501 7th Street
Rockford, Illinois 61104

and the Contractor:
(Paragraphs deleted)

for the following Project:

Bid No.

The Architect:

Program Manager:

The Owner and Contractor agree as follows.

Owner is an Illinois public school district. This Contract is the result of the award of a publicly bid contract pursuant to the provisions of the Illinois School Code pertaining to public contracts, particularly the provisions of 105 ILCS 5/10-20.21. The invitation to bid No. _____, all amendments thereof and Contractor's bid all form a part of this Contract. The terms of Illinois statutes applicable hereto shall govern all terms and conditions of this contract as though fully set forth herein.

Init.

TABLE OF ARTICLES

1	THE CONTRACT DOCUMENTS
2	THE WORK OF THIS CONTRACT
3	DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
4	CONTRACT SUM
5	PAYMENTS
6	DISPUTE RESOLUTION
7	TERMINATION OR SUSPENSION
8	MISCELLANEOUS PROVISIONS
9	ENUMERATION OF CONTRACT DOCUMENTS
10	INSURANCE AND BONDS

ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions) AIA Document A201-2007, as revised by Owner, Drawings, Specifications, Addenda issued prior to execution of this Agreement with Bid No. _____, other documents listed in this Agreement and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1

The Work is comprised of multiple dates of commencement of the Work. The construction start date, substantial completion date and final completion date are as follows:

Construction start date:

Substantial completion date:

Final Completion date: _____

§ 3.2 The Contract Time shall be measured from the date of commencement.

ARTICLE 4 CONTRACT SUM

§ 4.1 The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum consistent with the award of a public bid # _____ awarded by Owner to Contractor shall be the total contract sum of

(_____) subject to additions and deductions as provided in the Contract Documents.

Init.

§ 4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

§ 4.3 Unit prices, if

any, including all associated costs including, but not limited to, excavation, backfilling offsite transportation/site fee, labor, overhead, insurance and bond;

§ 4.4 Allowances included in the Contract Sum, if any:

ARTICLE 5 PAYMENTS

§ 5.1 PAYMENTS

§ 5.1.1 Based upon Applications for Payment submitted to and approved by the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make payments on account of the Contract Sum to the Contractor pursuant to its policies and procedures more fully explained in the Addendum attached hereto and made a part hereof marked Exhibit A, and as provided elsewhere in the Contract Documents.

§ 5.1.2 Contractor shall submit to the Architect not more than one Application for Payment per month. The payment may cover a time period up to and including the date of submission of the draft Application for Payment. Contractor shall submit a draft Application for Payment on or before the date established by Program Manager. A supplemental Application for Payment may be required at the end of Owner's School Year (June 30).

§ 5.1.3 Payments to Contractor shall be pursuant to the policies and procedures of Owner as set forth in Addendum Exhibit A attached.

§ 5.1.4 Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

§ 5.1.5 Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

§ 5.1.6 Subject to other provisions of the Contract Documents, the amount of each payment shall be the amount of Architect approved certificate for payment computed as follows:

- .1 Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of TEN percent (10.00%). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™-2007, General Conditions of the Contract for Construction as revised by Owner;
- .2 Subtract the aggregate of previous payments made by the Owner.

§ 5.1.7 The payment amount determined in accordance with Section 5.1.6 shall be further modified under the following circumstances:

- .1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled

claims

§ 5.1.8 Reduction or limitation of retainage, if any, shall be as follows:

NONE

Init.

§ 5.2 FINAL PAYMENT

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

- .1 the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 12.2.2 of AIA Document A201-2007, as revised by Owner, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

In accordance with Owners policies and procedures for payment as described in the Addendum Exhibit A attached hereto.

ARTICLE 6 DISPUTE RESOLUTION

§ 6.1 INITIAL DECISION MAKER

The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document

A201-2007 as revised by Owner.

§ 6.2 BINDING DISPUTE RESOLUTION

For any Claim subject to, but not resolved by, mediation pursuant to Section 15.3 of AIA Document A201-2007, as revised by Owner, the method of binding dispute resolution shall be as follows:

Owner and Contractor may but shall not be required to submit claims to arbitration or mediation. If Owner and Contractor each independently agree to mediation or arbitration of claims, such mediation and arbitration shall proceed according to the provisions of AIA Document A201-2007 as revised by Owner. Mediation or arbitration may be requested by either party in writing. If the responding party declines to mediate or arbitrate or fails to respond to the request within 7 days of receipt of a request the sole remedy and method of dispute resolution for such claim shall be litigation in a court of competent

jurisdiction. **Jurisdiction for purposes of this Agreement and all parties hereto shall be the laws of the State of Illinois and venue shall lie in the 17th Judicial Circuit Court, Winnebago County, Illinois.**

ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201-2007 as revised by Owner.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201-2007 as revised by Owner.

ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201-2007 or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents; however, in the case of AIA Document A201-2007, it shall refer to AIA Document A201-2007 as revised by Owner and attached as Exhibit B.

§ 8.2 The Owner's representative:

Todd Schmidt
Chief of Operations
Rockford Public Schools
501 Seventh Street
Rockford, Illinois 61104

§ 8.3 The

Contractor's representative:

Init.

§ 8.4

Neither the Owner's nor the Contractor's representative shall be changed without ten days written notice to the other party.

§ 8.5 Other provisions:

If Owner has contracted with a Program Manager for this project, in all cases in which notices are required or permitted to be given by Contractor, a copy of each such notice shall be simultaneously given to Program Manager.

Program Manager:

ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A101-2007, Standard Form of Agreement Between Owner and Contractor as revised by Owner.

§ 9.1.2 The General Conditions are AIA Document A201-2007 as revised by Owner and attached hereto marked Exhibit B, General Conditions of the Contract for Construction and Supplementary Conditions attached to Bid 14-52.

§ 9.1.3 The Supplementary and other Conditions of the Contract:

As contained in the Invitation to Bid # _____ and as attached hereto marked Exhibit C.

§ 9.1.4 The Specifications:

As set forth in invitation to bid # _____ and addenda thereto attached hereto as Exhibit C and D.

§ 9.1.5 The Drawings:

As set forth in invitation to bid # _____ and addenda thereto attached hereto as Exhibit C and D.

§ 9.1.6 The Addenda, if any:

As set forth and referenced in the document attached hereto marked Exhibit D.

§ 9.1.7 Documents forming the Contract Documents:

1. The Addendum attached hereto marked Exhibit A
2. General Conditions attached hereto marked as Exhibit B.
3. Bid No. _____ issued by Owner attached as Exhibit C (compact disk).

Init.

4. Addenda to Bid as referenced and attached as Exhibit D (compact disk).
5. Contractor's bid dated attached hereto as Exhibit E.

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201-2007, as revised by Owner and attached hereto and including the Supplementary Conditions issued by Owner.

This Agreement entered into as of the day and year first written above.

OWNER:

CONTRACTOR:

***BOARD OF EDUCATION OF ROCKFORD
SCHOOL DISTRICT NO. 205, WINNEBAGO
AND BOONE COUNTIES, ILLINOIS***

BY: _____
ITS PRESIDENT

BY: _____
ITS PRESIDENT

ATTEST: _____
ITS SECRETARY

ATTEST: _____
ITS SECRETARY



CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
	PHONE (A/C, No, Ext):	FAX (A/C, No):
	E-MAIL ADDRESS:	
	INSURER(S) AFFORDING COVERAGE	NAIC #
INSURED	INSURER A:	
	INSURER B:	
	INSURER C:	
	INSURER D:	
	INSURER E:	
	INSURER F:	

COVERAGES

CERTIFICATE NUMBER:

REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL SUBR INSR: WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
	GENERAL LIABILITY					EACH OCCURRENCE \$
	<input type="checkbox"/> COMMERCIAL GENERAL LIABILITY					DAMAGE TO RENTED PREMISES (Ea occurrence) \$
	<input type="checkbox"/> CLAIMS-MADE <input type="checkbox"/> OCCUR					MED EXP (Any one person) \$
						PERSONAL & ADV INJURY \$
						GENERAL AGGREGATE \$
	GEN'L AGGREGATE LIMIT APPLIES PER:					PRODUCTS - COMP/OP AGG \$
	<input type="checkbox"/> POLICY <input type="checkbox"/> PROJECT <input type="checkbox"/> LOC					\$
	AUTOMOBILE LIABILITY					COMBINED SINGLE LIMIT (Ea accident) \$
	<input type="checkbox"/> ANY AUTO					BODILY INJURY (Per person) \$
	<input type="checkbox"/> ALL OWNED AUTOS	<input type="checkbox"/> SCHEDULED AUTOS				BODILY INJURY (Per accident) \$
	<input type="checkbox"/> HIRED AUTOS	<input type="checkbox"/> NON-OWNED AUTOS				PROPERTY DAMAGE (Per accident) \$
						\$
	UMBRELLA LIAB	<input type="checkbox"/> OCCUR				EACH OCCURRENCE \$
	EXCESS LIAB	<input type="checkbox"/> CLAIMS-MADE				AGGREGATE \$
	DED <input type="checkbox"/> RETENTION \$					\$
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY					WC STATUTORY LIMITS <input type="checkbox"/> OTHER <input type="checkbox"/>
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICE/MEMBER EXCLUDED? <input type="checkbox"/> Y <input type="checkbox"/> N <input type="checkbox"/> N/A					E.L. EACH ACCIDENT \$
	(Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below					E.L. DISEASE - EA EMPLOYEE \$
						E.L. DISEASE - POLICY LIMIT \$

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

CERTIFICATE HOLDER

CANCELLATION

Rockford Public School District 205
Attn: Jim Heathscott
501 Seventh Street
Rockford, IL 61104

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

SECTION 00 4115 - REFERENCES

- 1.1 The undersigned Contractor has actively engaged in work of the nature of the project described, and have adequate specialized men and machines to do the work. The following list of construction projects that have been completed within the last five years and relate to the type of work specified.

1 Name of Project:

Amount (\$) of Contract:

Date Completed:

Owner:

Address:

Contact Person:

Telephone Number:

Architect:

Contact Person:

Telephone Number:

2 Name of Project:

Amount (\$) of Contract:

Date Completed:

Owner:

Address:

Contact Person:

Telephone Number:

Architect:

Contact Person:

Telephone Number:

3 Name of Project:

Amount (\$) of Contract:

Date Completed:

Owner:

Address:

Contact Person:

Telephone Number:

Architect:

Contact Person:

Telephone Number:

4 Name of Project:

Amount (\$) of Contract:

Date Completed:

Owner:

Address:

Contact Person:

Telephone Number:

Architect:

Contact Person:

Telephone Number:

BIDDER SIGNATURE: _____

Respectfully submitted this day of 2016.

END OF SECTION 008115

DOCUMENT 006000 - FORMS

1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

- A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:
 - 1. AIA Document A1012007, "Standard Form of Agreement between Owner and Contractor, Stipulated Sum."
 - a. The General Conditions for Project are AIA Document A201-2007, "General Conditions of the Contract for Construction."
 - 2. The General Conditions are included in the Project Manual.
 - 3. The Supplementary Conditions for Project are incorporated into a modified copy of the General Conditions included in the Project Manual.
 - 4. Owner's document(s) bound following this Document.

1.2 ADMINISTRATIVE FORMS

- A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.
- B. Copies of AIA standard forms may be obtained from the American Institute of Architects; <http://www.aia.org/contractdocs/purchase/index.htm>; docspurchases@aia.org; (800) 942-7732.
- C. Preconstruction Forms:
 - 1. Form of Performance Bond and Labor and Material Bond: AIA Document A312, "Performance Bond and Payment Bond."
 - 2. Form of Certificate of Insurance: AIA Document G715, "Supplemental Attachment for ACORD Certificate of Insurance 25-S."
- D. Information and Modification Forms:
 - 1. Form attached or Form for Requests for Information (RFIs): AIA Document G716, "Request for Information (RFI)."
 - 2. Form of Request for Proposal: AIA Document G709, "Work Changes Proposal Request."
 - 3. Change Order Form: AIA Document G701, "Change Order."
 - 4. Form of Architect's Memorandum for Minor Changes in the Work: AIA Document G707, "Architect's Supplemental Instructions."
 - 5. Form of Change Directive: AIA Document G714, "Construction Change Directive."
- E. Payment Forms:
 - 1. Schedule of Values Form: AIA Document G703, "Continuation Sheet."
 - 2. Payment Application: AIA Document G702/703, "Application and Certificate for Payment and Continuation Sheet."
 - 3. Form of Contractor's Affidavit: AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 - 4. Form of Affidavit of Release of Liens: AIA Document G706A, "Contractor's Affidavit of Payment of Release of Liens."
 - 5. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."

END OF DOCUMENT 006000

PROJECT MANUAL

ROCKFORD PUBLIC SCHOOLS DISTRICT 205

**BROOKVIEW ELEMENTARY SCHOOL
NEW GYMNASIUM, KITCHEN & LIFT**

ROCKFORD, ILLINOIS

ISSUED FOR BID AND PERMIT 03-11-2016



ARCHITECT'S PROJECT #C1823

**HAGNEY ARCHITECTS, LLC
4615 E. STATE STREET, SUITE 206
ROCKFORD, ILLINOIS 61108
PH: 815/397-3330 FAX: 815/397-0243**

DOCUMENT 003126 - EXISTING HAZARDOUS MATERIAL INFORMATION

1.1 EXISTING HAZARDOUS MATERIAL INFORMATION

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. An existing asbestos report for the Project, prepared by PSI Engineering, Consulting and Testing, is available for viewing at the office of Owner.
- C. Related Requirements:
 - 1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
 - 2. Document 003132 "Geotechnical Data" for reports and soil-boring data from geotechnical investigations that are made available to bidders.
 - 3. Section 024119 "Selective Structure Demolition" for notification requirements if materials suspected of containing hazardous materials are encountered.

END OF DOCUMENT 003126

DOCUMENT 003132 - GEOTECHNICAL DATA

1.1 GEOTECHNICAL DATA

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. Soil-boring data for Project, obtained by TSI-Testing Service Corporation, dated September 24, 2015, is appended to this Document.
- C. A geotechnical investigation report for Project, prepared by TSI-Testing Service Corporation, dated September 24, 2015, is appended to this Document.
- D. A Phase 1 investigation report for Project, prepared by Midwest Environmental Consulting Services, dated March 27, 2013, is available for viewing as appended to this Document.
- E. Related Requirements:
 - 1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.
 - 2. Document 003126 "Existing Hazardous Material Information" for hazardous materials reports that are made available to bidders.

END OF DOCUMENT 003132



Rockford, Illinois

TESTING SERVICE CORPORATION

Local Office:

2235 23rd Avenue, Rockford, IL 61104-7334
815.394.2562 • Fax 815.394.2566

September 24, 2015

Hagney Architects, LLC
Attn: Mr. Frank St. Angel, AIA, NCARB, LEED-AP
4615 East State Street, Suite 206
Rockford, Illinois 61108

RE: L-83,805
Proposed Gymnasium Addition
Brookview Elementary School
1750 Madron Road
Rockford, Illinois

Dear Mr. St. Angel:

Enclosed please find three (3) copies of our Soils Exploration Report prepared for the referenced project. A copy of the report has also been forwarded to you via e-mail. The invoice covering these geotechnical services will be sent under separate cover.

It has been a pleasure to assist you with this work. Please call if there are any questions or if we may be of further service.

Respectfully submitted,

TESTING SERVICE CORPORATION

Jeffrey L. Martin, P.E.
Rockford Branch Manager

JLM/rb

Enc. 3 Reports



TESTING SERVICE CORPORATION

Corporate Office

360 S. Main Place, Carol Stream, IL 60188-2404
630.462.2600 • Fax 630.653.2988

Local Offices:

1701 W. Market Street, Suite B, Bloomington, IL 61701-2641
309.821.0430 • Fax 309.821.1242

457 E. Gundersen Drive, Carol Stream, IL 60188-2492
630.653.3920 • Fax 630.653.2726

650 N. Peace Road, Suite D, DeKalb, IL 60115-8401
815.748.2100 • Fax 815.748.2110

401 Riverside Drive, Suite 24, Gurnee, IL 60031-5906
847.249.6040 • Fax 847.249.6042

2235 23RD Avenue, Rockford, IL 61104-7334
815.394.2562 • Fax 815.394.2566

203 Earl Road, Suite A, Shorewood, IL 60404-9446
815.744.1510 • Fax 815.744.1728

Geotechnical & Environmental Engineering



Construction Materials Engineering & Testing



Laboratory Testing of Soils, Concrete & Asphalt



Geo-Environmental Drilling & Sampling

Report of Soils Exploration

Proposed Gymnasium Addition for Brookview Elementary School

1750 Madron Road

Rockford, Illinois

Hagney Architects, LLC

**4615 East State Street,
Suite 206**

Rockford, Illinois 61108

GEOTECHNICAL GROUP

ROCKFORD

September 24, 2015

L - 83,805

REPORT OF SOILS EXPLORATION
PROPOSED GYMNASIUM ADDITION
BROOKVIEW ELEMENTARY SCHOOL
1750 MADRON ROAD
ROCKFORD, ILLINOIS

PREPARED FOR:
HAGNEY ARCHITECTS, LLC
4615 EAST STATE STREET, SUITE 206
ROCKFORD, ILLINOIS 61108

PREPARED BY:
TESTING SERVICE CORPORATION
2235 23RD AVENUE
ROCKFORD, ILLINOIS 61104
(815) 394.2562

TABLE OF CONTENTS

Section	Page
I. TEXT	
1.0 Introduction	2
2.0 Site Description	3
3.0 Field Exploration and Laboratory Testing	3
4.0 Discussion of Test Data	4
5.0 Analysis and Recommendations	6
5.1 Overview	6
5.2 Building Foundations/Bearing Table	7
5.3 Mass-Grading/Floor Slabs on Grade	11
5.4 Groundwater Management/Excavations	13
6.0 Closure	14
II. APPENDIX	

September 24, 2015

L - 83,805

REPORT OF SOILS EXPLORATION
PROPOSED GYMNASIUM ADDITION
BROOKVIEW ELEMENTARY SCHOOL
1750 MADRON ROAD
ROCKFORD, ILLINOIS

1.0 INTRODUCTION

This report presents results of the Soils Exploration performed for a proposed Gymnasium Addition for Brookview Elementary School. These geotechnical services are provided in general accordance with Testing Service Corporation's (TSC) Proposal Number 55,204, dated July 15, 2015, and the attached General Conditions, incorporated herein by reference.

It is understood that the project will include the construction of a new Gymnasium Building Addition to Brookview Elementary School, located at 1750 Madron Road in Rockford, Illinois. It is further understood that the building addition will extend off the north side of the existing gym/cafeteria at the school and will be approximately 5,270 square feet in size. The addition will be of single story, slab-on-grade design. It will be of masonry brick/block construction with steel roof joists and decking.

No information regarding foundation or floor loads were provided to us. For purposes of this report, it is assumed that column loads will not exceed 60 kips, while wall loads will be on the order of 7 kips per lineal foot (klf) or less. No information regarding Finished Floor (FF) Elevation for the building was available to us at this time. It assumed that floor loads will not exceed 250 pounds per square foot (psf). Also for purposes of this report, it was assumed that FF for the Gymnasium Addition will match that of the existing school at assumed reference Elevation 100.0. If the proposed project does not match these assumptions

or information, then TSC should be contacted in the design phase so that we may have an opportunity to revise our recommendations.

The results of field and laboratory testing and recommendations based upon these data are included in this report. Specifically addressed are building foundations, mass-grading and floor slabs.

2.0 SITE DESCRIPTION

The site of the proposed building addition is currently part pavement/playground area and a grassy area. The addition will extend off the north side of the existing school building at its northwest corner. Generally, residential properties are located in the immediate vicinity surrounding the school site. Brookview Park is located north of and adjacent to the school property.

The project site generally slopes down slightly from south to north. Total relief at the boring locations is on the order of slightly more than 2 feet.

3.0 FIELD EXPLORATION AND LAB TESTING

A total of three (3) soil borings, numbered 1 through 3, were performed by TSC in the proposed addition area. The borings were drilled at or near to the locations selected by Hagney Architects, LLC, the Rockford Public Schools District #205 architects, as shown on the attached Boring Location Plan. The boring locations were staked in the field by representatives of TSC. A site plan, provided to us by Hagney Architects, LLC, was used and reproduced for purposes of preparing a Boring Location Plan. Reference is made to the Boring Location Plan in the Appendix for the drilling layout.

TSC estimated the ground surface elevation at each boring location by conventional differential leveling methods using the Finished Floor of the existing building as a benchmark. The benchmark was arbitrarily assigned an elevation of 100.0. The ground surface elevation for each boring is shown on the boring logs, as well as on the Boring Location Plan, in the Appendix of this report.

Borings 1-3 were each drilled to a depth of 20 feet below existing grade. Drilling and sampling procedures were in general accordance with currently recommended American Society for Testing and Materials specifications. Soil sampling was generally performed at 2½-foot depth intervals to a depth of 15 feet and at a 5-foot interval thereafter, in conjunction with the Standard Penetration Test, for which driving resistance to a 2" split-spoon sampler (N value in blows per foot) provides an indication of the relative density of granular materials and consistency of cohesive soils. Water level readings were taken during and following completion of drilling operations.

Soil samples were examined in the laboratory to verify field descriptions and to classify them in accordance with the Unified Soil Classification System. Laboratory testing included moisture content determinations for all cohesive and intermediate (silt or loamy) soil types. An estimate of unconfined compressive strength was obtained for all inorganic native clay soils using a calibrated pocket penetrometer, and direct methods were also used on some clay samples. Dry unit weight tests were performed on select samples of clay fill and native clay soils encountered in the borings.

Reference is made to the boring logs in the Appendix which indicate approximate subsurface stratigraphy and soil descriptions, results of field and laboratory tests, as well as water level observations. Definitions of descriptive terminology are also included. While strata changes are shown as a definite line on the boring logs, the actual transition between soil layers will probably be more gradual. It should be noted that in the absence of foreign substances it is often very difficult or nearly impossible to distinguish samples of disturbed native soils from fill materials.

4.0 DISCUSSION OF TEST DATA

The following is a generalized description of the soil conditions found in our borings. The reader should refer to the individual Boring Logs in the Appendix for more specific details.

Pavement materials were found at the surface of Boring 2. The pavement materials consisted of bituminous concrete overlying crushed stone. The thickness of the bituminous concrete pavement was approximately 5.0 inches, while the crushed stone base material was approximately 8 inches in thickness at B-2. These pavement thicknesses should be considered approximate as they were estimated from the

disturbed sides of the augered holes. Pavement cores should be taken if more exact measurements are required.

Possible manmade fill material was found at the surface of Borings 1 and 3, extending to depths of 2.2 feet and 3.0 feet, respectively. The fill was composed of very silty or silty clay with trace amounts or less of sand and organic materials. Unconfined compressive strengths of the possible clay fill were 4.5+ tons per square foot (tsf) at a moisture content of approximately 11 percent in B-1 and 2.5 tsf at a moisture content of 22 percent in B-3. Standard Penetration Test "N" values of the possible fill varied from 4 to 5 blows per foot (bpf). A layer of clayey topsoil was found buried below the surficial pavement materials in Boring 2. The buried topsoil was found in the depth interval of 1.1 to 2.0 feet below existing grade in B-2.

Generally, native inorganic silty, very silty or sandy clays and layers or seams of clayey or silty sands were found below the pavement, possible manmade fill and/or the buried topsoil in the borings, extending to the boring termination depth of 20.0 feet below existing grade in each boring. The silty clay soils, including any native clayey topsoil layer, are believed to be derived from a wind-blown deposit known as loess. The loess was deposited after the withdrawal of the last glacial ice in this area some 12,000 years ago. The silty clay soils were found extending to depths of 3.0 to 6.0 feet below existing grade in the borings. They exhibited unconfined compressive strengths of 0.75 to 3.25 tsf, characterizing them as stiff to very tough. Moisture contents of the silty clays varied between 19 and 26 percent.

Generally, glacial till soils were found underlying the aforementioned silty clay soils, below depths of 6.0 to 8.0 feet in the borings and extending to the boring termination depths. The glacial till is soil that was transported here and deposited directly by the ice. Glacial till is typically a heterogeneous mixture of different minerals and soil particles which vary widely in size. Within a given till unit the soil grains may range in size from clay to large boulders. Based on correlations of grain-size distribution and mineralogical composition, geologists have distinguished between and named the several different till deposits in northern Illinois. At this site, the Argyle Till Member of the Winnebago Formation was sampled. This till is reported in literature to have been deposited from 45,000 to 50,000 years before present.

The glacial till soils encountered in the borings were classified as sandy, silty or very silty clays with varying amounts of sand and gravel and silty sands with gravel. The very silty clay till was often interbedded with silty sand seams or layers. Layers of weathered, moist to very moist sandy or silty clay or clayey sand till

were found in Borings 1-3 overlying relatively unweathered very silty clay with silty sand till. The layers of sandy or silty clay and clayey sand till varied in thickness, but were generally found between depths of 3.0 and 10.0 feet in these borings. The sandy or silty clay soils noted above exhibited unconfined compressive strengths of 0.25 to 2.0 tsf, characterizing them as very soft to very tough, at moisture contents between 10 and 16 percent. The relative density of the clayey sands encountered in Borings 1 and 3 were found to be very loose to loose.

Very silty clay glacial till, with varying amounts of sand and gravel and silty sand seams, was found below depths 8.0 to 10.0 feet in the borings, extending to the boring termination depth of each. The consistency of the very silty clay till varied from very tough to hard, with unconfined compressive strengths of 3.0 to 4.5+ tsf. Moisture contents of the very silty clay till varied between 6 and 12 percent.

Groundwater was encountered in Boring 1 at a depth of 16.0 feet below existing grade during drilling operations and shortly after completion. Borings 2 and 3 were "dry" while drilling to the depths drilled. These two borings remained dry upon completion of drilling and removal of the augers from the boreholes.

5.0 ANALYSIS AND RECOMMENDATIONS

5.1 Overview

Surficial pavement materials overlying a layer of topsoil material were found in Boring 2, extending to a depth of 2.0 feet below existing grade. Possible manmade fill was encountered in Borings 1 and 3, extending from the existing ground surface to depths of 2.2 feet and 3.0 feet, respectively. Underlying the pavement materials, topsoil and/or fill, generally, layers of very soft to very tough sandy or silty clays and very loose to loose clayey sands were found overlying very tough to hard very silty clays with silty sands, extending to the boring termination depths.

Spread footing foundations are recommended for supporting the proposed building addition. The native, inorganic soils encountered in the borings are, generally, considered suitable or marginally suitable for support of spread footings proportioned to exert a maximum net allowable bearing pressure of 2000 pounds per square foot (psf). The pavement materials, topsoil and existing possible manmade fill

encountered in the borings are not recommended for support of footing foundations or thickened floor slab elements, though stable, inorganic fill may be considered for support of floor slabs as discussed later in this report. It is recommended that footing excavations extend through all existing manmade fill (and topsoil or possible fill) until the native, inorganic clays considered suitable for 2000 psf bearing are reached.

Some undercutting of manmade fill (assuming it is not completely removed during mass-grading operations) from below footing bearing grade and replacement with "structural" fill should be anticipated and planned for. Accordingly, some interior and exterior footings may be expected to bear on "structural" fill placed during foundation excavation work or new engineered fill placed during mass-grading. It is anticipated that footings for the addition may bear on varying thicknesses of new fill. Footings bearing on new engineered fill or select, properly placed/compacted backfill material may be proportioned for 2000 psf bearing.

5.2 Building Foundations/Bearing Table

It is recommended that all vegetation, pavement materials and topsoil (native or manmade fill) be removed from beneath foundations and any thickened floor slab elements, as well as floor slabs. It is recommended that this be accomplished during mass-grading operations. Also, all manmade fill should be completely removed from beneath foundations and thickened floor slab areas; this may be accomplished during foundation construction or mass-grading operations. Pavement materials, buried topsoil and/or possible manmade fill were encountered extending to depths of 2.0 to 3.0 feet below existing grade in the borings.

Native inorganic clays considered suitable, or marginally suitable, for support of 2000 psf bearing were found below the buried topsoil layer or possible fill in the borings and at or near expected exterior footing bearing grade in Borings 2 and 3. As noted above, some undercutting of fill from below footings and replacement with coarse aggregate "structural" fill should be anticipated. Footings constructed on competent native, inorganic soils, new "structural" fill placed in footing over-excavations or engineered fill placed as part of mass-grading may be proportioned to exert a maximum net allowable bearing pressure of 2000 psf.

Summarized in the following table is the shallowest depth, rounded to the nearest 0.5 foot, and corresponding elevation at which in-situ, native soils considered capable (or marginally capable) of



supporting a design bearing stress of 2000 psf for footings were encountered at each boring. The depths of pavement, topsoil materials and/or possible manmade fill and ground surface elevations at the borings are also shown. Soil support recommendations for conventional interior and exterior footings in slab-on-grade areas designed for 2000 psf bearing are also presented. It is assumed that FF for the building will match that of the existing school building and will be at reference Elevation 100.0. For purposes of this report, it has also been assumed that conventional interior and exterior footings will bear at depths of 2.0 feet and 4.0 feet below FF or at reference Elevations 98.0 and 96.0, respectively. Added notes relate to the presence of suitable clay soils (CL); the presence of low strength or loose soil deposits underlying the bearing depth shown in the table or near footing bearing grade (L); the presence of marginal soils for foundation support (M); and, new (engineered) fill or backfill ("structural" fill) suitable for 2000 psf bearing expected to be present at footing bearing grade following removal of existing fill and topsoil and placement of new engineered fill during mass-grading or "structural" fill during foundation construction (NF); these conditions are discussed in greater detail below.

BORING NUMBER	GROUND SURFACE ELEVATION	DEPTH OF PAVEMENT (P), TOPSOIL (T) AND/OR POSSIBLE MANMADE FILL (F), FEET	2000 PSF BEARING		FOUNDATION SUPPORT RECOMMENDATIONS*	
			Depth in Feet	Elevation	Interior Footings, Elev. 98.0	Exterior Footings, Elev. 96.0
1	96.4	2.2 (F)	2.5 M, L	93.9	NF, L	NF, L
2	98.1	2.0 (P, T)	2.0 CL	96.1	NF	CL
3	98.6	3.0 (F)	3.0 CL, L	95.6	NF, L	NF, CL, L

* - Foundation recommendations based upon interior footings bearing at an Elevation of approximately 98.0 and exterior footings bearing at an Elevation of approximately 96.0.

Legend

CL - Clay soils at bearing grade or anticipated footing grade considered suitable for 2000 psf bearing.



- L - Relatively low-strength or loose deposits present beneath bearing grade shown.
- M - Marginal soils for foundation support found at or slightly below bearing depth shown - undercut a minimum of 2.0 feet below bearing grade or down to competent bearing soil, whichever depth comes first, and replace with "structural" fill.
- NF - Footings may be supported on New (Engineered) Fill placed during mass-grading operations and compacted in lifts to at least 95 percent of Modified Proctor lab density - strip vegetation, pavement, topsoil materials and existing possible manmade fill during mass grading and evaluate exposed native soils prior to new fill placement; or, footings may be supported on new "structural" fill placed and compacted during building construction in lifts in footing foundation over-excavations following removal/undercutting of existing manmade fill as recommended below in this report.

Native, inorganic soils encountered below the surficial topsoil or manmade fill in the borings are considered suitable, or marginally suitable, for support of 2000 psf bearing. As can be seen in the above table, generally, these native soils were first encountered at depths of approximately 2.0 to 3.0 feet below existing grade, or at approximate reference elevations 93.9 to 96.1. Suitable clays with unconfined strengths in excess of 1.0 tsf are expected to be present at or slightly below exterior footing bearing grade at Borings 2 and 3.

Marginal soil ("M" in the table) for foundation support was found shortly below the surficial possible fill in Boring 1, as indicated in the table above. Marginal bearing soils, consisting of marginal-strength clays (Qu 0.5 to 1.0 tsf), where encountered at footing bearing grade, should be over-excavated to a minimum depth of 2.0 feet below the bottom of footing, or down to competent bearing soil whichever comes first, and backfilled with "structural" fill as noted below; marginal soils should be evaluated at the time of foundation construction.

It should be noted that low-strength soil was encountered in Borings 1 and 3 at deeper depths than the interior and/or exterior footing bearing grades shown in the table. Very soft sandy clay soil and very loose to loose clayey sands were encountered from 6.0 to 10.0 feet below existing grade in Boring 1 and loose clayey sand was found in the depth interval of 7.0 to 8.0 feet in B-3. Although these soil types would not normally be considered suitable for support of foundation elements, lateral distribution of footing loads in overlying native, competent soils/materials may reduce actual stresses on these layers to acceptable levels, depending on where the low strength or loose soils are found as compared to footing bearing grade.



However, the thickness of stiffer overlying native soils, "structural" fill and/or engineered fill materials should be verified at the time of construction. If these low-strength soils are encountered during foundation construction at or shallowly below footing bearing grade, some undercutting and backfilling may be expected. The extent of undercutting of loose or low-strength soils from below footing bearing grade(s) should be evaluated by during the foundation excavation process. Observation of the foundation supporting soils by TSC personnel is recommended during foundation construction.

If it is chosen to primarily leave existing stable, inorganic existing fill in place under the floor slab, it is recommended that all existing manmade fill be completely removed from below footings and backfilled with "structural" fill as recommended below. Manmade fill should also be removed from beneath any thickened floor slab elements of the building. Removal or undercutting of inorganic possible manmade fill to depths on the order of 2.4 to 3.8 feet below anticipated interior footing bearing grade and to depths on the order of 0.4 to 1.8 feet below anticipated exterior footing bearing grade is expected at Borings 1 and 3.

Care should be taken when over-excavating and compacting new fill/backfill within a zone of approximately 5 feet of the existing building footings, so as to not consolidate the soils beneath the existing structure and cause distress. The contractor will need to take care not to undermine and/or cause damage to the existing structure. Excavations extending below adjacent, existing footings will require underpinning. Underpinning design is the responsibility of the contractor.

Foundation undercuts should exceed footing dimensions horizontally by at least 6 inches beyond each footing side for each one foot in depth of over-dig, as measured at the base of the excavation. Replacement materials should consist of crushed stone or crushed gravel between ¼ to 3 inches in size and containing no fines; Illinois Department of Transportation (IDOT) gradations CA-1 and CA-7 meet these criteria. The "structural" fill should be spread in 12 inch layers, loose thickness, each lift to be densified using vibratory compaction equipment or by tamping with a backhoe bucket.

Lean concrete may also be used as replacement material in foundation undercuts and may be better suited for any over-excavations adjacent to existing foundations. If lean concrete is used as backfill in foundation undercuts, it is recommended that it extend at least 6 inches beyond each footing face. Footings constructed on properly placed and compacted crushed stone, crushed gravel, select granular backfill or lean concrete may be proportioned for a 2000 psf bearing value. It is further recommended that the



backfilling operations be observed and the materials tested by TSC personnel during placement and compaction to verify that it is suitable for foundation support.

Depending on final grades, it is anticipated that interior footing foundations and some exterior footings may bear on new engineered fill placed as part of mass-grading operations. Provided that the pavement, topsoil materials and vegetation, as well as any unsuitable/unstable manmade fill materials, are removed down to the 2000 psf bearing soils, and new fill is placed and compacted in accordance with the mass-grading recommendations presented below, spread footings may also be placed on new engineered fill placed as part of mass-grading operations. Footings bearing on engineered fill may be proportioned for 2000 psf bearing. As noted in the table above, it is anticipated that new engineered fill will be present at interior footing bearing grade at Borings 1-3 and at exterior footing bearing grade at Borings 1 and 3.

In order to preclude disproportionately small footing sizes, it is recommended that all continuous wall footings be made at least 24 inches wide and isolated foundations at least 3.0 feet square, regardless of calculated dimensions. For frost considerations, all exterior footings in slab-on-grade areas should be constructed at least 3.5 feet below outside finished grade and 4.0 feet for foundations located outside of heated building limits. Interior footings may be constructed at higher elevations as long as they are protected against frost heave in the event of winter construction.

It is our professional judgement that if the recommendations contained herein are followed, maximum foundation settlements will be on the order of one inch. Differential foundation settlements are not expected to exceed ½ inch. It is recommended that foundation walls be reinforced so that any relatively minor differential settlements can be better tolerated. A 2006 or 2009 International Building Code (IBC) site seismic classification of "D" is recommended.

5.3 Mass-Grading/Floor Slabs on Grade

It is recommended that building addition and any new pavement areas be cleared of vegetation prior to mass-grading. It is recommended that stripping operations also include the removal of existing pavements, topsoil and/or any surficial manmade fill containing appreciable amounts of topsoil/organics, as well as any other deleterious materials. Topsoil material was found below surficial pavement materials in B-2, extending to a depth of 2.0 feet below existing grade. Generally, inorganic, possible manmade fill was



encountered at the surface of Borings 1 and 3, extending to depths of 2.2 feet and 3.0 feet, respectively. It is recommended that removal of a minimum of 4 inches of vegetation and root-zone material be assumed in the areas represented by Boring 1 and 3, assuming that stable, inorganic fill is encountered and that the fill does not need to be removed during mass-grading operations.

Assuming that no highly settlement-sensitive floor slab uses or heavy floor loads are planned and if some increased risk of settlement and distress can be tolerated, the existing fill could be left primarily in-place below the floor slab in the building area. As previously noted in this report, it is recommended that the fill be completely removed from beneath any thickened floor slab elements and replaced with new engineered fill. Also, as noted above, at a minimum, it is recommended that stripping operations include the removal of existing pavement materials, vegetation and any exposed significantly organic fill. The exposed subgrade should then be proof-rolled and evaluated as noted in the following paragraph. Floor slabs supported on existing fill may be designed for a reduced subgrade modulus of 100 pci. If it is decided to completely remove the existing fill from the building area during mass-grading then it is recommended that the fill be removed down to the 2000 psf bearing soils noted in the table in the previous section of this report, such that the zone of undercut extends a minimum of 5 feet outside the outer edges of the structure plus 0.5 feet for every one foot of new fill to be placed. Floor slabs constructed on new engineered fill or the native clay subgrade soils, assuming that the mass-grading recommendations contained in this report are followed, may be designed for a subgrade modulus of 150 pci.

Prior to placement of any new fill or base course/subbase materials, the building and any pavement areas should be proof-rolled in order to detect the presence of unsuitable or highly unstable soil types. The proof-roll should be performed using a loaded dump truck or other approved piece of heavy construction equipment. All soft or unsuitable materials determined by proof-rolling should be removed and replaced, or otherwise remediated using an appropriate method.

Marginal subgrade stability, represented by inorganic clays with unconfined compressive strengths of 1.5 tsf or less, was generally not encountered at depths shallower than approximately 3.0 feet in the borings at the time of our exploration. If or where encountered during construction, marginal stability soils will likely need to be reduced in moisture content and/or recompacted in order to achieve a stable subgrade. Undercutting unstable soils and replacing them with 1 to 2 feet of coarse, crushed aggregate can achieve similar results and has an advantage of allowing work to proceed in adverse weather conditions.

The stability of the shallow clayey soils at this site is expected to be greatly dependent upon weather conditions prevailing prior to and during grading. Significantly less problems with subgrade stability may be anticipated if site grading work takes place during hotter/drier times of the year. In any event, the need for subgrade reworking or additional undercutting should be evaluated on the basis of proof-rolling.

New fill should consist of approved granular materials or inorganic clays. It is recommended that compaction for building pad and any pavement areas be to a minimum of 95 and 90 percent of maximum dry density, respectively, as determined by the Modified Proctor test (ASTM D 1557). However, the uppermost 2.0 feet of fill in any pavement areas should be compacted to 95 percent of Modified Proctor density. The fill should be placed in approximate 9 inch thick lifts loose measure for cohesive soils and up to 12 inches for granular materials, each lift to be compacted to the specified density prior to the placement of additional fill.

Moisture control is important in the compaction of most soil types, and it is recommended that the water content of new fill be within 1 percentage point below and 3 percentage points above the optimum moisture as established by its laboratory compaction curve. If the soil is compacted too dry, it will have an apparent stability which will be lost if it later becomes saturated. If the soil is too wet, the Contractor will not be able to achieve proper compaction.

The traffic of heavy construction equipment frequently causes clayey sand, sandy clay and very silty or silty clay deposits, such as were found in the borings, to experience a short term decrease in stability. The associated soft and spongy condition of exposed soils is commonly referred to as "pumping" in this area. It is recommended that heavy construction equipment be detoured around any areas where pumping conditions are found to be developing. Depending upon grading requirements and specific site conditions, solutions to a persistent pumping problem may include use of geotextile fabric, removal of unstable soils and replacement with about 1 to 2 feet of coarse, crushed granular backfill, such as 3-inch rock, construction of trench drains or a combination thereof.

5.4 Groundwater Management/Excavations

Although groundwater was not encountered to the depths drilled in the Borings 2 and 3 and was encountered at a depth of 16.0 feet in B-1, the accumulation of run-off water or seepage at the base

of excavations may still occur during foundation construction. The Contractor should be prepared to remove these accumulations by dewatering procedures, as a minimum to include pumping from strategically placed sumps. Fluctuations in the groundwater levels should be anticipated. The magnitude of change will depend on variations in precipitation, surface run-off or other environmental factors. Changes in nearby river or stream levels or below ground construction in the immediate vicinity may also result in variations in the groundwater level here.

Generally, excavations at this site may be expected to encounter mostly near surface possible manmade clay fill, pavement and topsoil materials, as well as layers of native clayey sands and sandy or silty clays, overlying deeper deposits of very silty clays with silty sands seams. All slope angles and protection systems for either open cut or supported excavations should be designed to meet or exceed all current applicable OSHA regulations. It should be noted that excavation safety is solely the responsibility of the contractor.

6.0 CLOSURE

It is recommended that full-time construction observation and testing services be provided by Testing Service Corporation personnel during foundation construction, so that the soils at undercut and foundation levels can be observed and tested. In addition, approval of building materials, stripping and undercutting, fill placement and compaction as well as slab-on-grade and pavement construction should be observed and tested for compliance with the recommended procedures and specifications.

Certain information regarding the proposed construction of the project has been furnished to Testing Service Corporation and is detailed in the introduction of this report. In the event that our understanding of the scope of the project is incomplete or incorrect, or if any changes in the design of the proposed development are planned, we should be informed of these facts so that we might have the opportunity to revise or modify our recommendations and conclusions, as appropriate.

The analysis and recommendations submitted in this report are based upon the data obtained from the three (3) soil borings performed by TSC at the locations indicated on the Boring Location Plan.

This report does not reflect any variations which may occur between these borings, the nature and extent of which may not become evident until during the course of construction. If variations are then identified, recommendations contained in this report should be re-evaluated after performing on-site observations. We are available to review this report with you at your convenience.

Prepared by:



Steven R. Koester, P.E.
Vice President



Jeffrey L. Martin
Registered Professional Engineer
Illinois No. 062-047621

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL ENGINEERING REPORT

As the client of a consulting geotechnical engineer, you should know that site subsurface conditions cause more construction problems than any other factor. ASFE/The Association of Engineering Firms Practicing in the Geosciences offers the following suggestions and observations to help you manage your risks.

A GEOTECHNICAL ENGINEERING REPORT IS BASED ON A UNIQUE SET OF PROJECT-SPECIFIC FACTORS

Your geotechnical engineering report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. These factors typically include: the general nature of the structure involved, its size, and configuration; the location of the structure on the site; other improvements, such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask your geotechnical engineer to evaluate how factors that change subsequent to the date of the report may affect the report's recommendations.

Unless your geotechnical engineer indicates otherwise, do not use your geotechnical engineering report:

- when the nature of the proposed structure is changed, for example, if an office building will be erected instead of a parking garage, or a refrigerated warehouse will be built instead of an unrefrigerated one;
- when the size, elevation, or configuration of the proposed structure is altered;
- when the location or orientation of the proposed structure is modified;
- when there is a change of ownership; or
- for application to an adjacent site.

Geotechnical engineers cannot accept responsibility for problems that may occur if they are not consulted after factors considered in their report's development have changed.

SUBSURFACE CONDITIONS CAN CHANGE

A geotechnical engineering report is based on conditions that existed at the time of subsurface exploration. Do not base construction decisions on a geotechnical engineering report whose adequacy may have been affected by time. Speak with your geotechnical consultant to learn if additional tests are advisable before construction starts. Note, too, that additional tests may be required when subsurface conditions are affected by construction operations at or adjacent to the site, or by natural events such as floods, earthquakes, or ground water fluctuations. Keep your geotechnical consultant apprised of any such events.

MOST GEOTECHNICAL FINDINGS ARE PROFESSIONAL JUDGMENTS

Site exploration identifies actual subsurface conditions only at those points where samples are taken. The data were extrapolated by your geotechnical engineer who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your geotechnical engineer can work together to help minimize their impact. Retaining your geotechnical engineer to observe construction can be particularly beneficial in this respect.

A REPORT'S RECOMMENDATIONS CAN ONLY BE PRELIMINARY

The construction recommendations included in your geotechnical engineer's report are preliminary, because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Because actual subsurface conditions can be discerned only during earthwork, you should retain your geotechnical engineer to observe actual conditions and to finalize recommendations. Only the geotechnical engineer who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations are valid and whether or not the contractor is abiding by applicable recommendations. The geotechnical engineer who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

GEOTECHNICAL SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND PERSONS

Consulting geotechnical engineers prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your geotechnical engineer prepared your report expressly for you and expressly for purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the geotechnical engineer. No party should apply this report for any purpose other than that originally contemplated without first conferring with the geotechnical engineer.

GEOENVIRONMENTAL CONCERNS ARE NOT AT ISSUE

Your geotechnical engineering report is not likely to relate any findings, conclusions, or recommendations

about the potential for hazardous materials existing at the site. The equipment, techniques; and personnel used to perform a geoenvironmental exploration differ substantially from those applied in geotechnical engineering. Contamination can create major risks. If you have no information about the potential for your site being contaminated, you are advised to speak with your geotechnical consultant for information relating to geoenvironmental issues.

A GEOTECHNICAL ENGINEERING REPORT IS SUBJECT TO MISINTERPRETATION

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical engineering report. To help avoid misinterpretations, retain your geotechnical engineer to work with other project design professionals who are affected by the geotechnical report. Have your geotechnical engineer explain report implications to design professionals affected by them, and then review those design professionals' plans and specifications to see how they have incorporated geotechnical factors. Although certain other design professionals may be familiar with geotechnical concerns, none knows as much about them as a competent geotechnical engineer.

BORING LOGS SHOULD NOT BE SEPARATED FROM THE REPORT

Geotechnical engineers develop final boring logs based upon their interpretation of the field logs (assembled by site personnel) and laboratory evaluation of field samples. Geotechnical engineers customarily include only final boring logs in their reports. Final boring logs should not under any circumstances be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to minimize the possibility of contractors misinterpreting the logs during bid preparation. When this occurs, delays, disputes, and unanticipated costs are the all-too-frequent result.

To minimize the likelihood of boring log misinterpretation, give contractors ready access to the complete geotechnical engineering report prepared or authorized for their use. (If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared and that developing construction cost esti-

mates was not one of the specific purposes for which it was prepared. In other words, while a contractor may gain important knowledge from a report prepared for another party, the contractor would be well-advised to discuss the report with your geotechnical engineer and to perform the additional or alternative work that the contractor believes may be needed to obtain the data specifically appropriate for construction cost estimating purposes.) Some clients believe that it is unwise or unnecessary to give contractors access to their geotechnical engineering reports because they hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems. It also helps reduce the adversarial attitudes that can aggravate problems to disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY

Because geotechnical engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against geotechnical engineers. To help prevent this problem, geotechnical engineers have developed a number of clauses for use in their contracts, reports, and other documents. Responsibility clauses are not exculpatory clauses designed to transfer geotechnical engineers' liabilities to other parties. Instead, they are definitive clauses that identify where geotechnical engineers' responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your geotechnical engineering report. Read them closely. Your geotechnical engineer will be pleased to give full and frank answers to any questions.

RELY ON THE GEOTECHNICAL ENGINEER FOR ADDITIONAL ASSISTANCE

Most ASFE-member consulting geotechnical engineering firms are familiar with a variety of techniques and approaches that can be used to help reduce risks for all parties to a construction project, from design through construction. Speak with your geotechnical engineer not only about geotechnical issues, but others as well, to learn about approaches that may be of genuine benefit. You may also wish to obtain certain ASFE publications. Contact a member of ASFE or ASFE for a complimentary directory of ASFE publications.

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TESTING SERVICE CORPORATION

GENERAL CONDITIONS

Geotechnical and Construction Services

1. PARTIES AND SCOPE OF WORK: If Client is ordering the services on behalf of another, Client represents and warrants that Client is the duly authorized agent of said party for the purpose of ordering and directing said services, and in such case the term "Client" shall also include the principal for whom the services are being performed. Prices quoted and charged by TSC for its services are predicated on the conditions and the allocations of risks and obligations expressed in these General Conditions. Unless otherwise stated in writing, Client assumes sole responsibility for determining whether the quantity and the nature of the services ordered by Client are adequate and sufficient for Client's intended purpose. Unless otherwise expressly assumed in writing, TSC's services are provided exclusively for client. TSC shall have no duty or obligation other than those duties and obligations expressly set forth in this Agreement. TSC shall have no duty to any third party. Client shall communicate these General Conditions to each and every party to whom the Client transmits any report prepared by TSC. Ordering services from TSC shall constitute acceptance of TSC's proposal and these General Conditions.

2. SCHEDULING OF SERVICES: The services set forth in this Agreement will be accomplished in a timely and workmanlike manner. If TSC is required to delay any part of its services to accommodate the requests or requirements of Client, regulatory agencies, or third parties, or due to any cause beyond its reasonable control, Client agrees to pay such additional charges, if any, as may be applicable.

3. ACCESS TO SITE: TSC shall take reasonable measures and precautions to minimize damage to the site and any improvements located thereon as a result of its services or the use of its equipment; however, TSC has not included in its fee the cost of restoration of damage which may occur. If Client desires or requires TSC to restore the site to its former condition, TSC will, upon written request, perform such additional work as is necessary to do so and Client agrees to pay to TSC the cost thereof plus TSC's normal markup for overhead and profit.

4. CLIENT'S DUTY TO NOTIFY ENGINEER: Client represents and warrants that Client has advised TSC of any known or suspected hazardous materials, utility lines and underground structures at any site at which TSC is to perform services under this Agreement. Unless otherwise agreed in writing, TSC's responsibility with respect to underground utility locations is to contact the Illinois Joint Utility Locating Information for Excavators for the location of public, but not private, utilities.

5. DISCOVERY OF POLLUTANTS: TSC's services shall not include investigation for hazardous materials as defined by the Resource Conservation Recovery Act, 42 U.S.C. § 6901, et seq., as amended ("RCRA") or by any state or Federal statute or regulation. In the event that hazardous materials are discovered and identified by TSC, TSC's sole duty shall be to notify Client.

6. MONITORING: If this Agreement includes testing construction materials or observing any aspect of construction of improvements, Client's construction personnel will verify that the pad is properly located and sized to meet Client's projected building loads. Client shall cause all tests and inspections of the site, materials and work to be timely and properly performed in accordance with the plans, specifications, contract documents, and TSC's recommendations. No claims for loss, damage or injury shall be brought against TSC unless all tests and inspections have been so performed and unless TSC's recommendations have been followed.

TSC's services shall not include determining or implementing the means, methods, techniques or procedures of work done by the contractor(s) being monitored or whose work is being tested. TSC's services shall not include the authority to accept or reject work or to in any manner supervise the work of any contractor. TSC's services or failure to

perform same shall not in any way operate or excuse any contractor from the performance of its work in accordance with its contract. "Contractor" as used herein shall include subcontractors, suppliers, architects, engineers and construction managers.

Information obtained from borings, observations and analyses of sample materials shall be reported in formats considered appropriate by TSC unless directed otherwise by Client. Such information is considered evidence, but any inference or conclusion based thereon is, necessarily, an opinion also based on engineering judgment and shall not be construed as a representation of fact. Subsurface conditions may not be uniform throughout an entire site and ground water levels may fluctuate due to climatic and other variations. Construction materials may vary from the samples taken. Unless otherwise agreed in writing, the procedures employed by TSC are not designed to detect intentional concealment or misrepresentation of facts by others.

7. DOCUMENTS AND SAMPLES: Client is granted an exclusive license to use findings and reports prepared and issued by TSC and any sub-consultants pursuant to this Agreement for the purpose set forth in TSC's proposal provided that TSC has received payment in full for its services. TSC and, if applicable, its sub-consultant, retain all copyright and ownership interests in the reports, boring logs, maps, field data, field notes, laboratory test data and similar documents, and the ownership and freedom to use all data generated by it for any purpose. Unless otherwise agreed in writing, test specimens or samples will be disposed immediately upon completion of the test. All drilling samples or specimens will be disposed sixty (60) days after submission of TSC's report.

8. TERMINATION: TSC's obligation to provide services may be terminated by either party upon (7) seven days prior written notice. In the event of termination of TSC's services, TSC shall be compensated by Client for all services performed up to and including the termination date, including reimbursable expenses. The terms and conditions of these General Conditions shall survive the termination of TSC's obligation to provide services.

9. PAYMENT: Client shall be invoiced periodically for services performed. Client agrees to pay each invoice within thirty (30) days of its receipt. Client further agrees to pay interest on all amounts invoiced and not paid or objected to in writing for valid cause within sixty (60) days at the rate of twelve (12%) per annum (or the maximum interest rate permitted by applicable law, whichever is the lesser) until paid and TSC's costs of collection of such accounts, including court costs and reasonable attorney's fees.

10. WARRANTY: TSC's professional services will be performed, its findings obtained and its reports prepared in accordance with these General Conditions and with generally accepted principles and practices. In performing its professional services, TSC will use that degree of care and skill ordinarily exercised under similar circumstances by members of its profession. In performing physical work in pursuit of its professional services, TSC will use that degree of care and skill ordinarily used under similar circumstances. This warranty is in lieu of all other warranties or representations, either express or implied. Statements made in TSC reports are opinions based upon engineering judgment and are not to be construed as representations of fact.

Should TSC or any of its employees be found to have been negligent in performing professional services or to have made and breached any express or implied warranty, representation or contract, Client, all parties claiming through Client and all parties claiming to have in any way relied upon TSC's services or work agree that the maximum aggregate amount of damages for which TSC, its officers, employees and agents shall be liable is limited to \$50,000 or the total amount of the fee paid to TSC for its services performed with respect to the project, whichever amount is greater.

In the event Client is unwilling or unable to limit the damages for which TSC may be liable in accordance with the provisions set forth in the preceding paragraph, upon written request of Client received within five days of Client's acceptance of TSC's proposal together with payment of an additional fee in the amount of 5% of TSC's estimated cost for its services (to be adjusted to 5% of the amount actually billed by TSC for its services on the project at time of completion), the limit on damages shall be increased to \$500,000 or the amount of TSC's fee, whichever is the greater. This charge is not to be construed as being a charge for insurance of any type, but is increased consideration for the exposure to an award of greater damages.

11. INDEMNITY: Subject to the provisions set forth herein, TSC and Client hereby agree to indemnify and hold harmless each other and their respective shareholders, directors, officers, partners, employees, agents, subsidiaries and division (and each of their heirs, successors, and assigns) from any and all claims, demands, liabilities, suits, causes of action, judgments, costs and expenses, including reasonable attorneys' fees, arising, or allegedly arising, from personal injury, including death, property damage, including loss of use thereof, due in any manner to the negligence of either of them or their agents or employees or independent contractors. In the event both TSC and Client are found to be negligent or at fault, then any liability shall be apportioned between them pursuant to their pro rata share of negligence or fault. TSC and Client further agree that their liability to any third party shall, to the extent permitted by law, be several and not joint. The liability of TSC under this provision shall not exceed the policy limits of insurance carried by TSC. Neither TSC nor Client shall be bound under this indemnity agreement to liability determined in a proceeding in which it did not participate represented by its own independent counsel. The indemnities provided hereunder shall not terminate upon the termination or expiration of this Agreement, but may be modified to the extent of any waiver of subrogation agreed to by TSC and paid for by Client.

12. SUBPOENAS: TSC's employees shall not be retained as expert witnesses except by separate, written agreement. Client agrees to pay TSC pursuant to TSC's then current fee schedule for any TSC employee(s) subpoenaed by any party as an occurrence witness as a result of TSC's services.

13. OTHER AGREEMENTS: TSC shall not be bound by any provision or agreement (i) requiring or providing for arbitration of disputes or controversies arising out of this Agreement or its performance, (ii) wherein TSC waives any rights to a mechanics lien or surety bond claim; (iii) that conditions TSC's right to receive payment for its services upon payment to Client by any third party or (iv) that requires TSC to indemnify any party beyond its own negligence. These General Conditions are notice, where required, that TSC shall file a lien whenever necessary to collect past due amounts. This Agreement contains the entire understanding between the parties. Unless expressly accepted by TSC in writing prior to delivery of TSC's services, Client shall not add any conditions or impose conditions which are in conflict with those contained herein, and no such additional or conflicting terms shall be binding upon TSC. The unenforceability or invalidity of any provision or provisions shall not render any other provision or provisions unenforceable or invalid. This Agreement shall be construed and enforced in accordance with the laws of the State of Illinois. In the event of a dispute arising out of or relating to the performance of this Agreement, the breach thereof or TSC's services, the parties agree to try in good faith to settle the dispute by mediation under the Construction Industry Mediation Rules of the American Arbitration Association as a condition precedent to filing any demand for arbitration, or any petition or complaint with any court. Paragraph headings are for convenience only and shall not be construed as limiting the meaning of the provisions contained in these General Conditions.

APPENDIX

UNIFIED CLASSIFICATION CHART

LEGEND FOR BORING LOGS

BORING LOGS

BORING LOCATION PLAN

**TESTING SERVICE CORPORATION
UNIFIED CLASSIFICATION CHART**

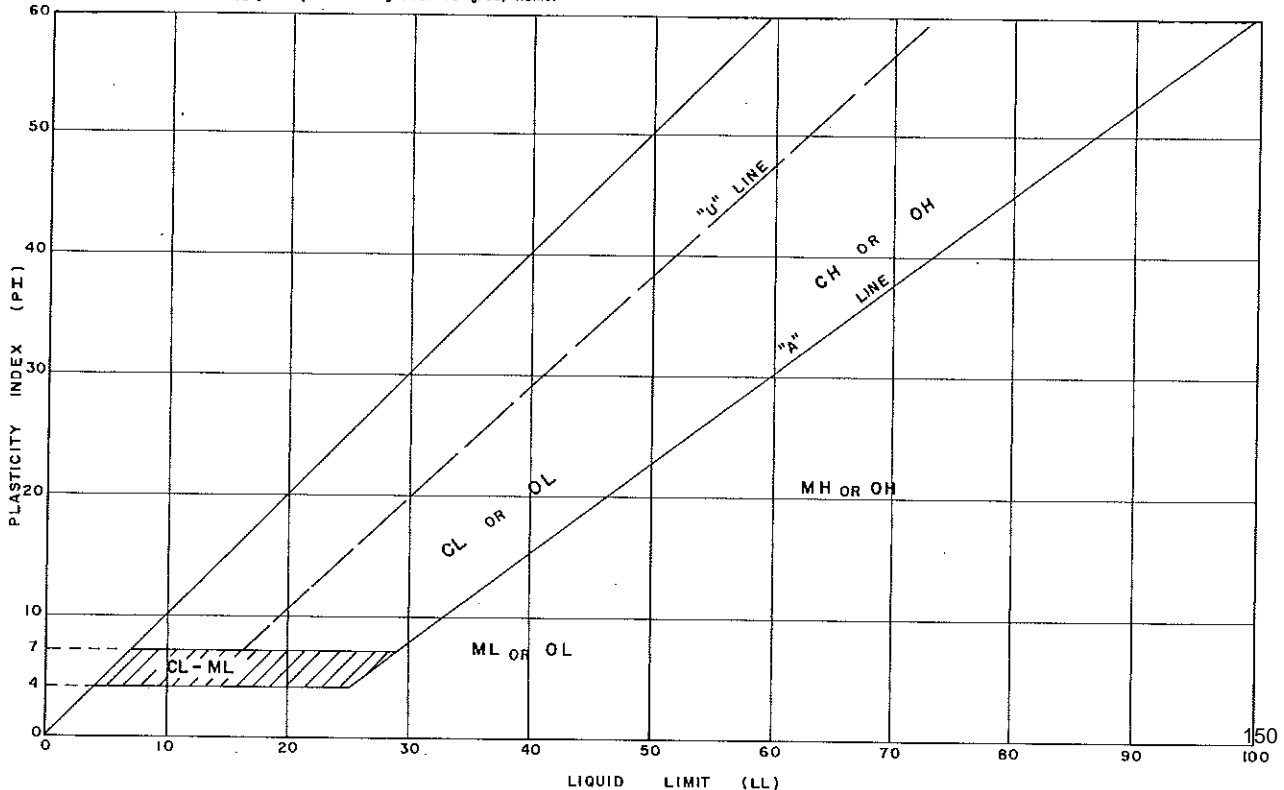
CRITERIA FOR ASSIGNING GROUP SYMBOLS AND GROUP NAMES USING LABORATORY TESTS ^a				SOIL CLASSIFICATION	
				GROUP SYMBOL	GROUP NAME ^b
COARSE-GRAINED SOILS more than 50% retained on No. 200 sieve	GRAVELS More than 50% of coarse fraction retained on No. 4 sieve	CLEAN GRAVELS Less than 5% fines ^c	$C_u \geq 4$ and $1 \leq C_c \leq 3$ ^e	GW	Well graded gravel ^f
			$C_u < 4$ and/or $1 > C_c > 3$ ^e	GP	Poorly graded gravel ^f
		GRAVELS WITH FINES More than 12% fines ^c	Fines classify as ML or MH	GM	Silty gravel ^{f,g,h}
			Fines classify as CL or CH	GC	Clayey gravel ^{f,g,h}
	SANDS 50% or more of coarse fraction passes No. 4 sieve	CLEAN SANDS Less than 5% fines ^d	$C_u \geq 6$ and $1 \leq C_c \leq 3$ ^e	SW	Well-graded sand ⁱ
			$C_u < 6$ and/or $1 > C_c > 3$ ^e	SP	Poorly graded sand ⁱ
		SANDS WITH FINES More than 12% fines ^d	Fines classify as ML or MH	SM	Silty sand ^{g,h,f}
			Fines classify as CL or CH	SC	Clayey sand ^{g,h,f}
FINE-GRAINED SOILS 50% or more passed the No. 200 sieve	SILTS & CLAYS Liquid limit less than 50%	Inorganic	$PI > 7$ and plots on or above "A" line ^j	CL	Lean clay ^{k,l,m}
			$PI \leq 4$ or plots below "A" line ^j	ML	Silt ^{k,l,m}
		Organic	$\frac{\text{Liquid limit} - \text{oven dried}}{\text{Liquid limit} - \text{not dried}} < 0.75$	OL	Organic clay ^{k,l,m,n} Organic silt ^{k,l,m,o}
	SILTS & CLAYS Liquid limit 50% or more	Inorganic	PI plots on or above "A" line	CH	Fat clay ^{k,l,m}
			PI plots below "A" line	MH	Elastic silt ^{k,l,m}
		Organic	$\frac{\text{Liquid limit} - \text{oven dried}}{\text{Liquid limit} - \text{not dried}} < 0.75$	OH	Organic clay ^{k,l,m,p} Organic silt ^{k,l,m,q}
Highly organic soils		Primarily organic matter, dark in color, and organic odor		PT	Peat

- a. Based on the material passing the 3-in (75-mm) sieve.
b. If field sample contained cobbles and/or boulders, add "with cobbles and/or boulders" to group name.
c. Gravels with 5 to 12% fines require dual symbols
GW-GM well graded gravel with silt
GW-GC well graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay
d. Sands with 5% to 12% fines require dual symbols
SW-SM well graded sand with silt
SW-SC well graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

- j. If Atterberg Limits plot in hatched area, soil is a CL-ML, silty clay.
k. If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel" whichever is predominant.
l. If soil contains $\geq 30\%$ plus No. 200, predominantly sand, add "sandy" to group name.
m. If soil contains $\geq 30\%$ plus No. 200, predominantly gravel, add "gravelly" to group name.
n. $PI \geq 4$ and plots on or above "A" line.
o. $PI \leq 4$ or plots below "A" line.
p. PI plots on or above "A" line.
q. PI plots below "A" line.

$$C_u = D_{60}/D_{10} \quad C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$$

- t. If soil contains $\geq 15\%$ sand, add "with sand" to group name.
u. If fines classify as CL-ML, use dual symbol GC-GM, SC-SM.
v. If fines are organic, add "with organic fines" to group name.
w. If soil contains $\geq 15\%$ gravel, add "with gravel" to group name.





TESTING SERVICE CORPORATION

LEGEND FOR BORING LOGS



FILL



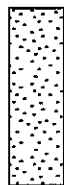
TOPSOIL



PEAT



GRAVEL



SAND



SILT



CLAY



DOLOMITE

SAMPLE TYPE

SS = Split Spoon
ST = Thin-Walled Tube
A = Auger
MC = Macro-Core (Geo Probe)

WATER LEVELS

▼ While Drilling
▼ End of Boring
▼ 24 Hours

FIELD AND LABORATORY TEST DATA

N = Standard Penetration Resistance in Blows per Foot
WC = In-Situ Water Content
Qu = Unconfined Compressive Strength in Tons per Square Foot
* Pocket Penetrometer Measurement: Maximum Reading = 4.5 tsf
Y_{DRY} = Dry Unit Weight in Pounds per Cubic Foot

SOIL DESCRIPTION

MATERIAL

BOULDER
COBBLE
Coarse GRAVEL
Small GRAVEL
Coarse SAND
Medium SAND
Fine SAND
SILT and CLAY

PARTICLE SIZE RANGE

Over 12 inches
12 inches to 3 inches
3 inches to 3/4 inch
3/4 inch to No. 4 Sieve
No. 4 Sieve to No. 10 Sieve
No. 10 Sieve to No. 40 Sieve
No. 40 Sieve to No. 200 Sieve
Passing No. 200 Sieve

COHESIVE SOILS

<u>CONSISTENCY</u>	<u>Qu (tsf)</u>
Very Soft	Less than 0.3
Soft	0.3 to 0.6
Stiff	0.6 to 1.0
Tough	1.0 to 2.0
Very Tough	2.0 to 4.0
Hard	4.0 and over

COHESIONLESS SOILS

<u>RELATIVE DENSITY</u>	<u>N (bpf)</u>
Very Loose	0 - 4
Loose	4 - 10
Firm	10 - 30
Dense	30 - 50
Very Dense	50 and over

MODIFYING TERM

Trace
Little
Some

PERCENT BY WEIGHT

1 - 10
10 - 20
20 - 35

PROJECT Brookview School Gymnasium Addition, 1750 Madron Road, Rockford, IllinoisCLIENT Hagney Architects, LLC, Rockford, IllinoisBORING 1 DATE STARTED 8-7-15 DATE COMPLETED 8-7-15 JOB L-83,805
 ELEVATIONS
 GROUND SURFACE 96.4
 END OF BORING 76.4

 WATER LEVEL OBSERVATIONS
 ▽ WHILE DRILLING 16.0'
 ▽ AT END OF BORING 16.0'
 ▽ 24 HOURS

DISTANCE BELOW SURFACE IN FEET	LENGTH RECOVERY	SAMPLE		N	WC	Qu	γ_{DRY}	DEPTH	ELEV.	SOIL DESCRIPTIONS
		NO.	TYPE							
0		A	SS	4	11.5	4.5+*				Hard brown and light brown very silty CLAY, trace sand and organic, moist (CL-ML) [Possible Fill]
		1			24.8	1.75*		2.2	94.2	
		B								
		2	SS	4	25.4	0.75*				Tough to stiff brown silty CLAY, moist to very moist (CL)
5								6.0	90.4	
		3	SS	1	13.7	0.25*				Very soft brown sandy CLAY to very loose clayey SAND, very moist (CL/SC)
								8.0	88.4	
		4	SS	5	11.0					Loose light brown clayey SAND, trace to little gravel, very moist (SC)
10								10.0	86.4	
		5	SS	10	9.5	4.0*				
		6	SS	23	8.4	4.5*				Hard to very tough pinkish-brown very silty CLAY, some sand, little gravel with silty sand seams, moist (CL-ML/SM)
15										
		7	SS	9	11.4	3.0*				
20										
										* Approximate unconfined compressive strength based on measurements with a calibrated pocket penetrometer.
25										

Division lines between deposits represent approximate boundaries between soil types; in-situ, the transition may be gradual.

End of Boring at 20.0'

DRILL RIG NO. 334



BORING 2 DATE STARTED 8-7-15 DATE COMPLETED 8-7-15 JOB L-83,805

WATER LEVEL OBSERVATIONS

▼ WHILE DRILLING **Dry**

▽ AT END OF BORING Dry

▼ 24 HOURS

[illegible]

DRILL RIG NO. 334

Division lines between deposits represent approximate boundaries between soil types; in-situ, the transition may be gradual.

End of Boring at 20.0'

PROJECT Brookview School Gymnasium Addition, 1750 Madron Road, Rockford, IllinoisCLIENT Hagney Architects, LLC, Rockford, IllinoisBORING 3 DATE STARTED 8-7-15 DATE COMPLETED 8-7-15 JOB L-83,805
 ELEVATIONS
 GROUND SURFACE 98.6
 END OF BORING 78.6

 WATER LEVEL OBSERVATIONS
 ▽ WHILE DRILLING Dry
 ▽ AT END OF BORING Dry
 ▽ 24 HOURS

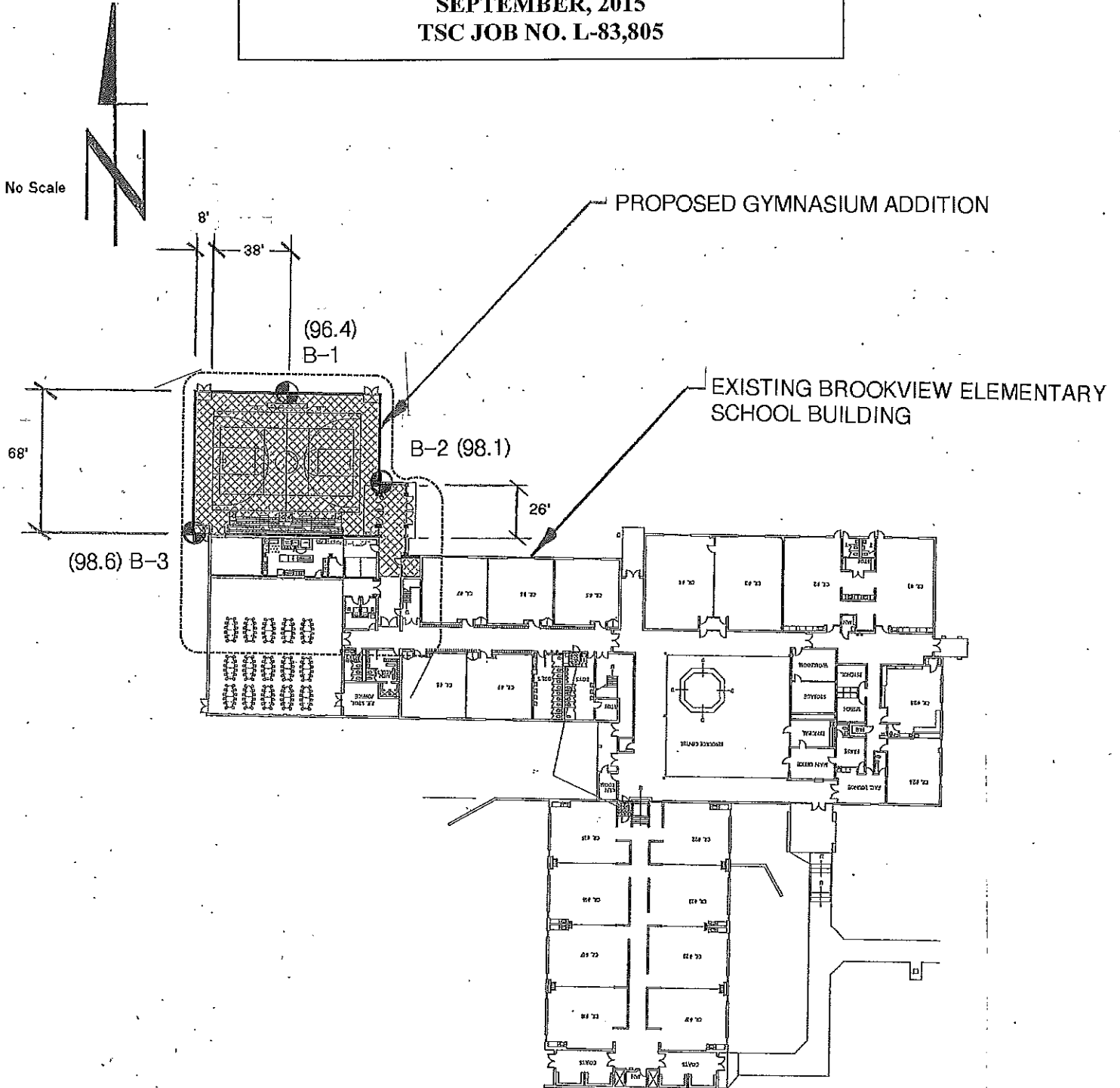
DISTANCE BELOW SURFACE IN FEET	LENGTH RECOVERY	SAMPLE		N	WC	Qu	γ_{DRY}	DEPTH	ELEV.	SOIL DESCRIPTIONS
		NO.	TYPE							
0		1	SS	5	22.2	2.5*		3.0	95.6	Very tough brown and grayish-brown silty CLAY, moist (CL) [Possible Fill]
5		2	SS	7	14.0	1.75*		6.0	92.6	Tough light brown sandy CLAY, trace gravel, moist (CL)
		A	SS	7	15.2	0.75*		7.0	91.6	Stiff pinkish-brown sandy CLAY, trace gravel, very moist (CL)
		3			14.2			8.0	90.6	Loose grayish-brown clayey SAND, trace gravel, very moist (SC)
10		4	SS	11	7.8	3.75*				Very tough to hard pinkish-brown to light brown very silty CLAY, some sand and gravel with silty sand seams, moist (CL-ML/SM)
		5	SS	26	8.0	4.5+*				
15		6	SS	29	7.2	4.5+*				
20		7	SS	39	7.1	4.5+*				* Approximate unconfined compressive strength based on measurements with a calibrated pocket penetrometer.
25										

Division lines between deposits represent approximate boundaries between soil types; in-situ, the transition may be gradual.

End of Boring at 20.0'

DRILL RIG NO. 334

**BORING LOCATION PLAN
PROPOSED GYMNASIUM ADDITION
BROOKVIEW ELEMENTARY SCHOOL
1750 MADRON ROAD
ROCKFORD, ILLINOIS
SEPTEMBER, 2015
TSC JOB NO. L-83,805**



PROJECT MANUAL

Carnow Conibear Project Number: A139670056

FOR: Rockford Public Schools
501 7th Street
Rockford, Illinois 61104

AT: Brookview Elementary School
1750 Madron Road
Rockford, Illinois 61107

PROJECT: Asbestos Abatement for 2016 New Addition and Interior Renovations

ENVIRONMENTAL CONSULTANT:

CARNOW, CONIBEAR & ASSOC., LTD.
600 W. Van Buren Street, Suite 500
Chicago, IL 60607
(312) 762.2900
(312) 782-5145 (fax)

Prepared by:

John M. Dobby, CIH, CSP
Project Designer
IDPH #100-09261

February 11, 2015

TABLE OF CONTENTS SUMMARY

ROCKFORD PUBLIC SCHOOLS - BROOKVIEW ELEMENTARY SCHOOL 2016 NEW ADDITION AND INTERIOR RENOVATIONS ASBESTOS ABATEMENT

SITE WORK

No. of Pages

Section 02131	Asbestos Abatement for Interior School Areas	18
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APPENDICES

Appendix A.	Additional Design Details	2
Appendix B.	Environmental Scope of Work and Drawings	7

SPECIFICATION SECTION 02131

**ASBESTOS ABATEMENT FOR INTERIOR SCHOOL
AREAS**

SECTION 02131 - ASBESTOS ABATEMENT FOR INTERIORS

PART 1 - GENERAL

- 1.1 Introduction: Asbestos abatement in interior building spaces, covered walkways or porticos connecting buildings, and on outdoor mechanical systems which condition indoor air (such as air handling units, air conditioners, cooling towers, etc.) is governed by rules established by the Illinois Department of Public Health (IDPH). This specification section addresses or references the requirements for complying with IDPH, OSHA, and EPA NESHAP asbestos rules. Each and every rule requirement may not be restated in detail since trained, accredited, and licensed contractors and individuals are required for this work and are presumed to be familiar with the relevant laws and rules. Full regulatory compliance is required, and is a part of the contract, whether specifically stated herein or not.

Exterior building spaces are not subject to IDPH rules unless the abatement procedures involve interior spaces of the building. Roofing, window replacement, exterior transite sheeting, asbestos siding, asbestos-containing paint, caulking, glazing, flashings, cements, or other products installed on the building exterior are subject to OSHA and NESHAP rules which, in many cases are less rigorous than IDPH requirements. Abatement of these items is specified in separate, related specification sections.

- 1.2 Definitions: In addition to the terms listed below, all definitions in the laws and regulations listed in Section 1.5 are incorporated by reference, whether or not restated herein.
- A. Abatement Contractor (AC) means the entity responsible for performing the work in this section and has the training and accreditation to competently perform the work. This entity will obtain and maintain licenses required for the indoor work in this section.
 - B. Asbestos Abatement Supervisor, hereinafter referred to as "supervisor" means a person retained by the AC, who supervises asbestos abatement workers. This person must be trained, accredited, and licensed as required, and must also meet OSHA "competent person" criteria for asbestos abatement.
 - C. Asbestos Project Manager (APM) is the individual that performs asbestos abatement project oversight, acts on behalf of the Rockford Public Schools or its agents on the project, and performs "Project Manager" duties as defined by IDPH asbestos regulations.
 - D. Rockford Public Schools means the owner of the property and the authority ordering the work specified herein.
 - E. HEPA Filter means a High Efficiency Particulate Air filter capable of trapping 99.97% percent of particles greater than 0.3 micrometers in mass median aerodynamic equivalent diameter.
 - F. IDPH means the Illinois Department of Public Health.
 - G. Carnow Conibear & Assoc., Ltd. (CCA) means the entity with overall responsibility for

the environmental aspects of the project, including design, organization, direction, and control as well as investigations, assessments, and supervision of project managers.

- H. MSDS means Material Safety Data Sheet, required by OSHA for any chemicals in the workplace that that could be expected to cause an exposure to workers during normal use or in emergency situations.
- I. Plasticize means to apply plastic sheeting over surfaces or objects to protect them from contamination or water damage.
- J. PPE (Personal Protection Equipment) means the protective suits, head and foot covers, gloves, respirators and other items used to protect persons from asbestos or other hazards.
- K. RCRA means the Resource Conservation and Recovery Act and associated regulations.
- L. TCLP means the Toxicity Characteristic Leaching Procedure as specified in EPA 530/SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods 3rd edition, November 1986.
- M. Work Area means the area or areas where asbestos abatement is being conducted.

1.3 Scope of Work: Refer to Environmental Scope forms and Drawings.

1.4 Work Included

- A. The work includes all labor, equipment, materials, and supplies necessary to perform the Scope of work in the Documents by the procedures described herein. The contractor, by submitting a bid for the work, represents itself as knowledgeable and expert in the performance of the work, and includes all things usually and customarily necessary to provide a complete and finished job, whether specifically mentioned or not.
- B. Removal of friable and non-friable asbestos-containing materials listed in the Documents, including pre-cleaning, moving of furnishings, establishing regulated areas, isolating the work areas, protection of adjacent areas, containment when required, cleanup and decontamination to the specified clearance levels, proper packaging and disposal of wastes, and all other steps necessary to complete the scope of work.
- C. Repair or replacement of damaged surfaces, fixtures, or furnishings to restore them to their pre-existing condition to the satisfaction of the Project Manager.
- D. When the Documents include lead and asbestos abatement items in the same spaces, they should be performed in the sequence and combinations that produce the most efficient results, minimize concentrated lead waste volume, and produce the least amount of total waste. That sequence will generally be:

1. Cleanup of lead dust, flakes, chips, and residues most likely to fail a TCLP test. If both lead and asbestos debris are present and mixed together, they may be cleaned up and disposed together.
2. Cleanup and removal of failed or delaminated friable asbestos-containing debris, if any.
3. Removal of friable asbestos materials and cleanup of visible residues.
4. Removal of lead-bearing architectural components.
5. Removal of non-friable asbestos items. If both asbestos and lead are on the same components, for example lead paint and asbestos-containing glazing compound, the components may be removed and disposed with both the lead and asbestos-bearing items intact.
6. Removal of lead-based paint, coatings, or surfacing material.
7. Final cleanup and decontamination of the work space. Final air clearance (asbestos) and wipe samples (lead) may be performed concurrently.
8. When lead and asbestos final decontamination processes are combined, the more stringent cleanup procedures will apply for both.
9. Waste disposal.
 - a. Hazardous waste: loose paint flakes, chips, and dust; lead-specific cleaning supplies; contaminated soil; combined final decontamination supplies; disposable suits, gloves, head covers, and foot covers; other items that fail a TCLP or other RCRA test.
 - b. Special waste: friable asbestos-containing waste materials and lead-contaminated waste that has passed TCLP or other RCRA tests.
 - c. Construction and demolition (C&D) debris: lead-bearing architectural components; concrete and lumber with or without tile or mastic attached; demolition debris, and other general wastes.
 - d. All asbestos-containing or lead-bearing wastes, regardless of classification, shall be disposed in a landfill approved by the IEPA to accept asbestos-containing or lead-bearing waste materials.

- E. Compliance with all applicable laws, regulations, standards, and these specifications. In the case of a conflict, the contractor will comply with the most stringent.
- F. Contractor is required to fully comply with IDPH rules and these specifications unless a variance is granted by IDPH. Any variances obtained by the CCA will be listed in the Documents.
- G. All licenses, accreditations, permits, fees, notifications, reports, or other documents required by law, regulation, this specification, or the Documents.
- H. Provide project closeout documentation to the APM within thirty (30) days after final clearance. This documentation shall include, but is not limited to, items listed in paragraph 1-7, Submittals.

1.5 Laws, Regulations and Standards

- A. The following laws, regulations, and standards are incorporated by reference:
 1. 105 ILCS 105: Illinois Asbestos Abatement Act

2. 77 Ill. Adm. Code 855: Asbestos Abatement for Public and Private Schools and Commercial and Private Buildings in Illinois
3. 29 CFR 1910: US OSHA General Industry Standards
4. 29 CFR 1926: US OSHA Construction Standards
5. 29 CFR 1926.1101: US OSHA Asbestos Construction Standards
6. ASHARA: US EPA Asbestos School Hazard Abatement Reauthorization Act
7. 40 CFR Part 61: US EPA National Emissions Standards for Hazardous Air Pollutants (NESHAP), 11/90 revision
8. 40 CFR 763 Subpart E: US EPA Asbestos Hazard Emergency Response Act (AHERA) Rules
9. 40 CFR 763 Subpart E: US EPA Asbestos Model Accreditation Plan (MAP): Appendix C -Interim Final Rule

1.6 Assessment, Monitoring, Testing and Analysis

- A. CCA will perform inspection, testing and design services prior to the start of work, and during the project, and will perform testing, inspection, and monitoring services during the work and upon its completion:

1. Prior to the start of the work

- a. CCA shall identify suspect materials and confirm their asbestos content through review of the school's historical documentation, management plan or by testing.
- b. CCA will design the project and address any design changes if requested by the Owner.
- c. CCA shall collect background air samples (as necessary) before conditions are disturbed. Background samples will be analyzed by PCM.
- d. Review and approve the pre-abatement submittals submitted by the AC.

2. During the work, CCA shall:

- a. Enter the work area at least every two hours to inspect the work procedures and work area integrity.
- b. Maintain a daily log to record the day's events, problems, corrective actions.
- c. Collect air samples inside and outside the work area, and in the breathing zone of representative persons.
- d. CCA will stop the work if airborne asbestos concentrations outside the work area exceed 0.01 f/cc. The work may restart when the source of fiber release has been identified and corrected. Contractor will be responsible for cleaning and decontaminating the outside area if caused by the asbestos abatement activities.
- e. Observe/document smoke testing of the containment by the contractor.
- f. Review original worker licenses and maintain weekly submittals from the AC.
- g. Notify CCA's project designer if design changes are needed before execution.

3. Upon completion of the work, CCA shall:

- a. Inspect for visible debris. Contractor shall be required to re-clean the area or portions of areas until no visible debris remains and the work area is dry.
 - b. Perform aggressive clearance testing by Transmission Electron Microscopy (TEM) when the ACM in a work area is 260 linear feet, 160 square feet, or 35 cubic feet of volume or more, as required by AHERA and IDPH Section 855.170. The sample set shall include at least 5 inside samples, 5 outside samples, 2 field blanks and 1 sealed blank. **Note:** Large complicated, or multi-floor contiguous work areas connected by corridors, stairways, or other connections shall be tested using additional inside the work area samples. For clearance of multiple mini containments containing a total removal quantity greater than 160 square feet or 260 linear feet, a combined PCM/TEM final clearance procedure may be used. The first part of the procedure shall involve the collection and analysis of one PCM sample from within each mini containment. The second part shall involve the collection and analysis of five (5) TEM samples within the mini containments having the highest PCM analysis results. If there are five or fewer mini containments to be sampled, then only TEM sampling shall be conducted. A minimum of five (5) TEM samples shall be collected. All requirements of 40 CFR 763 Subpart E, Appendix A shall apply.
 - c. Perform aggressive clearance testing by Phase Contrast Microscopy (PCM) when the ACM in a work area is less than 260 linear feet, 160 square feet, or 35 cubic feet of volume.
 - d. Collect and analyze samples in accordance with AHERA Appendix A procedures and IDPH rule section 855.470.
 - e. Prepare and submit the IDPH "Project Manager's Summary Report Form" within 10 days of final clearance.
 - f. Prepare and submit the Project Manager Report to the IDPH within 60 working days of clearance testing. The final Project Manager is responsible for completion of the project report.
- B. The Contractor shall provide OSHA compliance air monitoring to determine exposures to its employees in accordance with OSHA 29 CFR 1926.1101. Frequency of testing will comply with OSHA requirements for the anticipated and actual exposure levels.
1. A written Exposure Assessment may be provided prior to the start of the work to determine the requirements for respiratory protection and frequency of OSHA monitoring for each type of activity. The contractor should note that a Negative Exposure Assessment (NEA) may be possible for many tasks. For interior work, this would allow reduced OSHA monitoring frequency.
 2. Analysis may be performed on site.
- C. Credentials required for testing and analysis of PCM final clearance air samples:
1. Accreditation by AIHA or AAR; or
 2. Participation in the Proficiency Analytical Testing (PAT) program.
 3. Certification of individual qualification to read samples on site when on site analysis is performed.

1.7 Submittals by the Contractor

- A. To IDPH, IEPA (If Applicable), and CCA at least 10 working days before commencement of work:
 - 1. Asbestos Notification on current form, including inspector license number and landfill permit number.
 - 2. Written permission from building owner authorizing contractor to commence abatement.
 - 3. Building owner asbestos abatement notification to building occupants and users.

- B. To CCA at least five days prior to commencement of Work:
 - 1. Documentation of arrangements of transport and disposal, landfill name and location, handling procedures and PPE at the landfill, prepared and signed by the landfill.
 - 2. Drawings or sketches for layout and construction of isolation barriers and decontamination units.
 - 3. Respirators: NIOSH approvals and manufacturer certification of HEPA filtration for cartridges
 - 4. Manufacturers' certifications that all HEPA vacuums, negative air pressure equipment, and other local exhaust ventilation equipment conform to ANSI Z9.2-79
 - 5. Written notifications to rental companies for any rental equipment used.
 - 6. Results of any performance tests for encapsulants, if applicable.
 - 7. OSHA Exposure Assessment, if available.
 - 8. Laboratory and analyst credentials for contractor OSHA samples.
 - 9. Material Safety Data Sheets (MSDS) for chemicals used on site.
 - 10. Work Plan and Schedule.

- C. To CCA on the first day of abatement work:
 - 1. Original contractor, supervisor, and worker licenses along with a copy each.
 - 2. Initial Course Accreditation and current refresher accreditation for each supervisor and worker.
 - 2. Physician's Written Opinions for workers and supervisors.
 - 3. Fit test documentation for all employees, agents.

- D. To CCA weekly (or as necessary) during the abatement work:
 - 1. Job progress reports detailing abatement activities, progress compared to schedule, problems and actions taken, injury reports, and equipment breakdowns.
 - 2. Waste Shipment Records.
 - 3. Work site Entry logs.
 - 4. Manometer readable tape for negative pressure differentials for each negative pressure worker enclosure or a log of digital readout.
 - 5. Filter Change logs for respirators, HEPA vacuums, negative air machines, and other engineering controls.
 - 6. OSHA compliance air monitoring data.
 - 7. Worker license and certification log.

- E. Prior to beginning work, the AC shall submit required notifications to applicable regulatory agencies and receive an Owners Authorization and Notice to Occupants from Rockford Public Schools for buildings where asbestos abatement will take place. The AC will provide copies of all regulatory notices to CCA for review prior to sending such notices to each regulatory authority. The AC shall not begin a project until such notices are provided to Rockford Public Schools and/or CCA.

PART 2 - PRODUCTS

2.1 Tools and Equipment: All tools and equipment shall at least conform to minimum industry standards and IDPH regulations.

A. Equipment:

1. Negative Air Machines shall provide HEPA filtration and conform to ANSI Z9.2 fabrication criteria.
2. Respirators shall be NIOSH approved for use with lead, asbestos, or other contaminants anticipated in the work.
3. Contractor is fully responsible for complying with OSHA rules for other Safety equipment, such as hard hats, safety harnesses, eye protection, gloves, footwear, and any other safety devices used on the site.
4. Pressure differential manometer with readable tape shall be provided by the contractor, including calibration documentation.

B. Tools:

1. Shovels and scoops shall be rubber or plastic, suitable for use in a plasticized containment. Metal shovels are not permitted.
2. Scrapers, brushes, utility knives and other hand tools shall be of good quality and suitable for the intended uses. The contractor shall keep an ample supply on hand for the completion of the work.
3. Power tools such as, but not limited to saws, pneumatic chisels, brushes, sanders, and needle guns shall be equipped with shrouds and HEPA-filtered local exhaust systems to capture released particles.
4. Buffers are not permitted.

2.2 Materials: All materials shall at least conform to minimum industry standards and IDPH regulations.

A. Installed materials which become a part of the work such as, but not limited to, encapsulants shall be of good quality, non-lead-bearing, free of asbestos, and conform to the respective reinstallation specification sections prepared by others.

1. Contractor shall ensure that encapsulants and sealants used as primers, basecoats, or covering existing materials are compatible with the respective existing or reinstallation materials and their manufacturers' warranties.
2. Encapsulants for surfaces to which fireproofing will be applied (beams, columns, floor or roof decks, other structural members) shall be tested and rated as a component of the fireproofing system and listed in the UL Fire Resistance

Directory with the specific fireproofing material to be installed.

B. Abatement materials

1. Fire-retardant Poly sheeting for all applications shall be 6 mil nominal thickness for critical seals, floors, ceilings and drop cloths, and 4 mil for walls.
2. Tape shall be 2" or 3" duct tape or other waterproof tape suitable for joining poly seams and attaching poly sheeting to surfaces.
3. Spray adhesives shall be non-flammable and free of methylene chloride solvents.
4. Disposal bags shall be 6 mil.
5. Disposable suits, hoods, and foot coverings shall be TYVEK or similar.
6. Solvents shall be compatible with any primers, mastics, adhesives, paints, coatings, or other surfacing materials to be installed following their use.

PART 3 - EXECUTION

3.1 Employee Training, Qualification and Medical Screening

- A. Supervisors and Workers shall be trained, accredited, and licensed in accordance with IDPH rules.
1. Contractor shall keep copies of licenses and most recent annual refresher training certificate at the jobsite at all times for all contractor personnel.
 2. An IDPH- licensed supervisor (competent person) shall be present at the worksite at all times when work under this section is being conducted.
 3. Current fit testing documentation.
- B. Medical Screening. All contractor personnel shall have a current medical examination in accordance with OSHA requirements. Copies of the Physician's Written Opinions shall be kept on site.

3.2 Permissible Exposure Limits

- A. The OSHA permissible exposure limit (PEL) for worker exposure to airborne asbestos is 0.1 f/cc as an 8-hour time-weighted average (TWA).
- B. The OSHA short term excursion limit for worker exposure to airborne asbestos is 1.0 f/cc for a 30 minute sample.
- C. The permissible level of airborne fibers in areas adjacent to the work area is 0.01 f/cc or background level, whichever is higher, as determined by phase contrast microscopy (PCM).
1. Work shall immediately cease in any work area where the airborne fiber concentrations exceed this level.
 2. The source of outside contamination shall be determined, and corrective

measures (e.g. wet cleaning, changes in work practices, negative pressure containment) will be implemented to prevent recurrence.

3. The contractor shall be responsible for cleanup of contamination in adjacent areas caused by the asbestos abatement activities at no additional cost to the building owner.

3.3 Exposure Assessment and Monitoring

- A. The Contractor shall make an assessment of the airborne exposures. Assessment shall conform to OSHA requirements and may be based upon:

1. Initial monitoring of representative workers who the contractor believes are exposed to the greatest airborne concentrations of asbestos, or
2. Past monitoring (within the past 12 months) or objective data for conditions closely resembling the processes, type of material, control methods, work practices and environmental conditions to be used for this project, or
3. In the absence of an exposure assessment, the contractor shall perform the work in full negative pressure containment with Type C pressure-demand respirator with auxiliary SCBA escape bottle.

- B. The contractor shall perform personal monitoring in accordance with the following requirements:

1. Initially, to establish an exposure assessment when past monitoring or objective data are not available for an initial determination.
2. Periodically if the exposures are, or are expected to be, below the PEL.
 - a. Whenever there has been a change of equipment, process, control, personnel, or a new task has been initiated that may affect employee exposures, the exposure assessment shall be updated, and monitoring shall be reinstituted if exposures are unknown or are expected to exceed the PEL.

3. Daily, if exposures are above the PEL.

3.4 Respiratory Protection

- A. Respiratory protection shall be worn by all persons potentially exposed to airborne asbestos fibers from the start of the abatement project until all areas have passed clearance air monitoring, in accordance with all applicable regulations incorporated by reference in 1.5 A.
- B. Contractors must have a respiratory protection program in compliance with all applicable regulations incorporated by reference in 1.5 A.

3.5 Hygiene Practices

- A. Eating, drinking, smoking, chewing gum or tobacco, and applying of cosmetics are

not allowed in the work area.

- B. All persons entering the work area are required to wear appropriate PPE, and follow the entry and exit procedures posted in the Personnel Decontamination Enclosure System.
- C. Personal Protection Equipment (PPE) shall include:
 - 1. Full body disposable suits, headgear, and footwear.
 - 2. Gloves.
 - 3. Safety glasses
 - 4. Hardhats.
 - 5. Non-disposable footwear and clothing shall remain in the work area and shall be disposed of as contaminated waste when the job is completed.
 - 6. Authorized visitors shall be provided with suitable PPE.

3.6 Prohibited Activities

- A. Dry removal or dry sweeping.
- B. Use of compressed air for cleaning.
- C. Use of high speed power tools not equipped with a HEPA-filtered local exhaust system.
- D. The abatement contractor shall not execute abatement activities without asbestos abatement design drawings that have been signed by an IDPH licensed Asbestos Designer are on the job site. Any and all changes to containment layout and placement shall not be executed until revised design drawings that have been approved and signed by an IDPH licensed Asbestos Designer are on the job site.
- E. Buffers cannot be used to remove mastic.

3.7 Work Area Isolation and Preparation

- A. General Preparation. Contractor shall:
 - 1. Post:
 - a. Caution signs meeting the specifications of OSHA 29 CFR 1926.1101 (k)(6) at any location and approaches to a location where airborne concentrations of asbestos may exceed ambient background levels.
 - b. Decontamination and work procedures in equipment rooms and clean rooms.
 - c. EPA NESHAP asbestos rules (40 CFR Part 61, subparts A & M) in the clean room.
 - d. OSHA Asbestos Construction Standards (29 CFR 1926.1101) in the clean room.
 - e. Entry and Exit Log
 - f. List of telephone numbers in the clean room for:

- 1) local hospital and/or local emergency squad.
 - 2) school security office (if applicable).
 - 3) owner representative reachable 24 hours per day.
 - 4) contractor's headquarters.
 - 5) architects or consultants directly involved in the project.
2. Secure the work area from entry by unauthorized persons.
 3. Separate Work Areas from Occupied Areas
 - a. Seal off all doorways and corridors which will not be used for passage during work.
 - b. Install IDPH required separation barriers per section 855.430 (a) in all openings larger than 4 ft by 8 ft, consisting of wood or metal framing, a sheathing material such as plywood or drywall at least 5/8" thick on the work side, and double-layer 6-mil poly, both sides. Edges shall be caulked at the floor, ceiling, walls, and fixtures to form an air-tight seal.
 - c. If the school is not totally occupied (see Section 855.430), the sheathing material may be omitted.
 4. Separate occupied areas from secured areas
 - a. Install IDPH barriers per section 855.430 (b)

B. Interior Preparation.

1. Shut down and lock out electric power to all work areas. Provide temporary power from an outside source with ground-fault circuit interrupter (GFCI) at the source.
2. Shut down and isolate heating, cooling, and ventilating air systems. Remove HVAC filters, package and dispose as asbestos waste. (Need to discuss filter removal and disposal in light of replacement costs and clarify that this applies when work happens in a mech system and not in classrooms)
3. Pre-clean movable objects with HEPA vacuums or wet cleaning and remove from the work area to a location designated by the EC or Owner *where friable ACBM is involved*.
4. Pre-clean fixed items which must remain in the work area with HEPA vacuums or wet cleaning where friable ACBM is involved.
5. Wrap all fixed objects and equipment which will remain in the work area with a minimum of one layer of six mil poly.
6. Remove/protect carpeting per environmental scope sheets.
7. Pre-clean the work area with HEPA vacuums or wet cleaning.
8. Seal off all windows, corridors, doorways, skylights, ducts, grilles, diffusers, and other penetrations or openings in walls, ceilings and floors with 6-mil poly and tape.
9. Cover floors with two layers of fire-retardant 6-mil poly with seams staggered and taped, and extending 12" up walls. Cover walls with two layers of 4-mil poly, with each wall poly overlapping each floor poly layers by 12".
10. Asbestos materials shall not be disturbed during the preparation phase.
11. Suspended ceilings shall remain in place until preparation phase is complete. Remove/protect ceiling tile per environmental scope sheets.
12. Maintain emergency and fire exits.
13. Install a five chamber Worker Decontamination Enclosure System, consisting of clean room, shower room, and dirty room separated by airlocks at least 3' wide,

all with curtained doorways, of sufficient size to serve the size of the crew, and with all features required by IDPH rules.

a. Where a remote decon unit is used (i.e. non-friable ACBM and TSI glovebag operations), the AC shall:

- 1) set up the decon unit within the work area barriers
- 2) establish a negative pressure of at least 0.02" water column (wc) between the dirty room and adjacent spaces, including the clean room
- 3) provide at least 4 air changes per hour within the decon unit
- 4) use a double suiting procedure where the workers proceed to the work area exit, HEPA-vacuum gross debris from their persons using a "buddy system" put on a clean suit (either over their dirty suit or after removing the dirty suit), assure that their footwear are free of ACM contamination, and follow a designated path to the remote decon unit.
- 5) Once in the decon unit, follow normal decontamination procedures.

14. Install an Equipment Decontamination Enclosure System, consisting of a washing station and a holding area, with curtained doorways and a lockable door.

15. Maintain a negative pressure of at least 0.02" water column (wc) between each contained area and adjacent spaces 24 hours a day using negative air machines vented to the outside, from the start of abatement work to final clearance. Backup negative air machines shall be available onsite in case of machine failure.

16. Once operational, the system shall be inspected daily with smoke tubes by the contractor. Damages and defects will be repaired immediately upon discovery.

C. Exterior Preparation (for areas that interface with interior work)

1. 6 mil plastic sheeting shall be placed over the ground, foundation, or other surfaces below the abatement area.
2. Unauthorized entry shall be prevented by using appropriate barriers, such as warning tape, fencing, or other suitable barriers.
3. Nearby air intakes, grilles, and other openings into the building interior shall be sealed off with poly and tape.
4. The contractor shall be responsible for cleanup of any adjacent areas that become contaminated as a result of the abatement activities at no additional cost to the building owner.

3.8 Abatement Procedures

A. Removal:

1. Asbestos materials shall be adequately wetted and kept adequately wet during removal.
2. ACM waste shall be bagged or containerized as it is removed.
3. Work areas shall be kept wet until visible material is cleaned up.

B. Encapsulation:

1. Damaged or missing areas of existing materials shall be repaired with non-asbestos substitutes, where appropriate.
2. Loose or hanging ACM shall be removed using appropriate removal procedures.
3. Bridging encapsulants shall be applied in accordance with manufacturer's instructions.
4. Penetrating encapsulants shall be applied to penetrate existing materials to the substrate.
5. Encapsulants shall be applied with airless spray equipment.
6. Encapsulated ACM shall be labeled as asbestos to prevent future unprotected disturbance.

C. Enclosure:

1. Locations where openings for hangers, supports, framing, or other attachments must be made in the ACM must be misted with water and kept damp to reduce airborne fiber release. Tools used to drill, cut, or otherwise disturb the ACM during attachment installation shall be equipped with a HEPA-filtered local exhaust system.
2. Loose or hanging ACM shall be removed using removal procedures.
3. Damaged areas shall be repaired with non-asbestos materials.
4. Utilities or other items requiring access shall be relocated outside of the enclosure area. Once enclosures are installed, they shall not be opened or disturbed.
5. Enclosure materials shall be impact resistant and provide an airtight barrier.
6. Enclosures shall be labeled that they contain asbestos materials to prevent future unprotected disturbance.

3.9 Cleaning and Decontamination: Cleaning and decontamination of abatement areas, excluding glovebag areas, are as follows:

A. All visible accumulations of ACM, debris, tools, and unnecessary equipment shall be removed from the work area.

B. First clean:

1. Wet clean all surfaces and remove excess water.
2. Wait 12 hours before proceeding further to allow dust and fibers to settle.
3. Remove outer layer of poly and dispose as ACM waste.
4. Completion of First Clean shall be determined and documented by the EC.

C. Second clean:

1. Wet clean all surfaces and remove excess water.
2. Wait 12 hours before proceeding further to allow dust and fibers to settle.
3. Remove inner layer of poly and dispose as ACM waste.
4. Critical barriers on windows, doors, penetrations, and other openings shall remain in place and negative air system shall remain in continuous operation until final clearance tests have passed.
5. Completion of Second Clean shall be determined and documented by the EC.

- D. Third clean:
1. Wet clean all surfaces and remove excess water.
 2. Wait 12 hours before proceeding further to allow dust and fibers to settle.
 3. Remove all tools, cleaning materials, remaining wastes from the work area. Tools and equipment shall be cleaned before removal.
 4. Third Clean shall be determined and documented by the EC.
- E. Visual inspection: EC and contractor shall jointly inspect the work area for visible residue and excess water and, if observed, repeat the clean/12 hour wait cycle until residues are not detected and work area is dry.
- F. Apply lock-down encapsulants where specified in the Documents.
- G. EC will inform AC if the work area is ready for final clearance testing.

3.10 Final Clearance

- A. Final clearance testing (aggressive methods) shall be performed after 12 hours have lapsed since the final cleaning, and when visual inspection has been completed and no visible water or condensation remains.
- B. Work areas with 260 linear feet or 160 square feet or more of ACM shall be tested using aggressive sample collection methods and Transmission Electron Microscopy (TEM) analysis, as required by AHERA and IDPH Section 855.170. The sample set must include at least 5 inside samples, 5 outside samples, 2 field blanks, and 1 sealed blank. NOTE: Large, complicated, or multi-floor contiguous work areas connected by corridors, stairways, or other connections may be tested with a larger "inside" sample set rather than full, multiple TEM tests, so long as the inside sample distribution is reasonably representative of the work area conditions.
- C. Work areas with less than 260 linear feet or 160 square feet may be tested using aggressive sample collection methods and analyzed by Phase Contrast Microscopy (PCM).
- D. If final clearance test(s) fail, the AC is responsible for repeating the cleaning sequence as necessary until final clearance tests are successful. All expenses associated with the collection and analysis of additional final clearance tests are the responsibility of the AC.

3.11 Special Procedures: Less stringent requirements may apply in a number of cases.

- A. Variances from IDPH Regulations. Variances may be requested and approved by the IDPH. These less stringent procedures may only be used when they have been requested by the Project Designer and approved by the IDPH on a case-by-case basis.
1. Variances that have been applied for the project will be listed in the Documents. These variances may or may not be approved by the IDPH.
 2. The contractor is encouraged to request additional variances it believes will be

beneficial to the project. Such requests shall be submitted to the Project Designer (CCA) as a value engineering proposal which references the IDPH regulation section, describes the procedure variations, includes information which supports the efficacy and benefits of the alternative procedures, and offers appropriate cost savings.

3. Otherwise the contractor is required to fully adhere to the requirements of this specification. Failure to obtain a variance shall not constitute a change in the requirements of these documents.

B. Operations and Maintenance Procedures where minor areas of ACM must be disturbed for building repairs, such as drilling holes in walls or floors, cleaning small areas to allow installation of fixtures, smoke detectors, etc. The Documents will state if these procedures are allowed for a particular project or task.

1. Submit an asbestos notification to the IDPH for quantities over 3 linear or square feet.
2. Licensed abatement workers are required, but a licensed abatement contractor is not mandatory for work less than 3 linear or square feet.
3. Shut down heating, cooling, or ventilating air systems to prevent fiber dispersal to other areas.
4. Seal off openings in the work area, including windows, doorways, vents, and other openings with 6 mil poly sheeting and tape.
5. Lay an impermeable drop cloth under the work.
6. Wear appropriate PPE and at least a 1/2 mask APR respirator. Note that OSHA still requires an exposure assessment and respirators that are appropriate for the expected airborne fiber concentrations.
7. Use wet removal methods.
8. Wet clean work area, leaving no visible residue.
9. Package and dispose of asbestos-containing waste as specified in the waste disposal section.
10. Work shall be considered complete following inspection by Asbestos Project Manager and Post O&M Air Sampling <0.01 f/cc.

C. Glovebag Procedure. Glovebags may be used to remove pipe and duct insulation.

1. Normal IDPH Notification requirements apply to quantities of more than 3 linear or square feet.
2. Glovebag removal will require a single layer, 6 mil poly tent containment (mini-containment) with negative pressure air filtration.
3. Monitoring will be performed for each contained area by the CCA:
 - a. 1 personal sample
 - b. 1 area sample
 - c. 1 area sample at each negative pressure machine exhaust
4. Glovebag construction shall be 6 mil poly with seamless bottom, suitable for the intended use (straight runs, fittings, elbows, vertical pipes, etc.) without modification.
5. At least two licensed workers shall perform glovebag operations.
6. Workers shall wear full body PPE and at least a 1/2 mask APR respirator. Note here, too, that OSHA still requires an exposure assessment and respirators that are appropriate for the expected airborne fiber concentrations.

7. Prior to use, all loose or damaged material adjacent to the operation shall be wrapped in two layers of 6 mil poly or otherwise be rendered intact.
8. Work Practices shall include:
 - a. installation to completely cover the circumference of pipe or other structure. Pipe insulation diameter shall not exceed 1/2 the bag working length above the glove sleeves.
 - b. smoke test for leaks and seal any leaks prior to use.
 - c. glove bag shall be single use and not moved once it is placed.
 - d. wet removal methods on the materials to be removed and wet cleaning to remove all visible ACM from the pipe or structure surfaces.
 - e. not to be used on surfaces having temperatures greater than 150°F.
 - f. spray down the interior surfaces of the bag, substrate, and removed ACM.
 - g. first and second cleaning, waiting at least 12 hours following each cleaning.
 - h. wet down remaining ACM surfaces or seal with encapsulant.
 - i. seal off the lower portion of the bag containing the ACM waste by twisting several times and sealing with tape.
 - j. collapse glovebag with a HEPA vacuum.
 - k. slip a 6 mil poly waste disposal bag over the glovebag, detach the bag from the pipe, and gooseneck-seal it in the waste disposal bag.
 - l. dispose in accordance with this specification.

D. Resilient Floor Covering. Removal of resilient floor covering may only be performed when Gross Removal is not specifically required by the Project Designer or Project Documents. Intact removal of resilient vinyl floor coverings shall be by IDPH Licensed Asbestos Workers supervised by an IDPH licensed Supervisor using heat guns, infrared heat machines or other methods that remove the floor covering in whole pieces. Buffing machines may not be used for removal of mastic. The contractor shall insure that no damage is caused to the area or equipment below the floor. Abatement procedures are as follows:

1. Submit the Floor Tile Project Notice at least 10 working days prior to the beginning of all asbestos resilient floor covering abatement projects.
2. Post signs so that the work area cannot be entered from any direction without observing a sign.
3. Isolate the work area from areas to remain occupied.
4. Install barriers of six mil plastic sheeting sealed with duct tape at all openings in the work area. Openings larger than 4' x 8' may include wood constriction barriers.
5. Install a curtained doorway at the entry to the work area, lock out electrical power to the room and supply required power with ground fault interruption protected circuits.
6. Wear, as a minimum, half-faced dual cartridge NIOSH-approved respirators and double disposable suits.
7. Remove floor covering without causing breakage. Work will stop if breakage occurs and removal will be completed by gross removal at the contractors cost.
8. Dispose of floor covering and debris as asbestos waste.
9. HEPA vacuum the work area thoroughly following completion of the removal.
10. HEPA vacuum surface of protective clothing and dispose of clothing as asbestos waste.

11. Personal air monitoring will be performed by the contractor in accordance with OSHA during ALL intact floor tile/mastic removal operations.

3.12 Waste Disposal and Equipment Load-out

A. Preparing equipment for load-out.

1. Seal openings to prevent escape of internal contamination; or open up equipment, remove filters, and make equipment interiors accessible for cleaning and decontamination.
2. HEPA vacuum and wet wipe all equipment before removal

B. Packaging asbestos wastes:

1. All asbestos-containing wastes, including removed ACM and debris, containment poly, critical barrier materials, suits, respirator filters, vacuum and negative air machine HEPA filters, water filters, and other asbestos-containing items shall be properly packaged for disposal.
2. Use double 6 mil plastic bags with "gooseneck" seal, or other impermeable containers.
3. Wrap large or irregular items in 2 layers of 6 mil poly sheeting, seal with tape, and affix required labeling.
4. Sharp, jagged, or other items (floor tiles, screws, nails, metal debris, wood etc.) that may puncture poly shall be packaged in rigid impermeable containers such as drums or boxes, or wrapped in burlap or other protective covering before sealing in double bags or double layers of 6 mil poly.
5. Label containers:
 - a. OSHA warning label.
 - b. DOT performance-oriented hazardous material label.
 - c. Name and address of generator and abatement location.

C. Removing items from the work area:

1. Packaged asbestos wastes, non-porous debris (such as ceiling grid, doors, hardware, and other items that can be decontaminated), and equipment shall be wet cleaned, moved into the equipment decontamination enclosure system, cleaned a second time, and moved into the holding area.
2. Containers and equipment shall be removed from the holding area by workers in clean PPE and respirators who enter from the uncontaminated side (outside). The equipment decontamination enclosure system shall not be used to enter or exit the work area.
3. Waste shall be placed in a cart and covered. A plastic runner shall be placed on the floor to the waste storage area. The loaded cart shall be carefully taken to and unloaded into the enclosed waste storage container.

D. Storage of packaged asbestos wastes shall be in a completely enclosed dumpster or other suitable container that can be secured. The secured area shall be kept locked at all times to prevent unauthorized access.

E. Shipment of items from the project.

1. Decontaminated tools and equipment may be shipped by normal carrier to warehouse, another jobsite, or other destination.
2. For asbestos wastes:
 - a. Line shipping container with 6 mil poly prior to loading packaged asbestos wastes.
 - b. Post NESHAP placards during loading.
 - c. Persons performing loading operations shall wear PPE and respirators.
 - d. Containers and packages shall be tightly packed together to prevent shifting during transport. Large components or heavy items shall be secured to prevent shifting, and shall not be stacked on top of bags.
 - e. Execute the NESHAP-required Waste Shipment Record (WSR) to be signed by the generator, transporter, and landfill. All WSRs shall be returned to CCA within 30 days of shipment.
 - f. ACBM waste shall be transported from the work site directly to the landfill.

F. Disposal of packaged asbestos wastes.

1. Only landfills approved and permitted by Illinois for accepting asbestos wastes may be used for disposal.

3.13 Demobilization

- A. CCA shall inspect the work area for evidence of visible debris prior to releasing the area for tear-down. Detection of contamination will require additional cleaning and re-testing of the work area.
- B. Remove critical barriers and seals.
- C. Restore previously-removed items, if specified in the Documents:
 1. Re-mount fixtures and other previously dismounted objects.
 2. Return moveable objects to their original locations.
 3. Install new filters in HVAC systems where filters were previously removed.
 4. Re-establish electric systems and other utilities that were shut down or locked out.
- D. A punch list walk-through shall be conducted for each cleared work area within two working days of clearance testing by CCA, contractor, and school official. All punch list items shall be completed within five working days of walk through.

ATTACHMENT:

- Appendix A Additional Design Details
- Appendix B Environmental Scope & Drawings

END OF SECTION

APPENDIX A

ADDITIONAL DESIGN DETAILS

ASBESTOS ABATEMENT WORK
ROCKFORD PUBLIC SCHOOLS
BROOKVIEW ELEMENTARY SCHOOL
2016 NEW ADDITION AND INTERIOR RENOVATIONS

APPENDIX A: ADDITIONAL DESIGN DETAILS

	<u>Number of Pages</u>
1. Environmental Scope Sheets	4
2. Environmental Scope of Work Drawings	3

Additional Design Details

1. The contractor is responsible for verifying quantities in the field before bidding. Any questions about the scope or clarifications shall be obtained from the Project Designer prior to bidding. Any interpretations of the design documents shall only be made by the Project Designer.
2. The abatement contractor is responsible for all security to the work area(s) during the environmental abatement activities.
3. Abatement contractor shall execute the NESHAP required Waste Shipment Record (WSR) for ALL floor tile waste to be signed by the generator, transporter and landfill. All WSRs shall be returned to Carnow Conibear within 30 days of shipment.
4. Contractor shall label bags and/or containers for asbestos waste with the following information:
 1. Generator Name
 2. Contractor Name
 3. Project Location
 4. Month and year of contract work.

EC shall secure sample of label and retain as part of daily log/final report

5. The environmental scope of work drawings detail locations of decontamination units, separation barriers, negative air exhaust, etc. The contractor shall follow the design as it pertains to the drawings. Any deviations from the drawings must be requested in writing, no less than ten days prior to commencement of abatement activities, and signed off by Project Designer and sent to IDPH prior to any work activities.
6. Contractor to erect separation/construction barriers in a manner that will secure work areas from access by unauthorized personnel, confine any necessary decontamination units, associated water and electrical hook ups, water filtration, water discharge, negative air exhaust, etc.
7. Contractor is NOT responsible for the removal, relocation and replacement of area/room contents necessary to complete this project. All furniture, room contents and personal items shall be removed by district prior to mobilization.
8. This project is scheduled for Rockford Public Schools Summer Break 2016 (Two Phases).

ASBESTOS ABATEMENT WORK
ROCKFORD PUBLIC SCHOOLS
BROOKVIEW ELEMENTARY SCHOOL
2016 NEW ADDITION AND INTERIOR RENOVATIONS

APPENDIX A: ADDITIONAL DESIGN DETAILS

9. Contractor responsible for the cleaning and proper detergent washing of concrete floor substrate following the removal of asbestos containing flooring adhesives. Contractor shall utilize Envirowash Formula 805 manufactured by Sentinel Products, Inc. or similar (See Attached). Abatement Supervisor and Asbestos Project Manager shall document cleaning activities and products utilized in the required project logs.

Project and Building Information for IDPH Notifications

Rockford Public Schools – Swan Hillman Elementary School

IDPH Building ID#	04-101-2050-2018
Building Address	1750 Madron Road Rockford, Illinois 61107
Building Size	Approx. 56,500 SF
Age of Building	Approx. 50 years
Number of Floors	2
Owner	Rockford Public Schools - District 205 501 7 th Street, Rockford, Illinois 61104 Contact: Ms. Anne Ford Environmental Health & Safety Coordinator Phone: 1-815-966-3010
Project Designer	John M. Dobby, CIH, CSP 100-9261
Project Manager	To Be Determined Call CCA at time of Notification
Air Sampling Professional	To Be Determined Call CCA at time of Notification
Building Inspector ID#	Mr. Daniel Juneau IDPH# 100-03613
Name of Analytical Lab	CEI Labs

TECHNICAL LITERATURE PRODUCT Part #40320

Amerisafe

SAFETY & INSULATION SUPPLIES & SERVICES

High Strength Formula

LOW ODOR MASTIC REMOVER

- ◆ VOC COMPLIANT
- ◆ WORKS FAST
- ◆ RINSES CLEAN
- ◆ BIODEGRADABLE



SPECIFICATIONS

PART #.....40320
APPEARANCE.....CLEAR TO AMBER
ODOR.....LOW/CHARACTERISTIC
FLASHPOINT.....145° F PMCC MINIMUM
AVAILABILITY.....5 GL PLS/55 GAL DRUMS
SHIPPING.....CLEANING COMPOUND NOS
COVERAGE.....100-200 SQ. FT PER GL

Amerisafe High Strength Low Odor VOC Compliant Mastic Remover is a new formula designed to remove black mastic on asbestos abatement jobs. This new formula is biodegradable and works faster than traditional mastic removers.

CAUTION: Combustible Liquid. For industrial use only. Keep out of reach of children. Contains Petroleum Distillates and Glycol Ethers. Avoid contact with eyes and skin. Use only in well ventilated areas. Avoid breathing of vapor or mist, especially for those with asthma or allergies. Keep away from heat and open flames. Do not transfer to unmarked containers.

DIRECTIONS: Apply Amerisafe High Strength Low Odor VOC generously to the mastic. Allow enough time to penetrate and soften or liquify the mastic. Remove the mastic mixture from the floor with scrapers or squeegees. If necessary, resapply and agitate. Remove liquid using absorbents. Wash and rinse the floor with plenty of soap and water. Allow floor to completely dry before re-flooring.

DISPOSAL: Evaluation of resulting waste or mixtures, at the time of disposal, is required to be disposed of according to local, county, state and federal regulations.

HMIS CODE:

Health: 1 Flammability: 2 Reactivity: 0

V.O.C.—COMPLIANT PRODUCT This Floor and Wall Covering Adhesive Remover contains less than 5% V.O.C content by weight, in accordance with the requirements set forth by the California Air Resources Board (CARB) and the Ozone Transport Commission (OTC) effective 1-1-2009

AMERISAFE INC. 3390 Enterprise Court
Aurora, IL 630-862-2600

MATERIAL SAFETY DATA SHEET

Hazard rating:	HMS
HEALTH	1
FLAMMABILITY	2
REACTIVITY	0
PERSONAL PROTECTION	H

SECTION 1

Amerisafe Low Odor Mastic Remover
 Manufactured for: Amerisafe, Inc.
 3990 Enterprise Ct, Aurora, IL 60504
 630-862-2600

PRODUCT IDENTIFICATION

24 HOUR EMERGENCY
 RESPONSE NUMBER
 1-866-359-5661

SECTION 2

NAME
 PETROLEUM DISTILLATES
 AROMATIC HYDROCARBONS

CAS

64742-47-8
 64742-94-5

HAZARD IDENTIFICATION

EXPOSURE GUIDELINES

100 PPM (525 mg/m3) is a recommended PEL for 8-hour TWA
 100 PPM, 525 MG/M3 for 8 hour TWA

SECTION 3

BOILING POINT (F) -----470-540 °F
 VAPOR PRESSURE (mm Hg)-----less than 0.5mm/Hg @ 68°F
 ODOR -----mild/characteristic
 % VOLATILE-----not greater than 15g/L*

PHYSICAL DATA

VAPOR DENSITY -----heavier than air
 EVAPORATION RATE -----slower than ether
 WEIGHT PER GALLON -----7.00
 APPEARANCE -----clear

*when determining VOC concentrations in accordance with the requirements set forth by the California Air Resource Board (CARB) and Ozone Transport Commission (OTC)

SECTION 4

FLASH POINT (METHOD USED)

145 degrees F. Method PMCC. Note: Minimum

FIRE AND EXPLOSION DATA

AUTO IGNITION TEMPERATURE

421 degrees F. Note: Approximate

EXTINGUISHING MEDIA Small fires: Extinguish with dry chemical, CO2 or foam. Large fires: The use of dry chemical or foam is recommended.

SPECIAL FIRE FIGHTING PROCEDURES AND PRECAUTIONS The use of SCBA is recommended for fire fighters. Water spray may be useful in minimizing vapors and cooling containers exposed to heat and flame. Avoid spreading burning liquid with water used for cooling purposes.

UNUSUAL FIRE AND EXPLOSION This material is a NFPA IIIA combustible liquid.

SECTION 5

HEALTH HAZARD INFORMATION/FIRST AID

EYE CONTACT Immediately flush eyes with plenty of water for at least 15 minutes. If irritation persists, seek medical attention.

SKIN Flush skin with plenty of water, use soap if available. Remove contaminated clothing. Call a physician if irritation persists. Wash clothing before reuse.

INHALATION Remove to fresh air. If breathing has stopped, administer artificial respiration. Keep at rest. Get prompt medical attention.

INGESTION If swallowed, DO NOT induce vomiting. Keep at rest. Get prompt medical attention.

ASPIRATION HAZARD This material can enter lungs during swallowing or vomiting and cause lung inflammation and damage. THIS MATERIAL HAS NOT BEEN IDENTIFIED AS A CARCINOGEN OR PROBABLE CARCINOGEN BY NTP, IARC, OR OSHA.

SECTION 6

HEALTH HAZARDS/ROUTES OF ENTRY

EYE CONTACT Direct contact with this liquid may cause irritation.

SKIN CONTACT Repeated or prolonged contact with liquid may cause irritation, reddening and dermatitis.

INHALATION High vapor concentrations may cause headaches, stupor, irritation of throat and kidney effects. Extreme aspiration into the lungs may cause pneumonia or death.

INGESTION This material causes irritation of the stomach and intestines and signs of nervous system depression.

Acute exposure may result in narcosis, pulmonary edema and severe kidney and liver damage.

SECTION 7

SPECIAL PROTECTION INFORMATION

VENTILATION Air contaminant levels should be controlled below the PEL or TLV for this product. (See Section 2) Mechanical ventilation may be necessary if working with this product in enclosed areas.

RESPIRATORY PROTECTION Respiratory protection may be necessary to minimize exposure to organic vapors. Use NIOSH approved organic vapor air purifying respirator, self contained breathing apparatus, or air supplied respirators dependent on concentration.

PROTECTIVE GLOVES The use of impermeable gloves (Nitril or Neoprene) is recommended to prevent contact and possible irritation.

EYE PROTECTION When contact with liquid is possible, use a face shield, otherwise use safety glasses or goggles.

PROTECTIVE EQUIPMENT It is suggested that a clean source of water is available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed.

SECTION 8

REACTIVITY DATA

STABILITY - Stable

HAZARDOUS POLYMERIZATION - Will not occur.

INCOMPATIBILITY - Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS - Carbon monoxide and/or carbon dioxide.

SECTION 9

SPILL OR LEAK PROCEDURES

Stay upwind and away from spill. Keep all sources of ignition and hot metal surfaces away from spill. If spill is indoors, ventilate area of spill. Foam, especially high expansion foam, may be used to suppress vapors. Keep contained and dispose of in accordance with local, county, state and federal regulations.

SECTION 10

SHIPPING INFORMATION

DOT PROPER SHIPPING NAME: Combustible Liquid, n.o.s.

DOT HAZARD CLASS: Combustible Liquid

DOT IDENTIFICATION NUMBER: NA 1993 (not regulated in pkg. of less than 119 gal.)

PACKING GROUP: III

SECTION 11

STORAGE AND SPECIAL PRECAUTIONS

Keep containers tightly closed. Keep containers cool, dry and away from sources of ignition. Use and store this product with adequate ventilation. Avoid inhalation of vapors. Do not pressurize, cut weld, braze, solder, drill, grind or expose such containers to heat, flame, sparks or other sources of ignition. "Empty" drums should be completely drained, properly bunged and properly shipped to a qualified drum reconditioner.

SECTION 12

DOCUMENTARY INFORMATION

The information in this document is believed to be correct as of the date issued. However, no warranty of merchantability, fitness for any particular purpose, or any other warranty is expressed or is to be implied regarding the accuracy or completeness of this information, the results to be obtained from the use of this product or the hazards related to its use. This information and product are furnished on the condition that the person receiving them shall make his own determination as to the suitability of the product for his particular purpose and on the condition that he assume the risk of his use thereof.



Designed to Meet HUD Guidelines
And Phosphate Rules for
Maryland & New York.

HIGH PERFORMANCE ECO-FRIENDLY PRODUCTS

ENVIROWASH

FORMULA

805

CONCENTRATE

PRODUCT DESCRIPTION:

SENTINEL 805 is specifically formulated and highly concentrated. It has been designed to meet both HUD Guidelines and Phosphate rules for Maryland and New York. It can be used for lead and mercury dusts clean-up and for final surface preparation of sub-floors following mastic removal on asbestos abatement jobs.

REMOVES LEAD
HIGHLY CONCENTRATED
ASPHALT ADHESIVE CLEAN-UP

DIRECTIONS: (Always follow product label instructions for best results.)

FOR LEAD ABATEMENT: Mix 1 part 805 to 20 parts of water to meet HUD recommended dilution ratio (approximately 1 quart of 805 to 5 gallons of water). 805 should be used before encapsulating, after active abatement has concluded and for general maintenance in reducing exposure to lead dust.

To Use: Wash all surfaces, ceilings, walls, floors, windows, doors, fixtures, cabinets, etc. with EnviroWash solution. Starting with the ceiling, work down to the floor. The cleaning solution should be changed (at least) after each room has been washed, and more often in larger areas. Each time the mixture is changed, workers must ensure that the used water does not re-contaminate the environment. 805 may be applied with sponges, rags or mops, depending on the area to be cleaned. Protect exposed skin and eyes, especially when working overhead. Rinse if necessary. **Try Sentinel EnviroTowels if cross-contamination, mixing and diluting, or lack of water is a problem.**

FOR ASPHALT ADHESIVE RESIDUE REMOVAL: Mix from 5 to 10 parts of water to 1 part of 805, depending on the amount of residue left following adhesive removal. Pour mixture onto the floor to be cleaned. Use a broom, manual stripper pad or rotating floor scrubber with stripper pads to scrub the floor until clean. Wash and rinse the floor, changing the water as needed to ensure a clean surface. Allow to dry before resurfacing.



For additional information or assistance with this product, please call Sentinel Customer Service at, **800-373-0633**.

SPECIFICATIONS:

APPEARANCE	GREEN
APPROXIMATE BOILING POINT	215-290°F
ODOR	NONE
SPECIFIC GRAVITY (60°F)	.806
FLASHPOINT	NONE
pH	10.25

See reverse side for
Material Safety Data Sheet (MSDS)

800-373-0633
www.senpro.com

Sentinel Products, Inc.
51 NE 77th Ave
Minneapolis MN 55432



MATERIAL SAFETY DATA SHEET Sentinel Products Inc. - 51 NE 77th Ave. Minneapolis, MN 55432 - (763)571-0630 - (FAX)763-571-1819			
SECTION 1 PRODUCT IDENTIFICATION & EMERGENCY INFORMATION			
PRODUCT NAME: SENTINEL 805 EnviroWash		EMERGENCY MEDICAL AND SPILL NUMBER: 1-866-359-5661	
SYNONYMS: DETERGENT			
SECTION 2 COMPONENT & EXPOSURE DATA			
COMPONENT	CAS#	PEL	TLV
TRISODIUM PHOSPHATE DODECAHYDRATE (1.29%)	010101-89-0	Nuisance dust	15mg/m(3) 10mg/m(3)
<i>*SUBJECT TO THE REPORTING REQUIREMENTS OF SARA 312. TRISODIUM PHOSPHATE @ 100% IN POWDER FORM IS A NUISANCE DUST.</i>			
SECTION 3 EMERGENCY AND FIRST AID PROCEDURES			
EYE CONTACT: If this product comes in contact with eyes, gently flush with large quantities of water for at least 15 minutes. If irritation persists, seek immediate medical attention.			
SKIN CONTACT: Remove contaminated clothing. Cleanse affected area(s) thoroughly by washing with mild soap and water. If irritation or redness develops and persists, seek medical attention.			
INHALATION: If breathing difficulties, dizziness, or light-headedness occur when working in areas with high vapor concentration, victim should seek air free of vapors. If breathing stops, begin artificial respiration and seek immediate medical attention.			
INGESTION (SWALLOWING): If this product is swallowed, do not induce vomiting. Seek immediate medical advice and/or attention.			
SECTION 4 HEALTH HAZARDS & ROUTES OF ENTRY			
EYE CONTACT: This product may cause irritation.			
SKIN CONTACT: This product may cause skin irritation. Persons with pre-existing skin disorders may be more susceptible to the effects of this material.			
INHALATION: This product may cause headaches.			
INGESTION (SWALLOWING): If this product is swallowed, do NOT induce vomiting. Seek immediate medical advice and/or attention.			
COMMENTS: THIS SUBSTANCE HAS NOT BEEN IDENTIFIED AS A CARCINOGEN OF PROBABLE CARCINOGEN BY NTP, IARC, OR OSHA.			
SECTION 5 SPECIAL PROTECTION INFORMATION			
VENTILATION: Local.			
RESPIRATORY INFORMATION: Dust particle mask.			
PROTECTIVE GLOVES: The use of gloves impermeable to this material is advised to prevent skin contact and possible irritation.			
EYE PROTECTION: Approved eye protection to safeguard against potential eye contact, irritation or injury is recommended.			
OTHER PROTECTIVE EQUIPMENT: It is suggested that a source of clean water be available in the work area for flushing eyes and skin. Impervious clothing should be worn as needed.			
SECTION 6 REACTIVITY DATA			
STABILITY: Stable		HAZARDOUS POLYMERIZATION: Will not occur.	
INCOMPATIBILITY (MATERIALS TO AVOID): None known.			
HAZARDOUS DECOMPOSITION PRODUCTS: Oxides of carbon and phosphorous.			
SECTION 7 SPILL OR LEAK PROCEDURES			
PRECAUTION IN CASE OF LEAK OR SPILL: Mop up as much as possible, then flush residue with a large volume of water.			
WASTE DISPOSAL METHOD: Dispose of product in accordance with applicable local, county, state and federal regulations.			
SECTION 8 STORAGE, SHIPPING, & REGULATORY INFORMATION			
HANDLING & STORAGE: Keep containers tightly closed. Keep containers cool and dry. DOT PROPER SHIPPING NAME: Cleaning Compound, NOI DOT HAZARD			
CLASS: Not a regulated material.			
HAZARD RATINGS	HMIS	NFFA	
HEALTH	1	1	
FLAMMABILITY	0	0	
REACTIVITY	0	0	
SECTION 9 FIRE AND EXPLOSION HAZARD			
FLASH POINT (TEST METHOD): None to boiling.		AUTO IGNITION TEMPERATURE: N/A	
FLAMMABLE LIMITS IN AIR, % BY VOL. LOWER: N/A		UPPER: N/A	
EXTINGUISHING MEDIA: Use foam CO ₂ or dry chemical fire fighting apparatus.			
FIRE AND EXPLOSION HAZARD: Not determined.			
FIRE FIGHTING PROCEDURES: The use of a self-contained breathing apparatus is recommended for fire fighters. Water may be unsuitable as an extinguishing media, but helpful in keeping adjacent containers cool.			
UNUSUAL FIRE AND EXPLOSION HAZARD: N/A			
SECTION 10 PHYSICAL DATA			
BOILING POINT (°F): 215-290° F	APPEARANCE & ODOR: Green-Slight/Characteristic	SPECIFIC GRAVITY (H ₂ O=1): ~1.03	
VAPOR PRESSURE: Not known.	MELTING POINT: N/A	CONTAINS 0/g VOC	
SOLUBILITY IN WATER: Complete.	EVAPORATION RATE: Slower than ether.	VAPOR DENSITY: Not known.	
SECTION 11 DOCUMENTARY INFORMATION			
DISCLAIMER OF EXPRESSED OR IMPLIED WARRANTIES: The information in this document is believed to be correct as of the date issued. However, no warranty of merchantability, fitness for any particular purpose, or any other warranty is expressed or is to be implied regarding the accuracy or completeness of this information, the results to be obtained from the use of this information or the product, the safety of this product or the hazards related to its use. This information and product are furnished on the condition that the person receiving them shall make his/her own determination as to the suitability of the product for his/her particular purpose and on the condition he/she assume the risk of his use thereof.			

APPENDIX B

ENVIRONMENTAL SCOPE OF WORK & DRAWINGS

ENVIRONMENTAL SCOPE ROCKFORD PUBLIC SCHOOLS

Environmental Consultant: Carnow, Conibear & Assoc., Ltd. Date: February 11, 2016
Project # A139670048-02

School Building: Brookview Elementary School; 1750 Madron Road, Rockford, Illinois 61107

Room ID/Name: 1st Floor - Classroom #8 **PHASE I**

Substrate	Component	Walls				Floor	Ceiling	Response Action	Comments
		N	E	S	W				
Any	Floor Tile & Mastic					X		<u>ASBESTOS ABATEMENT</u> Selective Removal and disposal per Specification 02131. See Drawing ASB-1 for location & details	Includes only the area required for installation of new elevator. General Contractor shall mark exact dimensions prior to abatement

Phase I Abatement is scheduled for Rockford Public Schools Summer Break 2016. Abatement anticipated to begin the week of June 6, 2016. ALL Phase I abatement work shall be completed in no more than 10 work shifts.

Normal Typical Work hours shall be 7:00 am to 3:30 pm or 3:30 pm to 12:00.am (Monday thru Friday).

ADDITIONAL INFORMATION

- * District will provide electrician for connections/disconnections of any electrical necessary to support abatement. Abatement Contractor shall supply all parts and equipment and coordinate connections/disconnections directly with RPS electrician.
- * Removal and relocation of any building contents necessary to accommodate abatement shall be the responsibility of RPS 205.
- * When gross removal methods are utilized for removal of flooring materials, Contractor shall perform all work in strict accordance with all IDPH school rules and specification 02131. If non-friable removal methods are selected (Specification Section 3.11 (D), Contractor responsible for the isolation of the work area(s) with critical seals, signage, and the security of the work areas to eliminate access by unauthorized personnel. HEPA filtered negative air machines shall be set up within the work areas and run continuously through the completion of all non-friable work. All necessary room contents to be removed by the school staff prior to contract work.

Designer: John M. Dobby, CIH, CSP

Signature: _____

ENVIRONMENTAL SCOPE ROCKFORD PUBLIC SCHOOLS

Environmental Consultant: Carnow, Conibear & Assoc., Ltd. Date: February 11, 2016

Project # A139670048-02

School Building: Brookview Elementary School; 1750 Madron Road, Rockford, Illinois 61107

Room ID/Name: 1st Floor Storage Room, Bathrooms and Mechanical Room **PHASE I**

Substrate	Component	Walls				Floor	Ceiling	Response Action	Comments
		N	E	S	W				
Any	Pipe Insulation	X	X	X	X		X	<u>ASBESTOS ABATEMENT</u> Selective Glovebag Removal and disposal per Specification 02131. See Drawing ASB-1 for location & details	Includes localized dimensions of insulation in the 1 st floor storage room, 1 st floor bathrooms and 1 st floor mechanical room. General Contractor responsible for the demolition of plaster ceilings in bathrooms and storage room prior to abatement. General Contractor responsible to mark exact dimensions of insulation prior to abatement.

Phase I Abatement is scheduled for Rockford Public Schools Summer Break 2016. Abatement anticipated to begin the week of June 6, 2016. ALL Phase I abatement work shall be completed in no more than 10 work shifts.

Normal Typical Work hours shall be 7:00 am to 3:30 pm or 3:30 pm to 12:00 am (Monday thru Friday).

ADDITIONAL INFORMATION

- * District will provide electrician for connections/disconnections of any electrical necessary to support abatement. Abatement Contractor shall supply all parts and equipment and coordinate connections/disconnections directly with RPS electrician.
- * Removal and relocation of any building contents necessary to accommodate abatement shall be the responsibility of RPS 205.

Designer: John M. Dobby, CIH, CSP

Signature: _____

ENVIRONMENTAL SCOPE ROCKFORD PUBLIC SCHOOLS

Environmental Consultant: Carnow, Conibear & Assoc., Ltd. Date: February 11, 2016

Project # A139670048-02

School Building: Brookview Elementary School; 1750 Madron Road, Rockford, Illinois 61107

Room ID/Name: 2nd Floor Classroom #14 **PHASE I**

Substrate	Component	Walls				Floor	Ceiling	Response Action	Comments
		N	E	S	W				
Any	Carpet, Floor Tile & Mastic					X		<u>ASBESTOS ABATEMENT</u> Gross Removal and disposal per Specification 02131. See Drawing ASB-2 for location & details	

Phase I Abatement is scheduled for Rockford Public Schools Summer Break 2016. Abatement anticipated to begin the week of June 6, 2016. ALL Phase I abatement work shall be completed in no more than 10 work shifts.

Normal Typical Work hours shall be 7:00 am to 3:30 pm or 3:30 pm to 12:00 am (Monday thru Friday).

ADDITIONAL INFORMATION

- * District will provide electrician for connections/disconnections of any electrical necessary to support abatement. Abatement Contractor shall supply all parts and equipment and coordinate connections/disconnections directly with RPS electrician.
- * Removal and relocation of building contents necessary to accommodate abatement shall be the responsibility of RPS 205.
- * Removal by Non Friable work practices not permitted in Classroom #14.

Designer: John M. Dobby, CIH, CSP

Signature: _____

ENVIRONMENTAL SCOPE ROCKFORD PUBLIC SCHOOLS

Environmental Consultant: Carnow, Conibear & Assoc., Ltd. Date: February 11, 2016

Project # A139670048-02

School Building: Brookview Elementary School; 1750 Madron Road, Rockford, Illinois 61107

Room ID/Name: Gymnasium **PHASE II**

Substrate	Component	Walls				Floor	Ceiling	Response Action	Comments
		N	E	S	W				
Any	Floor Tile & Mastic					X		<u>ASBESTOS ABATEMENT</u> Removal and disposal per Specification 02131. See Drawing ASB-3 for location & details	Includes North end of gymnasium only. General Contractor responsible to mark exact dimensions prior to abatement.

Phase II Abatement is scheduled for Rockford Public Schools Summer Break 2016. Abatement anticipated to begin after July 4, 2016 and before August 1, 2016. ALL Phase II abatement work shall be completed in no more than 5 work shifts.

Normal Typical Work hours shall be 7:00 am to 3:30 pm or 3:30 pm to 12:00 am (Monday thru Friday).

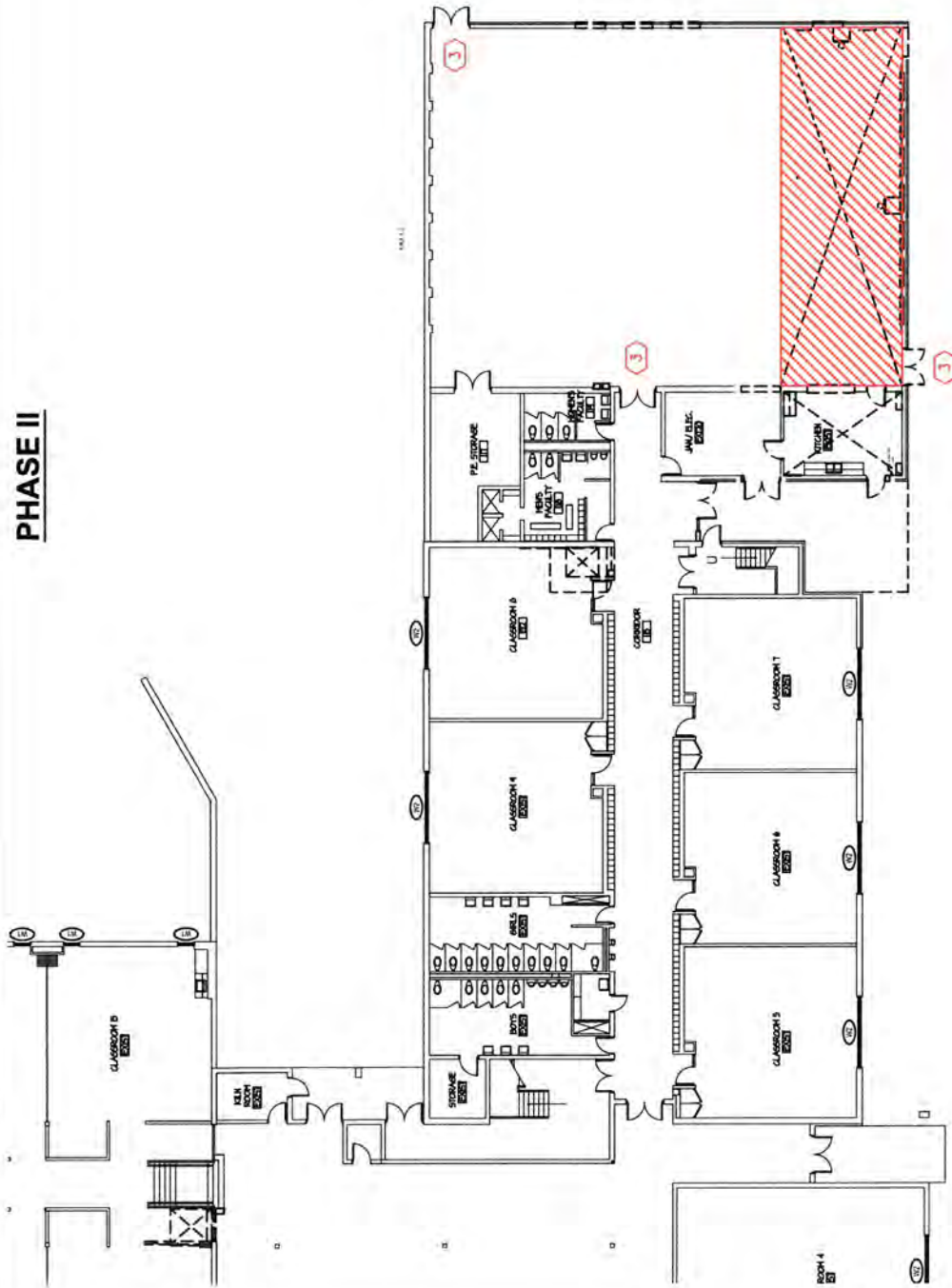
ADDITIONAL INFORMATION

- * District will provide electrician for connections/disconnections of any electrical necessary to support abatement. Abatement Contractor shall supply all parts and equipment and coordinate connections/disconnections directly with RPS electrician.
- * Removal and relocation of building contents necessary to accommodate abatement shall be the responsibility of RPS 205.
- * When gross removal methods are utilized for removal of flooring materials, Contractor shall perform all work in strict accordance with all IDPH school rules and specification 02131. If non-friable removal methods are selected (Specification Section 3.11 (D), Contractor responsible for the isolation of the work area(s) with critical seals, signage, and the security of the work areas to eliminate access by unauthorized personnel. HEPA filtered negative air machines shall be set up within the work areas and run continuously through the completion of all non-friable work. All room contents to be removed by the school staff prior to contract work.

Designer: John M. Dobby, CIH, CSP

Signature: _____

PHASE II



FIRST FLOOR PARTIAL PLAN:
ASBESTOS ABATEMENT



SCOPE OF WORK: Phase II Areas

ASBESTOS ABATEMENT - Selective removal and disposal of asbestos containing floor tile and mastic from North Gymnasium area per specification 02131, and all applicable IDPH, IEPA and OSHA regulations.

ABATEMENT SCHEDULE: Phase II

Abatement shall commence during RPS205 Summer Break (between July 5th, 2016 and August 1st, 2016). Abatement in Gymnasium shall be completed in five (5) work shifts.

ASBESTOS ABATEMENT KEY NOTES:

INDICATES LOCATION OF FIVE (5) CHAMBER WORKER DECONTAMINATION UNIT

INDICATES LOCATION OF TWO CHAMBER WASTE-OUT

INDICATES LOCATION OF AIRLOCK UNIT

INDICATES LOCATION OF NEGATIVE AIR EXHAUST

INDICATES LOCATION OF CONTAINMENT BARRIER PER IDPH 855.430(a)

INDICATES LOCATION OF SECURITY BARRIER PER IDPH 855.430(b)

CONTRACTOR TO SECURE DOORWAY AND CONTROL ACCESS

INDICATES LOCATION OF FLOOR TILE AND FLOOR TILE MASTIC REMOVAL AREA

INDICATES LOCATION OF NON REMOVAL WORK AREA

GENERAL NOTES:

- Access to work areas and exact project phasing dates to be determined by building owner, general contractor and Carnow Conibeat.
- Locations shown are approximate only.
- Worker decontamination enclosure systems shall be constructed in strict accordance with IDPH school rules and regulations. Clean room shall be sized to accommodate the needs and size of the work crew. Donning and Doffing of PPE outside of clean room is strictly prohibited.
- When gross removal methods area utilized for abatement, Contractor shall perform all work in strict accordance with all IDPH school rules and specification 02131. If non-riable removal methods are utilized (Specification Section 3.11 (D)), Contractor shall be responsible for the isolation of work area(s) with critical seals, signage, and the security of the work areas to eliminate access by unauthorized personnel. HEPA filtered negative air machines shall be set up within the work areas and run continuously through the completion of all non-riable work. All room contents to be removed by the school staff prior to contract work.

KEY PLAN:



CLIENT: Rockford Public Schools 501 7th Street Rockford, Illinois 61104	PROJECT NAME: Brookview Elementary School 1750 Madron Road Rockford, Illinois 601107	SHEET NAME: ASBESTOS ABATEMENT - PHASE II	DRAWN BY: EBB REVISOR BY: EBB CHECKED BY: DJ DATE: 02-01-16	DATE: 02-01-16	CHECKED BY: DJ DATE: 02-10-16	DESIGNED BY: John Dobby IDPH #: 100-9261	DESIGNER SIGNATURE: <i>John M. Dobby</i>	CCA PROJECT NUMBER A1396700556	DATE 1/26/2016	SHEET NUMBER ASB-3



PHASE I

SCOPE OF WORK: Phase I Areas

ASBESTOS ABATEMENT - Selective removal and disposal of asbestos containing floor tile and mastic from 1st Floor Classroom #8 per specification 02131, and all applicable IDPH, IEPA and OSHA regulations.

ASBESTOS ABATEMENT - Removal and disposal of all carpeting and underlying asbestos containing floor tile and mastic from 2nd Floor Classroom #14 per specification 02131, and all applicable IDPH, IEPA and OSHA regulations.

ASBESTOS ABATEMENT - Selective glovebag removal and disposal of asbestos containing pipe insulation from 1st Floor Janitor/Storage Room, Bathrooms and Mechanical Room.

ABATEMENT SCHEDULE: Phase I

Abatement shall commence during RPS205 Summer Break (approximately June 8th, 2016)

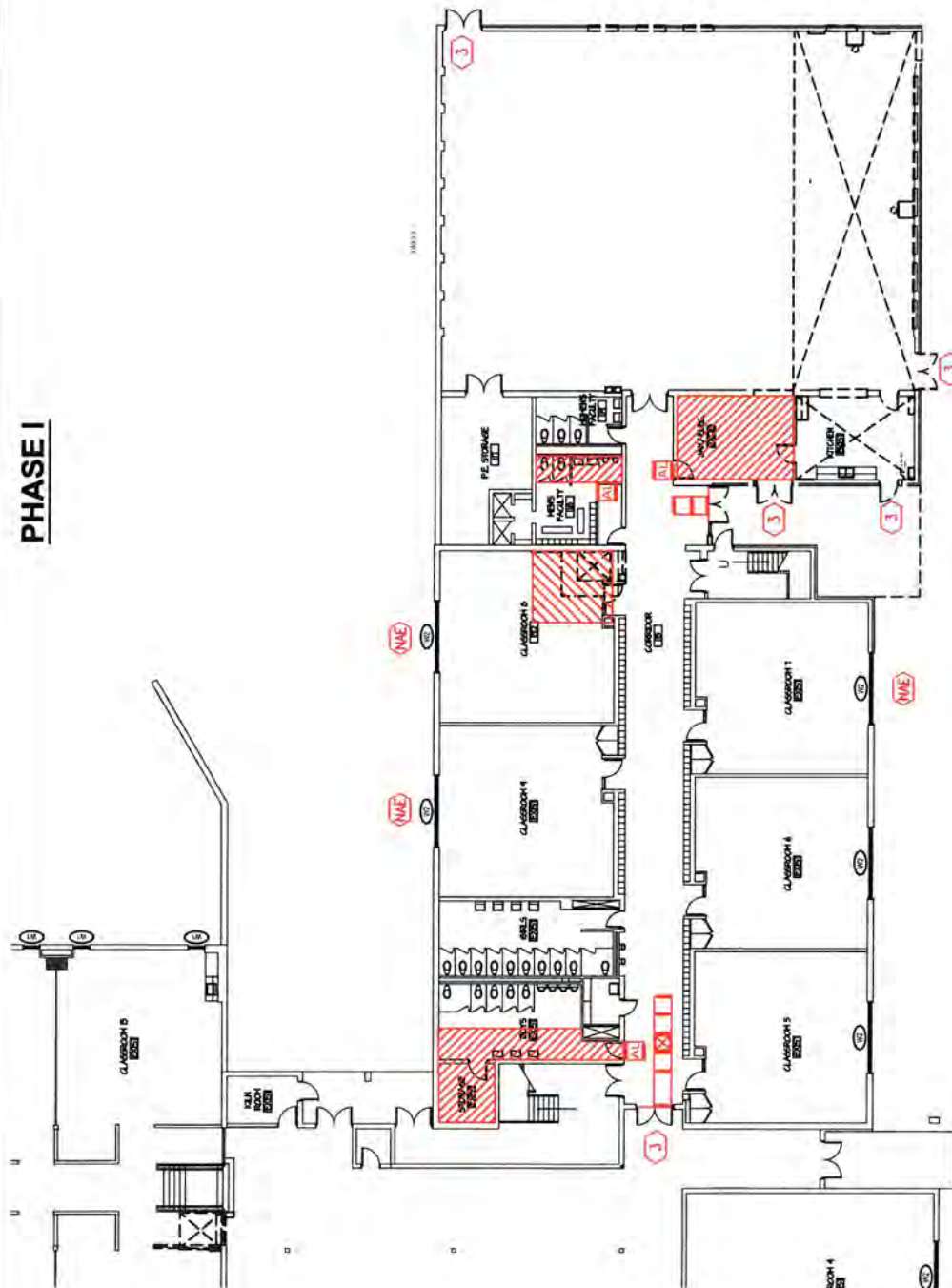
All work shall be completed in 10 work shifts.

ASBESTOS ABATEMENT KEY NOTES:

- INDICATES LOCATION OF FIVE (5) CHAMBER WORKER DECONTAMINATION UNIT
- INDICATES LOCATION OF TWO CHAMBER WASTE-OUT
- INDICATES LOCATION OF AIRLOCK UNIT
- INDICATES LOCATION OF NEGATIVE AIR EXHAUST
- INDICATES LOCATION OF CONTAINMENT BARRIER PER IDPH 855.430(a)
- INDICATES LOCATION OF SECURITY BARRIER PER IDPH 855.430(b)
- CONTRACTOR TO SECURE DOORWAY AND CONTROL ACCESS
- INDICATES LOCATION OF FLOOR TILE AND FLOOR TILE MASTIC REMOVAL AREA
- INDICATES LOCATION OF GLOVEBAG ASBESTOS PIPE INSULATION REMOVAL AREA

GENERAL NOTES:

- Access to work areas and exact project dates phasing to be coordinated by building owner, general contractor and Carnow Conibeat and Assoc.
- Glued down carpeting is present in 2nd floor classroom (Gross removal only this area).
- Worker decontamination enclosure systems shall be constructed in strict accordance with IDPH school rules and regulations. Clean room shall be sized to accommodate the needs and size of the work crew. Donning and Doffing of PPE outside of clean room is strictly prohibited.
- Demolition of non asbestos plaster ceilings in Janitor/Storage Room and Bathroom shall be performed by General Contractor prior to abatement.
- Exact dimensions of floor tile and mastic required for abatement in Classroom #8 shall be identified by General Contractor.
- Exact dimensions of pipe insulation scheduled for glovebag removal shall be marked by General Contractor.
- When gross removal methods area utilized for abatement of flooring materials, Contractor shall perform all work in strict accordance with all IDPH school rules and specification 02131. If non-friable removal methods are utilized (Specification Section 3.11 (D)), Contractor shall be responsible for the isolation of work area(s) with critical seals, signage, and the security of the work areas to eliminate access by unauthorized personnel. HEPA filtered negative air machines shall be set up within the work areas and run continuously through the completion of all non-friable work. All room contents to be removed by the school staff prior to contract work.



KEY PLAN:



FIRST FLOOR PARTIAL PLAN:
ASBESTOS ABATEMENT

CLIENT: Rockford Public Schools 501 7th Street Rockford, Illinois 61104	PROJECT NAME: Brookview Elementary School 1750 Madron Road Rockford, Illinois 601107	SHEET NAME: ASBESTOS ABATEMENT - PHASE I	DESIGNED BY: John Dobby IDPH #: 100-9261	DRAWN BY: EBB CHECKED BY: DJ REVISOR BY: EBB CHECKED BY: DJ REVISOR BY: EBB CHECKED BY: DJ DESIGNER SIGNATURE: <i>John M. Dobby</i>	DATE: 02-01-16 DATE: 02-10-16 DATE: 02-10-16 DATE: 02-10-16	Carnow Conibeat & Assoc. Ltd. 500 W. 7th Street, Suite 100 Rockford, IL 61107 P: 815/791-1100 F: 815/791-1101 www.carnow.com	CCA PROJECT NUMBER A139670056	DATE 2/11/2016	SHEET NUMBER ASB-1

PHASE I

SCOPE OF WORK: Phase I Areas

ASBESTOS ABATEMENT - Selective removal and disposal of asbestos containing floor tile and mastic from 1st Floor Classroom #8 per specification 02131, and all applicable IDPH, IEPA and OSHA regulations.

ASBESTOS ABATEMENT - Removal and disposal of all carpeting and underlying asbestos containing floor tile and mastic from 2nd Floor Classroom #13 per specification 02131, and all applicable IDPH, IEPA and OSHA regulations.

ASBESTOS ABATEMENT - Selective glovebag removal and disposal of asbestos containing pipe insulation from 1st Floor Janitor/Storage Room, Bathrooms and Mechanical Room.

ABATEMENT SCHEDULE: Phase I

Abatement shall commence during RPS205 Summer Break (approximately June 6th, 2016)

All work shall be completed in 10 work shifts.

ASBESTOS ABATEMENT KEY NOTES:

INDICATES LOCATION OF FIVE (5) CHAMBER WORKER DECONTAMINATION UNIT

INDICATES LOCATION OF TWO CHAMBER WASTE-OUT

INDICATES LOCATION OF AIRLOCK UNIT

INDICATES LOCATION OF NEGATIVE AIR EXHAUST

INDICATES LOCATION OF CONTAINMENT BARRIER PER IDPH 855.430(a)

INDICATES LOCATION OF SECURITY BARRIER PER IDPH 855.430(b)

CONTRACTOR TO SECURE DOORWAY AND CONTROL ACCESS

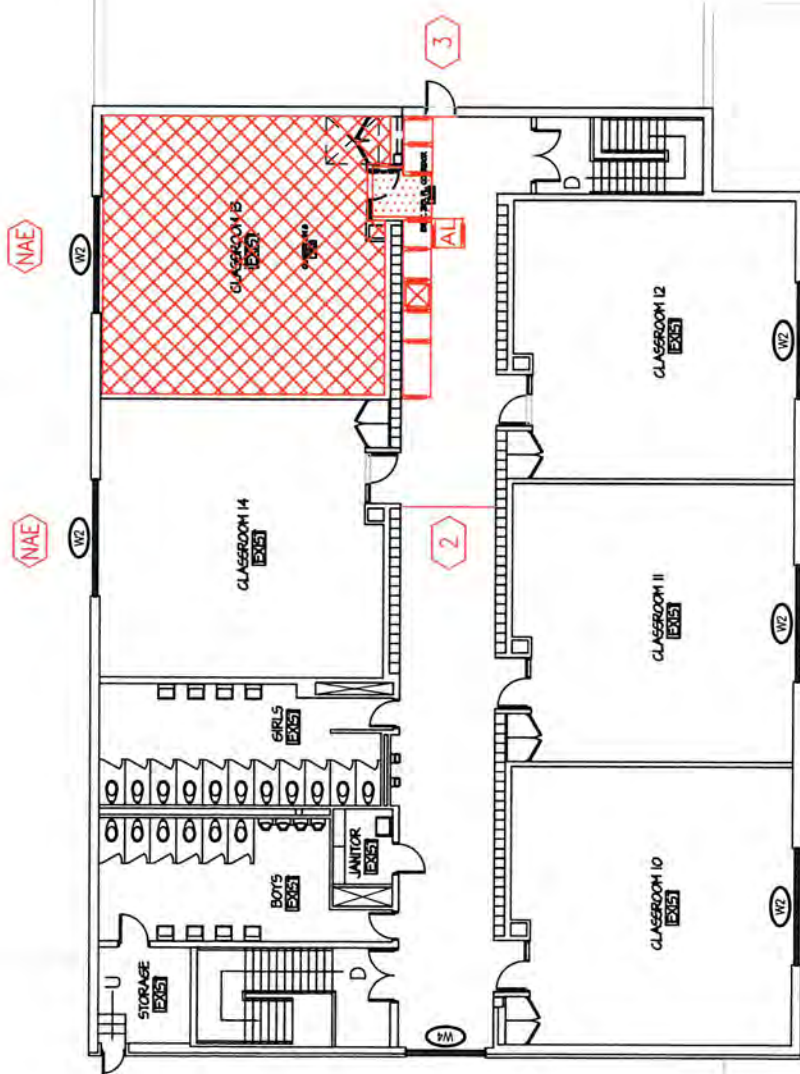
INDICATES LOCATION OF CARPET, FLOOR TILE AND MASTIC REMOVAL AREA

INDICATES LOCATION OF NON REMOVAL WORK AREA

GENERAL NOTES:

- Access to work areas and project phasing to be determined by building owner and general contractor.
- Glued down carpeting is present in 2nd floor classroom (Gross removal only this area).
- Worker decontamination enclosure systems shall be constructed in strict accordance with IDPH school rules and regulations. Clean room shall be sized to accommodate the needs and size of the work crew. Donning and Doffing of PPE outside of clean room is strictly prohibited.

KEY PLAN:



REVISED DRAWING



SECOND FLOOR PLAN:
ASBESTOS ABATEMENT

CLIENT: Rockford Public Schools 501 7th Street Rockford, Illinois 61104	PROJECT NAME: Brookview Elementary School 1750 Madron Road Rockford, Illinois 601107	SHEET NAME: ASBESTOS ABATEMENT - Phase I	DRAWN BY: EBB REVISOR BY: EBB REVISOR BY: EBB REVISOR BY: EBB DESIGNER SIGNATURE: John M. Dobby	DATE: 02-01-16 DATE: 02-10-16 DATE: 02-17-16 DATE: DATE:	CHECKED BY: DJ CHECKED BY: DJ CHECKED BY: DJ CHECKED BY: DJ	CCA PROJECT NUMBER A139670056	DATE Revised: 2/17/2016	SHEET NUMBER ASB-2



Carnow, Conibear & Assoc., Ltd.
400 W. Van Buren St., Suite 800, Chicago, IL 60607
Tel: 312.467.1100 Fax: 312.467.1101
www.ccnw.com

PHASE II

SCOPE OF WORK: Phase II Areas

ASBESTOS ABATEMENT - Selective removal and disposal of asbestos containing floor tile and mastic from North Gymnasium area per specification 02131, and all applicable IDPH, IEPA and OSHA regulations.

ABATEMENT SCHEDULE: Phase II

Abatement shall commence during RPS205 Summer Break (between July 5th, 2016 and August 1st, 2016). Abatement in Gymnasium shall be completed in five (5) work shifts.

ASBESTOS ABATEMENT KEY NOTES:

INDICATES LOCATION OF FIVE (5) CHAMBER WORKER DECONTAMINATION UNIT

INDICATES LOCATION OF TWO CHAMBER WASTE-OUT

INDICATES LOCATION OF AIRLOCK UNIT

INDICATES LOCATION OF NEGATIVE AIR EXHAUST

INDICATES LOCATION OF CONTAINMENT BARRIER PER IDPH 855.433(a)

INDICATES LOCATION OF SECURITY BARRIER PER IDPH 855.433(b)

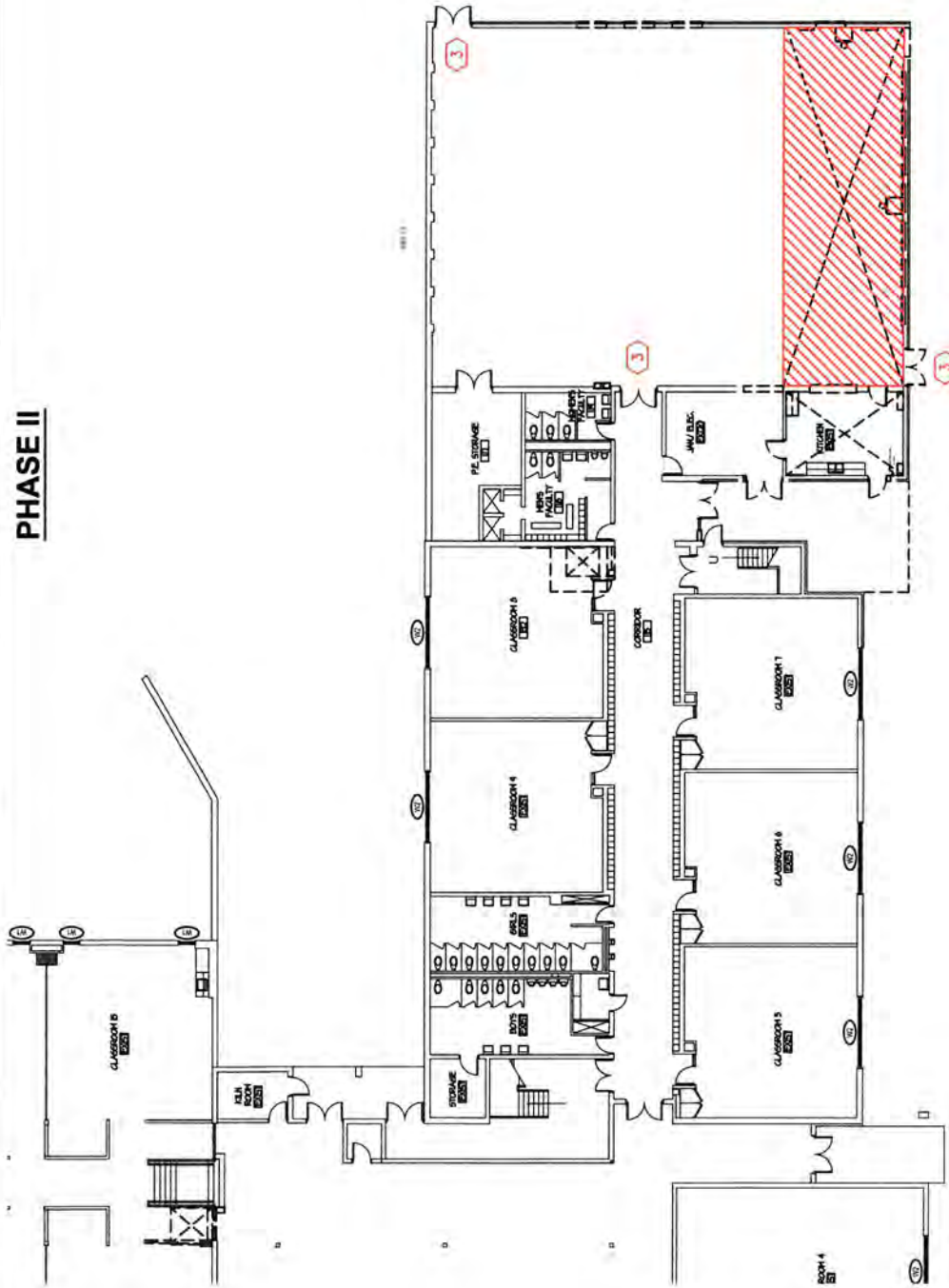
CONTRACTOR TO SECURE DOORWAY AND CONTROL ACCESS

INDICATES LOCATION OF FLOOR TILE AND FLOOR TILE MASTIC REMOVAL AREA

GENERAL NOTES:

- Access to work areas and exact project phasing dates to be determined by building owner, general contractor and Carnow Conibeat.
- Locations shown are approximate only.
- Worker decontamination enclosure systems shall be constructed in strict accordance with IDPH school rules and regulations. Clean room shall be sized to accommodate the needs and size of the work crew. Donning and Doffing of PPE outside of clean room is strictly prohibited.
- When gross removal methods area utilized for abatement, Contractor shall perform all work in strict accordance with all IDPH school rules and specification 02131. If non-liable removal methods are utilized (Specification Section 3.11 (D)), Contractor shall be responsible for the isolation of work area(s) with critical seals, signage, and the security of the work areas to eliminate access by unauthorized personnel. HEPA filtered negative air machines shall be set up within the work areas and run continuously through the completion of all non-liable work. All room contents to be removed by the school staff prior to contract work.

KEY PLAN:



FIRST FLOOR PARTIAL PLAN:
ASBESTOS ABATEMENT

CLIENT: Rockford Public Schools 501 7th Street Rockford, Illinois 61104	PROJECT NAME: Brookview Elementary School 1750 Madron Road Rockford, Illinois 601107	SHEET NAME: ASBESTOS ABATEMENT - PHASE II	DESIGNED BY: John Dobby IDPH #: 100-9261	DRAWN BY: EBB REVIEWED BY: EBB CHECKED BY: DJ	DATE: 02-01-16 DATE: 02-10-16 DATE: 1/26/2016	CHECKED BY: DJ CHECKED BY: DJ CHECKED BY: John M. Dobby	CCA PROJECT NUMBER A1396700556	DATE 1/26/2016	SHEET NUMBER ASB-3

Carlow, Conibeat & Assoc., Ltd.
600 W. Van Buren St., Suite 300 Chicago, IL 60607
Tel: 312.762.5100 Fax: 312.762.5105
www.carlow.com

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Project information.
 - 2. Work covered by Contract Documents.
 - 3. Phased construction.
 - 4. Work by Owner.
 - 5. Access to site.
 - 6. Coordination with occupants.
 - 7. Work restrictions.
 - 8. Specification and drawing conventions.
 - 9. Miscellaneous provisions.
- B. Related Requirements:
 - 1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 PROJECT INFORMATION

- A. Project Identification: RPS 205 - New Gymnasium, Kitchen and Lift.
 - 1. Project Location: Brookview Elementary, 1750 Madron Road, Rockford, IL 61107.
- B. Owner: RPS District 205.
 - 1. Owner's Representative: Todd Schmidt, Chief of Operations.
- C. Architect of Record: Hagney Architects, LLC, 4615 E. State St Ste 206, Rockford, IL 61108.
 - 1. Architect's Representative: Mark Kehely.
 - 2. Tel.: 815.397.3330.
 - 3. e-mail: MarkK@HagneyArchitects.com
- D. Architect's Consultants: The Architect has retained the following design professionals who have prepared designated portions of the Contract Documents:
 - 1. Civil Engineer:
 - a. ARC Design Resources Inc., 5291 Zenith Parkway, Loves Park, IL 61111.
 - 1) Representative: Ryan C. Swanson, PE
 - 2) Tel.: 815-484-4300
 - 3) e-mail: ryans@arcdesign.com.

2. Structural Engineer:
 - a. Missman Engineering, 1717 State St., Suite 201, Bettendorf, IA 52722.
 - 1) Representative: Chad Carr.
 - 2) Tel.: 563-344-0260
 - 3) e-mail: ChadC@Missman.com.
 3. MEP Engineer:
 - a. OAS, LLC, 769 Heartland Dr., Unit A, Sugar Grove, IL 60554.
 - 1) Representative: Keith O'Higgins.
 - 2) Tel.: 630-538-1996.
 - 3) e-mail: KOhiggins@oasllc.net.
 4. Kitchen Consultant:
 - a. S2O Consultants, 530 N. Wood, #C, Chicago, IL 60622
 - 1) Representative: Kristin Sedej, FCSI
 - 2) Tel.: 224-717-1999
 - 3) e-mail: kristin@s2oconsultants.net
- E. Program Manager: Ragnar-Benson - Mr. Dennis Williams.
1. Program Manager has been engaged for this Project to serve as an advisor to Owner and to provide assistance in administering the Contract for Construction between Owner and Contractor, according to a separate contract between Owner and Program Manager.
- F. Project FTP Site: A project FTP site administered by Architect Program Manager Contractor will be used for purposes of managing communication and documents during the construction stage.
1. See Section 013100 "Project Management and Coordination." for requirements for using the Project Web site.
- 1.4 WORK COVERED BY CONTRACT DOCUMENTS
- A. The Work of Project is defined by the Contract Documents and consists of the following:
1. New Gymnasium, Kitchen and Lift at Brookview Elementary School.
- B. Type of Contract:
1. Project will be constructed under a single general contract.
- 1.5 PHASED CONSTRUCTION
- A. The Work shall be conducted in two phases, with each phase substantially complete as indicated:
1. Phase One: New gymnasium, east entrance work, south and west lift project.
 2. Phase Two: Interior kitchen demolition and renovation scope of work.

B. Milestone Completion Requirements (see also "Project Milestone" document sheet):

- 1. Gym Addition: Substantial Completion 12-23-2016.**
- 2. West Lifts & South Chair Incline Lift: Must be completed no later than 08-08-2016.**
- 3. New Entry: Must be completed by 08-08-2016 (if roof structure cannot be completed by 08-08-2016, the contractor shall work after school or on Saturday to complete the work. Any extra work is part of the base bid).**
- 4. New Kitchen: Owner occupancy 08-31-2016.**

1.6 PERMITS

- A. General Building Permit will be obtained from the Regional Office of Education by RPS 205.
- B. Permits from ComEd and Nicor Gas will be obtained by RPS 205. Changes to fees required by ComEd and Nicor Gas will be paid for by RPS 205.
- C. The Contractor shall complete the IC form and submit to the RRWRD along with payment of permit fee. RPS 205 will pay any connection fee, if applicable.

1.7 TESTING

- A. Generally, material testing will be provided and paid for by RPS 205 and shall be performed as indicated in individual specification sections. Contractor shall coordinate and assist the testing process.
- B. Special Inspections required by Authority Having Jurisdiction will be provided and paid for by RPS 205. Contractor shall schedule, coordinate and assist the testing process.
- C. Additional ancillary testing shall be provided and paid for by the contractor as indicated in specification.

1.8 ACCESS TO SITE

- A. General: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Use of Site: Limit use of Project site to work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
 1. Driveways, Walkways and Entrances: Keep driveways and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.

- b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.

1.9 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Owner Limited Occupancy of Completed Areas of Construction: Owner reserves the right to occupy and to place and install equipment in completed portions of the Work, prior to Substantial Completion of the Work, provided such occupancy does not interfere with completion of the Work. Such placement of equipment and limited occupancy shall not constitute acceptance of the total Work.
 - 1. Architect will prepare a Certificate of Substantial Completion for each specific portion of the Work to be occupied prior to Owner acceptance of the completed Work.
 - 2. Obtain a Certificate of Occupancy from authorities having jurisdiction before limited Owner occupancy.
 - 3. Before limited Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will operate and maintain mechanical and electrical systems serving occupied portions of Work.
 - 4. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied portions of Work.

1.10 WORK RESTRICTIONS

- A. Work Restrictions, General: Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets and with other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work in the existing building to normal business working hours of 7:00 a.m. to 4:00 p.m., Monday through Friday, unless otherwise indicated.
 - 1. Hours for Utility Shutdowns: Coordinate with Owner and Program Manager.
 - 2. Hours for Core Drilling: Coordinate with Owner and Program Manager.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after providing temporary utility services according to requirements indicated:

1. Obtain Program Manager's or Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, and Odors: Coordinate operations that may result in high levels of noise and vibration, odors, or other disruption to Owner occupancy with Owner.
 1. Obtain Program Manager's or Owner's written permission before proceeding with disruptive operations.
- E. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor-air intakes.
- F. Controlled Substances: Use of tobacco products and other controlled substances on Project site is not permitted.

1.11 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
 1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and noted in construction documents.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
 - 2. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 3. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect through Program Manager at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange schedule of values consistent with format of AIA Document G703.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

- a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
4. Submit a wage rate schedule to Architect through Program Manager at earliest possible date, but no later than seven days before the date scheduled to submittal of initial Application for Payment. See "Wage Rate Schedule" example, attached. Include hourly wage rates and complete job titles for all personnel on site for the duration of the project.
 - a. The hourly labor rate disclosed shall be fully burdened rate to include the following:
 - 1) Wage, taxes, benefits package, insurance, FUTA, SUTA and workman's compensation. The hourly labor rate shall NOT include overhead cost nor mark up.
 - 2) Time and a Half and Double Time Rates will also need to be submitted and include the same breakdown as above.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Change Orders: Provide separate sub-line items in the schedule of values for each approved change order portion allocated to each main line item.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and Program Manager and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use AIA Document G702/CMA and AIA Document G703 Insert name and designation of standard form as form for Applications for Payment.

- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Program Manager will return incomplete applications without action.
1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 3. See attached AIA G703 for format requirements.
 4. Contractor shall provide an updated progress schedule with each pay application.
- E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect and Program Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Labor rate schedule (see attached).
 4. Contractor's construction schedule (preliminary if not final).
 5. Schedule of unit prices.
 6. Submittal schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Updated schedule shall be submitted with each monthly pay application.
- H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707-1994, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

Brookview Wage Rates

[illegible]

CONTINUATION SHEET

AIA DOCUMENT G703

PAGE OF PAGES

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, containing Contractor's signed certification is attached.

In tabulations below, amounts are stated to the nearest dollar.

Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:

APPLICATION DATE:

PERIOD TO:

ARCHITECT'S PROJECT NO:

A ITEM NO.	B DESCRIPTION OF WORK	C SCHEDULED VALUE	D WORK COMPLETED		F MATERIALS PRESENTLY STORED (NOT IN D OR E)	G		H BALANCE TO FINISH (C - G)	I RETAINAGE (IF VARIABLE RATE)
			FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD		TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)		
1	General Conditions								
2	Supervision								
3	Fee								
4	Sitework & Excavation								
5	Submittals								
6	Closeout Documents								
7	Site Utilities								
8	Submittals								
9	Closeout Documents								
10	Asphalt Paving								
11	Submittals								
12	Closeout Documents								
13	Site Concrete								
14	Submittals								
15	Closeout Documents								
16	Building Concrete								
17	Submittals								
18	Closeout Documents								
19	Renovation Concrete								
20	Building Masonry								
21	Submittals								
22	Closeout Documents								
23	Renovation Masonry								
	GRAND TOTALS	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		\$0.00	

Users may obtain validation of this document by requesting of the license a completed AIA Document D401 - Certification of Document's Authenticity

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination drawings.
 - 2. Requests for Information (RFIs).
 - 3. Project meetings.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

- A. RFI: Request from Owner, Program Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at

meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
- D. The Contractor will be required to provide an online "cloud"-based collaborative, secure system for exchanging, reviewing, and archiving construction submittals, RFI's and other construction communications electronically. Basis of Design: "Submittal Exchange" or owner approved equivalent system.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility.

1.6 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect and Program Manager.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: AIA Document G716.
- D. Architect's and Program Manager's Action: Architect and Program Manager will review each RFI, determine action required, and respond. Allow five working days for Architect's response for each RFI. RFIs received by Architect or Program Manager after 1:00 p.m. will be considered as received the following working day.
 1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Program Manager in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use CSI Log Form 13.2B.
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect and Program Manager.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's and Program Manager's response was received.
- F. On receipt of Architect's and Program Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Program Manager within three days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- 1.7 PROJECT MEETINGS
- A. General: General Contractor will schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Program Manager, and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Program Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.

- c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of record documents.
 - l. Use of the premises and existing building.
 - m. Work restrictions.
 - n. Working hours.
 - o. Owner's occupancy requirements.
 - p. Responsibility for temporary facilities and controls.
 - q. Procedures for moisture and mold control.
 - r. Procedures for disruptions and shutdowns.
 - s. Construction waste management and recycling.
 - t. Parking availability.
 - u. Office, work, and storage areas.
 - v. Equipment deliveries and priorities.
 - w. First aid.
 - x. Security.
 - y. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Program Manager, and Owner's Commissioning Authority of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written instructions.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.

- s. Testing and inspecting requirements.
 - t. Installation procedures.
 - u. Coordination with other work.
 - v. Required performance results.
 - w. Protection of adjacent work.
 - x. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: General Contractor will conduct progress meetings at weekly intervals.
- 1. Attendees: Weekly progress review meetings with Owner, Architect and Contractor are required. These meetings are to be limited to Owner, Architect and General Contractor only. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
 - 3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress

meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Construction schedule updating reports.
 - 3. Daily construction reports.
 - 4. Site condition reports.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic format (11 x 17, if appropriate).
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- C. Construction Schedule Updating Reports: Submit with Applications for Payment.
- D. Daily Construction Reports: Submit at weekly intervals.

1.4 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Program Manager's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.
 - 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 4. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.

- f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 - 5. Work Stages: Indicate important stages of construction for each major portion of the Work.
 - D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
 - E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 - 1. Unresolved issues.
 - 2. Unanswered Requests for Information.
 - 3. Rejected or unreturned submittals.
 - 4. Notations on returned submittals.
 - 5. Pending modifications affecting the Work and Contract Time.
 - F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.
 - G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 - 1. Use Microsoft Project, .
- 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)
- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed.
 - B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 - 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.
- 2.3 REPORTS
- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 - 7. Accidents.
 - 8. Meetings and significant decisions.
 - 9. Unusual events.

10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Substantial Completions authorized.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
 4. Project schedule shall be submitted with every pay request.
- B. Distribution: Distribute copies of approved schedule to Architect, Program Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 012000 - PROJECT REQUIREMENTS

PART 1 - GENERAL

1.1 CONTRACTOR'S RESPONSIBILITIES

- A. The Contractor and all Subcontractors shall submit a schedule of work days and hours to and consistent with the specifications of the Program Manager prior to beginning and ending work each day.
- B. Provide shop drawings of all fabricated items.
- C. The General Contractor shall provide fences, barricades, guard lights, site security etc. as required to protect persons and property from injury in conjunction with this contract work both inside and outside school buildings.
- D. Protect existing work - repair damage to this contract work at no cost to Owner. Water damage to building, including the interior, caused by Contractor's failure to properly protect the work, shall be the responsibility of the Contractor to correct.
- E. Protect existing trees, shrubs, lawns, etc.
- F. Remove rubbish and debris daily.
- G. Remove excess materials and construction equipment from the site upon completion.
- H. Contractor is to guarantee all work for a period of one year after final acceptance.
- I. Provide all items, articles, materials, operations, or methods listed, mentioned, or scheduled on the drawings and/or herein, including all equipment, and incidentals necessary and required pertaining to the work of this contract.

1.2 USE OF FACILITIES

- A. Construction personnel will NOT be allowed to use toilet facilities in existing buildings.
- B. Confine parking, site access, equipment and materials to areas on the site as designated by the Program Manager or directed by the Architect.
- C. The Contractor shall provide temporary electricity, natural gas and water as required for the work by extending proper feeders, switches, etc. from the Owner's existing system. Existing electric current, natural gas and water will be provided by Owner at no cost to Contractor upon the condition that connection strictly complies with specifications of the Architect and such use does not interrupt regular activities at school buildings. Contractor is responsible for the loss of use of electric service, natural gas and water due to excessive use and improper connection. Do not connect any equipment requiring more than **110 V** to Owner's system.
- D. Temporary water service required for the work will be available from Owner's existing system as directed by Owner. Owner will pay cost of water used.

1.3 SUBMITTALS

- A. Submit necessary shop drawings, product data and samples.

END SECTION 012000

SECTION 012200 - UNIT PRICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for unit prices.
- B. Related Requirements:
 - 1. Section 012600 "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
 - 2. Section 014000 "Quality Requirements" for general testing and inspecting requirements.

1.3 DEFINITIONS

- A. Unit price is an amount incorporated in the Agreement, applicable during the duration of the Work as a price per unit of measurement for materials, equipment, or services, or a portion of the Work, added to or deducted from the Contract Sum by appropriate modification, if the scope of Work or estimated quantities of Work required by the Contract Documents are increased or decreased.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, overhead, and profit.
- B. Measurement and Payment: See individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A schedule of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF UNIT PRICES

- A. The following unit prices shall be included in the contractors' bid for EACH project.
- B. Unit Price 1: Removal of unsatisfactory soil and replacement with satisfactory soil material.
 - 1. Description: Unsatisfactory soil excavation and disposal off site and replacement with satisfactory fill material or engineered fill from off site, as required, according to Section 312000 "Earth Moving."
 - 2. Unit of Measurement: Cubic yard of soil excavated, based on survey of volume removed.

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for the installation of four (4) new windows in the current new Cafeteria and Office 130 as indicated on Sheet A1.0.0, Detail 3 of A1.0.2, A1.3.1 and A3.1.1.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
 - 1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
 - 2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
 - 1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.
- C. Execute accepted alternates under the same conditions as other work of the Contract.
- D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES - Brookview Elementary School.

A. Alternate No. A-1:

1. Base Bid: No Work.
2. Alternate: Installation of four (4) new windows in the current new Cafeteria and Office 130 as indicated on Sheet A1.0.0, Detail 3 of A1.0.2, A1.3.1 and A3.1.1.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
 - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Request Form: Use CSI Form 13.1A.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.

- d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
 - k. Cost information, including a proposal of change, if any, in the Contract Sum.
 - l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
 - m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.
 - h. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- B. Substitutions for Convenience: Not allowed.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.
- B. Refer to "Change Order Procedure" document attached dated 04.30.13.

1.2 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions." form included in Project Manual.

1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: Architect or Program Manager will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
 - 1. Work Change Proposal Requests issued by Architect or Program Manager are not instructions either to stop work in progress or to execute the proposed change.
 - 2. Within time specified in Proposal Request or 20 days, when not otherwise specified, after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
 - a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
 - b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
 - c. Include costs of labor and supervision directly attributable to the change.
 - d. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
 - e. Quotation Form: Use forms provided by Owner. Sample copies are included in Project Manual. forms acceptable to Architect.
- B. Contractor-Initiated Work Change Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to Program Manager.
 - 1. Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
4. Include costs of labor and supervision directly attributable to the change.
5. Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
6. Comply with requirements in Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.
7. Work Change Proposal Request Form: Use form provided by Owner. Sample copy is included in Project Manual. form acceptable to Architect.

1.4 ADMINISTRATIVE CHANGE ORDERS

- A. Unit-Price Adjustment: See Section 012200 "Unit Prices" for administrative procedures for preparation of Change Order Proposal for adjusting the Contract Sum to reflect measured scope of unit-price work.

1.5 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Program Manager will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

1.6 CONSTRUCTION CHANGE DIRECTIVE

- A. Construction Change Directive: Architect or Program Manager may issue a Construction Change Directive on AIA Document G714. Construction Work Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.
 1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- B. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

CHANGE ORDER PROCEDURES

In order to process change orders it is important that procedures are followed and documentation provided in a manner that allows timely processing.

Field Orders will be issued for all changes that occur on the project. Changes are typically associated with a response to a RFI, Bulletins, or Field Conditions.

This document contains information needed for Field Orders, processing changes from RFIs, Bulletins and Field Conditions. Requirements for Change Order Requests are also provided.

FIELD ORDERS

A Field Order will be issued for all change conditions. It is a document that tracks changes to the project and will provide directions for processing.

The Field Order heading contains the following tracking information, it is important that this information is contained in all change order requests:

1. Field Order Number
2. RFQ Number
3. PCO Number

The Field Order provides direction on how to proceed.

1. You are authorized to proceed with the change, subject to the method of payment listed in the following section, or
2. You are directed not to proceed until you have submitted all cost and schedule information within 7 days and the costs have been approved by RPS.

There are 4 methods of payment listed.

1. No Cost
2. Lump Sum
3. Time and Materials
4. Submit Quotations

NO COST CHANGE

If this box is selected, it means that the information that you have received is a clarification of information contained in your contract and will not require a change to your contract.

LUMP SUM

If this box is selected, it means that an agreement exists on a lump sum amount for a contract modification. This is rarely used as a way to process contract changes.

CHANGE ORDER PROCEDURES

TIME & MATERIALS

If this box is selected, tickets will need to be submitted to Ragnar Benson on a daily basis. Tickets that are not submitted on a daily basis will be subject to rejection.

If a ticket is signed by a Ragnar Benson representative, it does not guarantee additional payment or acceptance of pricing. The signature is only to confirm that the time spent on a particular task has been accepted. The only authority that can accept, approve, and or modify changes to the contract is a RPS project representative. A RPS employee that is not a project representative is not authorized to commit the district for additional work. This would include but not be limited to school administrators, teachers, or maintenance personnel.

SUBMIT QUOTATIONS

If this box is checked then you will need to submit a Change Order Request subject to the change order requirements listed in a subsequent section of this document.

Please note that you are not to proceed with any additional work unless you have a signed field order. If you proceed with extra work without a signed field order you do so at your own risk.

CHANGE CONDITIONS

RFI's

All RFI's will be submitted by the general contractor to the Architect of Record with a copy sent to Ragnar Benson. The response will include a field order will direct you on how you are to proceed.

BULLETINS

When a Bulletin is issued, a Field Order will be included and it will direct you on how to proceed.

FIELD CONDITIONS

If you encounter unknown conditions and think that you are entitled to additional compensation, notify the Architect of Record and Ragnar Benson immediately and include all appropriate documentation. A Field Order will provide direction on how you are to proceed.

CHANGE ORDER REQUESTS

To aid in the processing of change orders, we will need certain information included in each of the change order requests.

A detailed cost breakdown that includes quantities, man hours, labor and material costs needs to be included for each trade that is requesting additional compensation. Please use the Cost Proposal Worksheet that is included in this document.

Include all backup that is needed to evaluate the change order request. Examples of this would be quotes received from subcontractors , material suppliers, sketches that identify how quantities were calculated, worksheets, and pictures may also be appropriate for our analysis.

CHANGE ORDER PROCEDURES

FEES

The fees shall be calculated as a lump sum to all changes. The fees are to be calculated per the information provided below.

GENERAL CONTRACTOR FEES

12% allowed for self-performed work- this includes overhead, profit, bond and insurance.

5% allowed for subcontracted work - this includes overhead, profit, bond and insurance.

SUBCONTRACTOR FEES

12% allowed for self-performed work - this includes overhead, profit, bond and insurance.

Please see a sample change order request that is included with this attachment.



FIELD ORDER

#: 4

Project: 10101- CSX - Worcester IMF Expansion
To: David Marois
MAROIS BROS
 115 Blackstone River Road
 Worcester, MA 01697
Phone: 508-791-8134
Fax: 508-754-4214
Email: dmarois@maroisbrothers.com

Date: 11/07/2011
From: Carl Zeigler
RAGNAR BENSON CONSTRUCTION LLC
 250 South Northwest Highway
 Park Ridge, IL 60068
Phone: 847-698-4900
Fax: 847-692-9320
Email: carl.zeigler@rbic.com
RBRFQ#: 6 **PCO#:** 109

CC: Tim Brown - ARCADIS - Phone: 508-421-8307 - Fax: 508-421-8305,
 Keith Goldberg - ARCADIS - Phone: 508-421-8307 - Fax: 508-421-8305,
 Dennis Dunn - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
 Stephen Groh - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
 Fred Jewel - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
 Steven Kehm - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
 Knut Olberg - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
 Paul Paolini - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
 Randy Perdue - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
 Greg Stambaugh - RAGNAR BENSON CONSTRUCTION LLC - Phone: 847-698-4900 - Fax: 847-692-9320,
 Chris Swanson - WILLIAM CHARLES CONSTRUCT COMPANY LLC - Phone: 815-654-4700 - Fax: 8156544736

Description: Foundation Removal at Franklin and Plastic Streets

- ☐ You are hereby authorized to proceed with the following terms of work on the above project. All work shall be performed in accordance with the requirements of the Contract Documents.
- ☒ Do not proceed with the modifications or clarifications. Please submit your proposal listing both schedule and cost impact of the modifications or clarifications with 7 days. If we do not receive a proposal within 7 days, we will assume there are no schedule or cost impacts associated with this work.

Item	PCO Description	Detail Notes:
2	WCC - Foundations found at underground detention pipes	
3	Marois - Foundations found at underground detention pipes	

Notes:

Method of Payment:

- ☐ No Cost
☐ Lump Sum
☐ Time and materials
- ☒ Submit quotations promptly for the above described work. The cost of the work will be determined from the Subcontractor Proposal, subject to review, and will be resolved to be mutually agreeable.

Schedule: The effect of this order on the contract completion date is as follows:

- ☒ No Change.
☐ Impact is unknown at this time.
- ☐ Completion Date is estimated at days.
☐ Subcontractor to submit a revised schedule listing duration changes to specific activities.

250 SOUTH NORTHWEST HIGHWAY, PARK RIDGE, IL 60068 • PHONE: 847-698-4900 • FAX: 847-692-9320

Page 1 of 2

DOT 35.2.03-11

**FIELD ORDER**

4

		Date
David Marois	MAROIS BROS	11/07/2011
Carl Zeigler	RAGNAR BENSON CONSTRUCTION LLC	11/07/2011
Keith Goldberg	Arcadis	
In Scope Change N		

{ Contractor Name }	Change Order Request No.:	001
(Contractor Address)	PCO No.:	17
(Contractor City/State/Zip)	RBRFQ No.:	6
(Contractor Telephone No.)	Field Order No.:	21

CHANGE ORDER REQUEST RECAP SHEET

COR No. 1 is submitted for changes associated with Bulletin No. 001.
 Bulletin No. 001 added a new 30 foot retaining wall and changed the ceilings
 in the Toilet Rooms from Lay 1 to Gypboard. All detailed backup for labor and
 materials are on the attached work sheets.

CONTRACTOR SELF PREFORMED WORK

Excavation and Backfill	\$ 7,000.00
Concrete	\$ 15,000.00
Self Performed Work - NET COST:	\$ 22,000.00
Overhead/Profit/Bond/Insurance @ 12%:	\$ 2,640.00
CONTRACTOR'S SUB-TOTAL:	\$ 24,640.00

WORK - SUBCONTRACTOR

Gyp Board Ceilings	\$ 4,500.00
Lay in Ceilings - Credit	\$ (1,500.00)
Subcontractor - NET COST:	\$ 3,000.00
Contractor Overhead/Profit/Bonds/Insurance @ 5%:	\$ 150.00
SUBCONTRACTOR'S SUB-TOTAL:	\$ 3,150.00

CONTRACTOR'S SUB-TOTAL	\$ 24,640.00
SUBCONTRACTOR'S SUB-TOTAL	\$ 3,150.00
TOTAL CHANGE ORDER REQUEST NO. 1	\$ 27,790.00

Revision Date: 03/04/13

COST PROPOSAL WORKSHEET

Change Order Request No.:

232

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
 - 1. Section 012200 "Unit Prices" for administrative requirements governing the use of unit prices.
 - 2. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
 - 3. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
 - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
 - a. Application for Payment forms with continuation sheets.
 - b. Submittal schedule.
 - c. Items required to be indicated as separate activities in Contractor's construction schedule.
 - 2. Submit the schedule of values to Architect through Program Manager at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.
 - 3. Subschedules for Phased Work: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values coordinated with each phase of payment.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
 - 1. Identification: Include the following Project identification on the schedule of values:
 - a. Project name and location.
 - b. Name of Architect.
 - c. Architect's project number.
 - d. Contractor's name and address.
 - e. Date of submittal.
 - 2. Arrange schedule of values consistent with format of AIA Document G703.
 - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of five percent of the Contract Sum.

- a. Include separate line items under Contractor and principal subcontracts for Project closeout requirements in an amount totaling five percent of the Contract Sum and subcontract amount.
4. Submit a wage rate schedule to Architect through Program Manager at earliest possible date, but no later than seven days before the date scheduled to submittal of initial Application for Payment. See "Wage Rate Schedule" example, attached. Include hourly wage rates and complete job titles for all personnel on site for the duration of the project.
 - a. The hourly labor rate disclosed shall be fully burdened rate to include the following:
 - 1) Wage, taxes, benefits package, insurance, FUTA, SUTA and workman's compensation. The hourly labor rate shall NOT include overhead cost nor mark up.
 - 2) Time and a Half and Double Time Rates will also need to be submitted and include the same breakdown as above.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the schedule of values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Change Orders: Provide separate sub-line items in the schedule of values for each approved change order portion allocated to each main line item.
10. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
 - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.
11. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and Program Manager and paid for by Owner.
 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application for Payment Forms: Use AIA Document G702/CMA and AIA Document G703 Insert name and designation of standard form as form for Applications for Payment.

- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Program Manager will return incomplete applications without action.
1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
 3. See attached AIA G703 for format requirements.
 4. Contractor shall provide an updated progress schedule with each pay application.
- E. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect and Program Manager by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
 2. When an application shows completion of an item, submit conditional final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- G. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:
1. List of subcontractors.
 2. Schedule of values.
 3. Labor rate schedule (see attached).
 4. Contractor's construction schedule (preliminary if not final).
 5. Schedule of unit prices.
 6. Submittal schedule (preliminary if not final).
 7. List of Contractor's staff assignments.
 8. List of Contractor's principal consultants.
 9. Copies of building permits.
 10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
 11. Initial progress report.
 12. Report of preconstruction conference.
 13. Certificates of insurance and insurance policies.
 14. Updated schedule shall be submitted with each monthly pay application.
- H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.

2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
 1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
 6. AIA Document G707-1994, "Consent of Surety to Final Payment."
 7. Evidence that claims have been settled.
 8. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

Brookview Wage Rates

[illegible]

CONTINUATION SHEET

AIA DOCUMENT G703

PAGE OF PAGES

AIA Document G702, APPLICATION AND CERTIFICATION FOR PAYMENT, containing Contractor's signed certification is attached.

In tabulations below, amounts are stated to the nearest dollar.

Use Column I on Contracts where variable retainage for line items may apply.

APPLICATION NO:

APPLICATION DATE:

PERIOD TO:

ARCHITECT'S PROJECT NO:

A ITEM NO.	B DESCRIPTION OF WORK	C SCHEDULED VALUE	D WORK COMPLETED		F MATERIALS PRESENTLY STORED (NOT IN D OR E)	G		H BALANCE TO FINISH (C - G)	I RETAINAGE (IF VARIABLE RATE)
			FROM PREVIOUS APPLICATION (D + E)	THIS PERIOD		TOTAL COMPLETED AND STORED TO DATE (D+E+F)	% (G ÷ C)		
1	General Conditions								
2	Supervision								
3	Fee								
4	Sitework & Excavation								
5	Submittals								
6	Closeout Documents								
7	Site Utilities								
8	Submittals								
9	Closeout Documents								
10	Asphalt Paving								
11	Submittals								
12	Closeout Documents								
13	Site Concrete								
14	Submittals								
15	Closeout Documents								
16	Building Concrete								
17	Submittals								
18	Closeout Documents								
19	Renovation Concrete								
20	Building Masonry								
21	Submittals								
22	Closeout Documents								
23	Renovation Masonry								
	GRAND TOTALS	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00		\$0.00	

Users may obtain validation of this document by requesting of the license a completed AIA Document D401 - Certification of Document's Authenticity

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
 - 1. Coordination drawings.
 - 2. Requests for Information (RFIs).
 - 3. Project meetings.
- B. Related Requirements:
 - 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

1.2 DEFINITIONS

- A. RFI: Request from Owner, Program Manager, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

1.3 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Use CSI Form 1.5A. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.

1.4 GENERAL COORDINATION PROCEDURES

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at

meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's construction schedule.
 2. Preparation of the schedule of values.
 3. Installation and removal of temporary facilities and controls.
 4. Delivery and processing of submittals.
 5. Progress meetings.
 6. Preinstallation conferences.
 7. Project closeout activities.
 8. Startup and adjustment of systems.
- D. The Contractor will be required to provide an online "cloud"-based collaborative, secure system for exchanging, reviewing, and archiving construction submittals, RFI's and other construction communications electronically. Basis of Design: "Submittal Exchange" or owner approved equivalent system.

1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
 2. Plenum Space: Indicate subframing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
 3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
 4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.

5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
6. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility.

1.6 REQUESTS FOR INFORMATION (RFIs)

- A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 1. Project name.
 2. Project number.
 3. Date.
 4. Name of Contractor.
 5. Name of Architect and Program Manager.
 6. RFI number, numbered sequentially.
 7. RFI subject.
 8. Specification Section number and title and related paragraphs, as appropriate.
 9. Drawing number and detail references, as appropriate.
 10. Field dimensions and conditions, as appropriate.
 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 12. Contractor's signature.
 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
- C. RFI Forms: AIA Document G716.
- D. Architect's and Program Manager's Action: Architect and Program Manager will review each RFI, determine action required, and respond. Allow five working days for Architect's response for each RFI. RFIs received by Architect or Program Manager after 1:00 p.m. will be considered as received the following working day.
 1. The following RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for coordination information already indicated in the Contract Documents.
 - d. Requests for adjustments in the Contract Time or the Contract Sum.
 - e. Requests for interpretation of Architect's actions on submittals.
 - f. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Section 012600 "Contract Modification Procedures."
 - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Program Manager in writing within 10 days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use CSI Log Form 13.2B.
1. Project name.
 2. Name and address of Contractor.
 3. Name and address of Architect and Program Manager.
 4. RFI number including RFIs that were dropped and not submitted.
 5. RFI description.
 6. Date the RFI was submitted.
 7. Date Architect's and Program Manager's response was received.
- F. On receipt of Architect's and Program Manager's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect and Program Manager within three days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
 2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.
- 1.7 PROJECT MEETINGS
- A. General: General Contractor will schedule and conduct meetings and conferences at Project site unless otherwise indicated.
1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
 2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
 3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Program Manager, and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Program Manager, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 2. Agenda: Discuss items of significance that could affect progress, including the following:
 - a. Tentative construction schedule.
 - b. Phasing.

- c. Critical work sequencing and long-lead items.
 - d. Designation of key personnel and their duties.
 - e. Procedures for processing field decisions and Change Orders.
 - f. Procedures for RFIs.
 - g. Procedures for testing and inspecting.
 - h. Procedures for processing Applications for Payment.
 - i. Distribution of the Contract Documents.
 - j. Submittal procedures.
 - k. Preparation of record documents.
 - l. Use of the premises and existing building.
 - m. Work restrictions.
 - n. Working hours.
 - o. Owner's occupancy requirements.
 - p. Responsibility for temporary facilities and controls.
 - q. Procedures for moisture and mold control.
 - r. Procedures for disruptions and shutdowns.
 - s. Construction waste management and recycling.
 - t. Parking availability.
 - u. Office, work, and storage areas.
 - v. Equipment deliveries and priorities.
 - w. First aid.
 - x. Security.
 - y. Progress cleaning.
3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
- 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, Program Manager, and Owner's Commissioning Authority of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Weather limitations.
 - l. Manufacturer's written instructions.
 - m. Warranty requirements.
 - n. Compatibility of materials.
 - o. Acceptability of substrates.
 - p. Temporary facilities and controls.
 - q. Space and access limitations.
 - r. Regulations of authorities having jurisdiction.

- s. Testing and inspecting requirements.
 - t. Installation procedures.
 - u. Coordination with other work.
 - v. Required performance results.
 - w. Protection of adjacent work.
 - x. Protection of construction and personnel.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Progress Meetings: General Contractor will conduct progress meetings at weekly intervals.
- 1. Attendees: Weekly progress review meetings with Owner, Architect and Contractor are required. These meetings are to be limited to Owner, Architect and General Contractor only. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
 - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
 - 1) Review schedule for next period.
 - b. Review present and future needs of each entity present, including the following:
 - 1) Interface requirements.
 - 2) Sequence of operations.
 - 3) Status of submittals.
 - 4) Deliveries.
 - 5) Off-site fabrication.
 - 6) Access.
 - 7) Site utilization.
 - 8) Temporary facilities and controls.
 - 9) Progress cleaning.
 - 10) Quality and work standards.
 - 11) Status of correction of deficient items.
 - 12) Field observations.
 - 13) Status of RFIs.
 - 14) Status of proposal requests.
 - 15) Pending changes.
 - 16) Status of Change Orders.
 - 17) Pending claims and disputes.
 - 18) Documentation of information for payment requests.
 - 3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.
 - a. Schedule Updating: Revise Contractor's construction schedule after each progress

meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's construction schedule.
 - 2. Construction schedule updating reports.
 - 3. Daily construction reports.
 - 4. Site condition reports.

1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor Activity: An activity that precedes another activity in the network.
 - 3. Successor Activity: An activity that follows another activity in the network.
- B. Float: The measure of leeway in starting and completing an activity.
 - 1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.

1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF electronic format (11 x 17, if appropriate).
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
 - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- C. Construction Schedule Updating Reports: Submit with Applications for Payment.
- D. Daily Construction Reports: Submit at weekly intervals.

1.4 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, list of subcontracts, submittal schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from entities involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

PART 2 - PRODUCTS

2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for the Notice to Proceed to date of final completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
 - 1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
 - 2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
 - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
 - 4. Startup and Testing Time: Include no fewer than 15 days for startup and testing.
 - 5. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's and Program Manager's administrative procedures necessary for certification of Substantial Completion.
 - 6. Punch List and Final Completion: Include not more than 30 days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.
 - 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 4. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.

- f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 5. Work Stages: Indicate important stages of construction for each major portion of the Work.
 - D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
 - E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
 1. Unresolved issues.
 2. Unanswered Requests for Information.
 3. Rejected or unreturned submittals.
 4. Notations on returned submittals.
 5. Pending modifications affecting the Work and Contract Time.
 - F. Recovery Schedule: When periodic update indicates the Work is 14 or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.
 - G. Computer Scheduling Software: Prepare schedules using current version of a program that has been developed specifically to manage construction schedules.
 1. Use Microsoft Project, .
- 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)
- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within 30 days of date established for the Notice to Proceed.
 - B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
 1. For construction activities that require three months or longer to complete, indicate an estimated completion percentage in 10 percent increments within time bar.
- 2.3 REPORTS
- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 1. List of subcontractors at Project site.
 2. List of separate contractors at Project site.
 3. Approximate count of personnel at Project site.
 4. Equipment at Project site.
 5. Material deliveries.
 6. High and low temperatures and general weather conditions, including presence of rain or snow.
 7. Accidents.
 8. Meetings and significant decisions.
 9. Unusual events.

10. Stoppages, delays, shortages, and losses.
 11. Meter readings and similar recordings.
 12. Emergency procedures.
 13. Orders and requests of authorities having jurisdiction.
 14. Change Orders received and implemented.
 15. Construction Change Directives received and implemented.
 16. Services connected and disconnected.
 17. Equipment or system tests and startups.
 18. Partial completions and occupancies.
 19. Substantial Completions authorized.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 3. As the Work progresses, indicate final completion percentage for each activity.
 4. Project schedule shall be submitted with every pay request.
- B. Distribution: Distribute copies of approved schedule to Architect, Program Manager, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
 2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Section 013200 "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
 - 2. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
 - 3. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 4. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
- B. Submit Submittal Schedule no later than thirty (3) days after contract date.
- C. ALL submittals to be completed sixty (60) days after contract date.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. All submittals shall be made in electronic format unless paper submittals have been previously authorized in writing by the Architect.
- B. Architect's Digital Data Files: Electronic copies of digital data files of the Contract Drawings will not be provided by Architect upon Contractor's request, Contractor's use in preparing submittals.

1. Architect will furnish Contractor one set of digital data drawing files of the Contract Drawings for use in preparing Shop Drawings and Project record drawings.
 - a. Architect makes no representations as to the accuracy or completeness of digital data drawing files as they relate to the Contract Drawings.
 - b. Contractor shall execute a data licensing agreement in the form of Agreement included in Project Manual.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Resubmittal Review: Allow 10 days for review of each resubmittal.
- E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. Submittal number shall include a prefix indicating the number of the submittal, the six digit specification section and a sequential number indicating how many times the submittal has been submitted.
 - 1) Example: 098413-03-01, where, 098413 is the specification section number, 03 represents the third submittal under Section 098413, and 01 represents the number of times the submittal has been submitted, where 00 is the original submittal, 01 is the first re-submittal and so on.
 3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
 4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Contractor.
 - e. Name of firm or entity that prepared submittal.

- f. Names of subcontractor, manufacturer, and supplier.
 - g. Category and type of submittal.
 - h. Submittal purpose and description.
 - i. Specification Section number and title.
 - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - k. Drawing number and detail references, as appropriate.
 - l. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.
 - n. Indication of full or partial submittal.
 - o. Transmittal number, numbered consecutively.
 - p. Submittal and transmittal distribution record.
 - q. Other necessary identification.
 - r. Remarks.
- F. Options: Identify options requiring selection by Architect.
- G. Deviations: Identify deviations from the Contract Documents on submittals.
- H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
- 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements:
- 1. Submit electronic submittals via email as PDF electronic files. Submit files to e-mail address to be identified by Architect, at pre-construction meeting.
 - a. Architect, will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
 - 2. Action Submittals: Submit three paper copies of each submittal unless otherwise indicated. Architect, will return one copy.
 - 3. Informational Submittals: Submit two paper copies of each submittal unless otherwise indicated. Architect will not return copies.
 - 4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

- a. Provide a digital signature with digital certificate on electronically-submitted certificates and certifications where indicated.
 - b. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 2. Mark each copy of each submittal to show which products and options are applicable.
 3. Include the following information, as applicable:
 - a. Manufacturer's catalog cuts.
 - b. Manufacturer's product specifications.
 - c. Standard color charts.
 - d. Statement of compliance with specified referenced standards.
 - e. Testing by recognized testing agency.
 - f. Application of testing agency labels and seals.
 - g. Notation of coordination requirements.
 - h. Availability and delivery time information.
 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
 5. Submit Product Data before or concurrent with Samples.
 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
 - b. Two opaque (bond) copies of each submittal. Architect, will return one copy(ies).
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between sub-

mittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, will return submittal with options selected.
 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three Insert number sets of Samples. Architect will retain **two** Sample sets; one will be returned. Mark up and retain one returned Sample set as a project record sample.
 - 1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
1. Submit product schedule in the following format:
 - a. PDF electronic file.
 - b. **Two** paper copies of product schedule or list unless otherwise indicated. Architect, will return **one** copies.
- F. Coordination Drawings Submittals: Comply with requirements specified in Section 013100 "Project Management and Coordination."

- G. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- H. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- I. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- J. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- K. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- L. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- M. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- N. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- O. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- P. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- Q. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- R. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- S. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- T. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project.
- U. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."

- V. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- W. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- X. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- Y. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S 'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action, as follows:
 - 1. Shop Drawing Review Stamp: The Architect will stamp each submittal with a uniform, shop drawing review stamp. The Architect will mark the stamp appropriately to indicate the action taken, as follows:
 - a. Final Unrestricted Release: When the Architect marks a submittal "**REVIEWED**" the Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 - b. Final-But-Restricted Release: When the Architect marks a submittal "**REVIEWED AS NOTED**", the Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance. In this option, the Architect may require a re-submittal by checking the "**REVISE AND RESUBMIT**" box or not by leaving the "**REVISE AND RESUBMIT**" box blank.
 - c. Returned Rejected: When the Architect marks a submittal "Resubmit" or "**REJECTED**" do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary to obtain different action mark.
 - d. Acknowledgement only: When the Architect marks a submittal "**INFORMATION ONLY**", the Architect acknowledges receipt. Submittal will be returned for record only.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300



SUBMITTAL TRANSMITTAL

Project: _____ Date: _____
A/E Project Number: _____

TRANSMITTAL To (Contractor): _____ Date: _____ Submittal No. _____
A From (Subcontractor): _____ By: _____ ☐ Resubmission

Qty.	Reference / Number	Title / Description / Manufacturer	Spec. Section Title and Paragraph / Drawing Detail Reference

- ☐ Submitted for review and approval
☐ Resubmitted for review and approval
☐ Complies with contract requirements
☐ Will be available to meet construction schedule
☐ A/E review time included in construction schedule

- ☐ Substitution involved - Substitution request attached
☐ If substitution involved, submission includes point-by-point comparative data or preliminary details
☐ Items included in submission will be ordered immediately upon receipt of approval

Other remarks on above submission: _____

☐ One copy retained by sender

TRANSMITTAL To (A/E): _____ Attn: _____ Date Rec'd by Contractor: _____
B From (Contractor): _____ By: _____ Date Trnsmt'd by Contractor: _____

- ☐ Approved
☐ Approved as noted

- ☐ Revise / Resubmit
☐ Rejected / Resubmit

Other remarks on above submission: _____

☐ One copy retained by sender

TRANSMITTAL To (Contractor): _____ Attn: _____ Date Rec'd by A/E: _____
C From (A/E): _____ ☐ Other By: _____ Date Trnsmt'd by A/E: _____

- ☐ Approved
☐ Approved as noted
☐ Not subject to review
☐ No action required
☐ Revise / Resubmit
☐ Rejected / Resubmit
☐ Approved as noted / Resubmit

- ☐ Provide file copy with corrections identified
☐ Sepia copies only returned
☐ Point-by-point comparative data required to complete approval process
☐ Submission Incomplete / Resubmit

Other remarks on above submission: _____

☐ One copy retained by sender

TRANSMITTAL To (Subcontractor): _____ Attn: _____ Date Rec'd by Contractor: _____
D From (Contractor): _____ By: _____ Date Trnsmt'd by Contractor: _____

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ One copy retained by sender

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
 - 1. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
 - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, Program Manager, or authorities having jurisdiction are not limited by provisions of this Section.
 - 3. Specific test and inspection requirements are not specified in this Section.
 - 4. Unless more stringent requirements are indicated in individual sections testing and inspection program shall comply with the requirements of authorities having jurisdiction and the applicable building code IBC-2009.
 - a. See Section 014000A for the Statement of Special Inspection which is to be filed with the Authority having Jurisdiction as part of the permit application.
- C. Special 'Called Inspection' services are required by the Code Authority having jurisdiction at intervals during construction and at completion of construction. These inspections are required to be conducted by qualified Independent Inspectors. Contractor is required to schedule inspections and notify the Independent Inspector at appropriate time depending on construction activities.

1.2 DEFINITIONS

- A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
- B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Program Manager.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Laboratory Mockups: Full-size physical assemblies constructed at testing facility to veri-

fy performance characteristics.

- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- K. Called Inspection: A routine visit by a Qualified Inspector to check for compliance with applicable codes during construction.
 - 1. Called Inspection Record: A form used during a called inspection to document information regarding compliance or non-compliance, prepared by a qualified inspector.

1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.4 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.
 3. Qualified Inspector's credentials and indicating approval by Illinois State Board of Education (ISBE)

1.5 REPORTS AND DOCUMENTS

- A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:
1. Date of issue.
 2. Project title and number.
 3. Name, address, and telephone number of testing agency.
 4. Dates and locations of samples and tests or inspections.
 5. Names of individuals making tests and inspections.
 6. Description of the Work and test and inspection method.
 7. Identification of product and Specification Section.
 8. Complete test or inspection data.
 9. Test and inspection results and an interpretation of test results.
 10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
 11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
 12. Name and signature of laboratory inspector.
 13. Recommendations on retesting and reinspecting.
 14. Called Inspection Records: Submit two copies at appropriate time corresponding with construction activities.
- B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:
1. Name, address, and telephone number of representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 5. Other required items indicated in individual Specification Sections.
- C. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.
- E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.
- F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
 - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
 - 1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
 - 2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.
- H. Manufacturer's Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.
- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
 - 1. Contractor responsibilities include the following:
 - a. Provide test specimens representative of proposed products and construction.
 - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
 - d. When testing is complete, remove test specimens, assemblies, and mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.
- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 3. Demonstrate the proposed range of aesthetic effects and workmanship.
 4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 6. Demolish and remove mockups when directed unless otherwise indicated.
- K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Specification Sections.

1.7 QUALITY CONTROL

- A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.
 1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
 2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.
- B. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.
- C. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect, and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
 1. Notify Architect, and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
 3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.
 5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
 6. Do not perform any duties of Contractor.
- E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:
1. Access to the Work.
 2. Incidental labor and facilities necessary to facilitate tests and inspections.
 3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
 4. Facilities for storage and field curing of test samples.
 5. Delivery of samples to testing agencies.
 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.8 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage Engage a qualified special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in Statement of Special Inspections attached to this Section, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected work.
- B. Called Inspection Records: Provide called inspection records indicating inspections performed and certified by Qualified Inspectors. Perform all inspections required by International Building Code (IBC 2009), International Energy Conservation Code (IECC 2009), International Fire Code (IFC 2009), International Fuel Gas Code (IFGC 2006), and the International Mechanical Code (IMC 2009).
1. Unless otherwise requested by the Regional Office of Education, the following minimum

inspections shall be provided:

- a. See attachment Exhibit A.
2. The Inspection Records shall show the Qualified Inspector's signed authorization to proceed after each phase or milestone of construction.
3. Schedule called inspections required to be completed prior to covering up work.
4. Provide access for Qualified Inspector to perform inspection. Uncover work as required for proper inspection at no additional cost to the Owner

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
 1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.
 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

CONFIRMATION OF CALLED INSPECTION RECORDS

☐ 2009 International Building Code Called Inspection Records

	Called Inspection Type	Approval to Proceed Date	A/E or Qualified Inspector Signature	ISBE ID Number or A/E License Number
1.	Footing			
2.	Foundation			
3.	Concrete Slab / Under-floor			
4.	Lowest Floor Elevation			
5.	Framing			
6.	Lathe and Gypsum Board			
7.	Fire Resistant Penetrations			
8.	Energy Efficiency			
9.	Special Inspection			
10.	Final IBC			

☐ 2009 International Electrical Code (Appendix K) Called Inspection Records

	Called Inspection Type	Approval to Proceed Date	A/E or Qualified Inspector Signature	ISBE ID Number or A/E License Number
1.	Prefabricated Assembly Evaluation Report			
2.	Underground			
3.	Rough-in			
4.	Final IEC			

☐ 2009 International Energy Conservation Code Called Inspection Records

	Called Inspection Type	Approval to Proceed Date	A/E or Qualified Inspector Signature	ISBE ID Number or A/E License Number
1.	Foundation (thermal envelope)			
2.	Framing (thermal envelope)			
3.	Insulation (thermal envelope)			
4.	Rough-in "Okay to Cover" (mechanical, service water heating, electrical, lighting)			
5.	Final (mechanical, service water heating, electrical, lighting)			
6.	Final IECC			

☐ 2009 International Fire Code Called Inspection Records

	Called Inspection Type	Approval to Proceed Date	A/E or Qualified Inspector Signature	ISBE ID Number or A/E License Number
1.	Final IFC			

☐ 2009 International Mechanical and Fuel Gas Code Called Inspection Records

	Called Inspection Type	Approval to Proceed Date	A/E or Qualified Inspector Signature	ISBE ID Number or A/E License Number
1.	Prefabricated Assembly Evaluation Report			
2.	Underground Piping			
3.	Rough-in			
4.	Final IMC & IFGC			

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
- C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

1.2 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.
- D. Natural Gas Service from Existing System: Gas from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.3 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

1.4 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.
- C. Accessible Temporary Egress: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts. Provide galvanized-steel bases for supporting posts.

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Storage and Fabrication Sheds: Provide sheds sized, furnished, and equipped to accommodate materials and equipment for construction operations.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
 - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
 - 2. Heating Units: Listed and labeled for type of fuel being consumed, by a qualified testing agency acceptable to authorities having jurisdiction, and marked for intended location and application.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
 - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."
- B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

- A. General: Install temporary service or connect to existing service.
 - 1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.
- B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
 - 1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- E. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
 - 1. Toilets: Use of Owner's existing toilet facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- G. Electric Power Service: Connect to Owner's existing electric power service, but only up to 100A capacity. Maintain equipment in a condition acceptable to Owner.
- H. Electric Power Service: If more than 100A is needed, provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
 - 1. Install electric power service overhead unless otherwise indicated.

2. Connect temporary service to Owner's existing power source, as directed by Owner.
- I. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
 1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.
- J. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.
 1. At each telephone, post a list of important telephone numbers.
 - a. Police and fire departments.
 - b. Ambulance service.
 - c. Contractor's home office.
 - d. Contractor's emergency after-hours telephone number.
 - e. Architect's office.
 - f. Engineers' offices.
 - g. Owner's office.
 - h. Principal subcontractors' field and home offices.
 2. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
 1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
 2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Traffic Controls: Comply with requirements of authorities having jurisdiction.
 1. Protect existing site improvements to remain including curbs, pavement, and utilities.
 2. Maintain access for fire-fighting equipment and access to fire hydrants.
- C. Parking: Use designated areas of Owner's existing parking areas for construction personnel.
- D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction. Maintain Project site, excavations, and construction free of water.
 1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties or endanger permanent Work or temporary facilities.
 2. Remove snow and ice as required to minimize accumulations.
- E. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.
 1. Identification Signs: Provide Project identification signs as indicated on Drawings.
 2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
 - a. Provide temporary, directional signs for construction personnel and visitors.
 3. Maintain and touchup signs so they are legible at all times.

- F. Waste Disposal Facilities: Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
 - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- H. Existing Stair Usage: Use of Owner's existing stairs will be permitted, provided stairs are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore stairs to condition existing before initial use.
 - 1. Provide protective coverings, barriers, devices, signs, or other procedures to protect stairs and to maintain means of egress. If stairs become damaged, restore damaged areas so no evidence remains of correction work.
- I. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
- C. Stormwater Control: Comply with requirements of authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.
- D. Tree and Plant Protection: Comply with requirements specified in Section 015639 "Temporary Tree and Plant Protection."
- E. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.
- F. Site Enclosure Fence: Prior to commencing earthwork, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
 - 1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
 - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.
- G. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

- H. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- I. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- J. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.
 - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- K. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise.
 - 1. Construct dustproof partitions with gypsum wallboard with joints taped on occupied side, and fire-retardant-treated plywood on construction operations side.
 - 2. Construct dustproof partitions with two layers of 6-mil (0.14-mm) polyethylene sheet on each side. Cover floor with two layers of 6-mil (0.14-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.
 - 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
 - 4. Insulate partitions to control noise transmission to occupied areas.
 - 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
 - 6. Protect air-handling equipment.
 - 7. Provide walk-off mats at each entrance through temporary partition.
- L. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire prevention program.
 - 1. Prohibit smoking in construction areas.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.
 - 4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.
- C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Discard or replace water-damaged and wet material.
 - 4. Discard, replace, or clean stored or installed material that begins to grow mold.
 - 5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Remove materials that can not be completely restored to their manufactured moisture level within 48 hours.

3.6 OPERATION, TERMINATION, AND REMOVAL

- A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
- B. Maintenance: Maintain facilities in good operating condition until removal.
 - 1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.
- D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.
 - 1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
 - 2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for requests for substitutions.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Comparable Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Where a Basis of Design Product is specified, the project shall be assumed to have been designed to accommodate all the requirements of the Basis of Design Product. Should the acceptable alternate product be used, the Contractor shall bear the cost of modifications, which may be required to accommodate the alternate product.
 - 1. Modifications that may be required include but are not limited to:
 - a. Alterations due to physical size and weight of equipment.
 - a. Electrical power and grounding requirements
 - b. Cabling, auxiliary equipment, and controls.
 - c. Water and sanitation requirements.
 - d. Heating, air-conditioning and ventilation requirement.
 - 2. The cost of modifications shall include the cost of re-engineering and revisions to drawings and specifications, as required. These costs shall be paid directly from the Contractor.

tor to the Architect.

1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: Submit request for consideration of each comparable product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Asbestos Containing Materials (ACM): Products containing any Asbestos Containing Materials, shall not be used on this project. Contractor shall certify in writing, as part of Closeout requirements, that ACM containing products have not been used in the project.
- C. Paint containing lead may shall not be used on this project. Contractor shall certify in writing, as part of Closeout requirements, that Lead containing paints have not been used in the project.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store products to allow for inspection and measurement of quantity or counting of units.
 - 2. Store materials in a manner that will not endanger Project structure.
 - 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.

5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
6. Protect stored products from damage and liquids from freezing.

1.6 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
 1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
- B. Product Selection Procedures:
 1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product.
 4. Manufacturers:
 - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.
 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.
- ## 2.2 COMPARABLE PRODUCTS
- A. Conditions for Consideration: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
1. Evidence that the proposed product does not require revisions to the Contract Documents,

- that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 016000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. Construction layout.
 - 2. Field engineering and surveying.
 - 3. Installation of the Work.
 - 4. Cutting and patching.
 - 5. Coordination of Owner-installed products.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.
 - 9. Correction of the Work.
- B. Related Requirements:
 - 1. Section 011000 "Summary" for limits on use of Project site.
 - 2. Section 013300 "Submittal Procedures" for submitting surveys.
 - 3. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 4. Section 024119 "Selective Structure Demolition" for demolition and removal of selected portions of the building.
 - 5. Section 078413 "Penetration Firestopping" for patching penetrations in fire-rated construction.

1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor professional engineer.

- B. Certificates: Submit certificate signed by land surveyor professional engineer certifying that location and elevation of improvements comply with requirements.
- C. Cutting and Patching Plan: Submit plan describing procedures at least 10 days prior to the time cutting and patching will be performed. Include the following information:
 - 1. Extent: Describe reason for and extent of each occurrence of cutting and patching.
 - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building appearance and other significant visual elements.
 - 3. Products: List products to be used for patching and firms or entities that will perform patching work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities and Mechanical and Electrical Systems: List services and systems that cutting and patching procedures will disturb or affect. List services and systems that will be re-located and those that will be temporarily out of service. Indicate length of time permanent services and systems will be disrupted.
 - a. Include description of provisions for temporary services and systems during interruption of permanent services and systems.
- D. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.
- E. Certified Surveys: Submit two copies signed by land surveyor professional engineer.
- F. Final Property Survey: Submit 10 copies showing the Work performed and record survey data.

1.5 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.
 - 1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection
 - 2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Mechanical systems piping and ducts.
 - f. Control systems.
 - g. Communication systems.
 - h. Fire-detection and -alarm systems.

- i. Conveying systems.
 - j. Electrical wiring systems.
 - k. Operating systems of special construction.
 - 3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:
 - a. Water, moisture, or vapor barriers.
 - b. Membranes and flashings.
 - c. Exterior curtain-wall construction.
 - d. Sprayed fire-resistive material.
 - e. Equipment supports.
 - f. Piping, ductwork, vessels, and equipment.
 - g. Noise- and vibration-control elements and systems.
 - 4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
- C. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
1. Description of the Work.
 2. List of detrimental conditions, including substrates.
 3. List of unacceptable installation tolerances.
 4. Recommended corrections.
- D. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Section 013100 "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Program Manager promptly.
- B. General: Engage a land surveyor professional engineer to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish limits on use of Project site.
 - 3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 4. Inform installers of lines and levels to which they must comply.
 - 5. Check the location, level and plumb, of every major element as the Work progresses.
 - 6. Notify Architect and Program Manager when deviations from required lines and levels exceed allowable tolerances.
 - 7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Program Manager.

3.4 FIELD ENGINEERING

- A. Identification: Owner will identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
 - 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Program Manager. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Program Manager before proceeding.
 - 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of [two] <Insert number> permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Docu-

- ments.
- 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
- 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.

3.5 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of **96 inches (2440 mm)** in occupied spaces and **90 inches (2300 mm)** in unoccupied spaces.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.
- H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 CUTTING AND PATCHING

- A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.
- C. Temporary Support: Provide temporary support of work to be cut.
- D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Section 011000 "Summary."
- F. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to prevent interruption to occupied areas.
- G. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - 4. Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - 6. Proceed with patching after construction operations requiring cutting are complete.
- H. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demon-

- strate physical integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
 - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - b. Restore damaged pipe covering to its original condition.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
 - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.
- I. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.7 OWNER-INSTALLED PRODUCTS

- A. Site Access: Provide access to Project site for Owner's construction personnel.
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.
 - 1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.
 - 2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.8 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

- a. Use containers intended for holding waste materials of type to be stored.
4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 1. Remove liquid spills promptly.
 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Section 015000 "Temporary Facilities and Controls."
- H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.
- J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.9 STARTING AND ADJUSTING

- A. Coordinate startup and adjusting of equipment and operating components with requirements in Section 019113 "General Commissioning Requirements."
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

- E. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements."

3.10 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300



REQUEST FOR INTERPRETATION

Project: _____ R.F.I. Number: _____

From: _____
To: _____ Date: _____

A/E Project Number: _____
Re: _____ Contract For: _____

Specification Section: Paragraph: Drawing Reference: Detail:

Request:

Signed by: _____ Date: _____

Response:

☐ Attachments

Response From: To: Date Rec'd: Date Ret'd:

Signed by: _____ Date: _____

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
 - 1. Substantial Completion procedures.
 - 2. Final completion procedures.
 - 3. Warranties.
 - 4. Final cleaning.
 - 5. Repair of the Work.
 - 6. Electronic Document Closeout.
- B. Related Requirements:
 - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
 - 2. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
 - 3. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.
- C. Field Report: For pest control inspection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.
- B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
 - 2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
 - 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 - 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Program Manager. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Program Manager's signature for receipt of submittals.
 - 5. Submit test/adjust/balance records.
 - 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
 - 1. Advise Owner of pending insurance changeover requirements.
 - 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 3. Complete startup and testing of systems and equipment.
 - 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
 - 6. Advise Owner of changeover in heat and other utilities.
 - 7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
 - 8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
 - 9. Complete final cleaning requirements, including touchup painting.
 - 10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and

tests. On receipt of request, Architect and Program Manager will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.
1. Number of Inspections: The Architect will perform one substantial completion inspection and one substantial completion re-inspection at no cost to the contractor. If additional re-inspections are required, the Contractor shall reimburse the Architect on a per diem basis based on the Architect's Project Manager rate.
2. Submit Called Inspection Records.

E. Occupancy Inspection: When the Architect and Program Manager deem that the Project is substantially complete, the Architect or Program Manager will notify the Regional Office of Education and request an Occupancy Permit.

1. Documentation required prior to Occupancy Inspection:
 - a. Application for Occupancy Permit prepared by Architect and signed by the District's Superintendent and the President of the Board of Education.
 - a. Architect's and Program Manager's list of items to be completed and corrected (punch list).
 - b. Copies of Called Inspections Record for all disciplines.
2. Upon receipt of Occupancy Permit the Architect will prepare the Certificate of Substantial Completion or will notify the Contractor of items either on Contractor's list or additional items identified by Architect, Program Manager and ROE, that must be completed or corrected before certificate will be issued.
3. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
4. Results of completed inspection will form the basis of requirements for Final Completion.

1.6 FINAL COMPLETION PROCEDURES

A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.
5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Architect and Program Manager will either proceed with inspection or notify Con-

tractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Number of Inspections: The Architect will perform one final completion inspection and one final completion re-inspection at no cost to the contractor. If additional re-inspections are required, the Contractor shall reimburse the Architect on a per diem basis based on the Architect's Project Manager rate.

1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction. Use CSI Form 14.1A.
1. Organize list of spaces in sequential order, starting with exterior areas first .
 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 3. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Architect, through Program Manager, will return annotated copy.
 - b. PDF electronic file. Architect, through Program Manager, will return annotated copy.
 - c. paper copies unless otherwise indicated. Architect, through Program Manager, will return two copies.

1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
1. Bind warranties and bonds in (2) heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch (215-by-280-mm) paper.
 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
 4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- C. Provide additional copies of each warranty to include in operation and maintenance manuals.

1.9 CERTIFICATIONS

- A. General: Provide certification on each Contractor's letter head and signed and sealed by Firm's authorized legal representative, stating the following:
1. No asbestos containing materials (ACM) have been incorporated into the project and that all products installed in the project have been manufactured without ACM components.
 2. No lead containing materials have been incorporated into the project and that all products installed in the project have been manufactured without lead components.

1.10 ELECTRONIC CLOSEOUT DOCUMENTATION

- A. General: Provide a complete project closeout documentation package in electronic format. This package shall include:
1. Project Record Documents.
 2. Approved Submittals.
 3. Operation and Maintenance Manuals.
 4. Warranties.
 5. Owner training DVD's.
 6. Project Contact Directory.
- B. The Electronic Closeout Documentation shall be prepared by Digital Revolution Inc./BHFX LLC Contact TJ Hurckes at 847-899-3414 or tj.hurckes@bhfx.net.
- C. In order to facilitate the Electronic Closeout Documentation process, comply with the following procedures:
1. Contact Digital Revolution, Inc. a minimum of three months prior to the date of Substantial Completion to schedule a pre-closeout meeting. Review the following:
 - a. Format of documents: PDF electronic format for all documents.
 - b. Folder structure for storage and transfer of files.
 - c. Schedule for collection and turn-over of closeout documentation.
 - d. Record Document format procedures: Provide clean and accurate paper copies of the marked-up Record Documents (Drawings and Specifications) for scanning.
 - e. Provide contact information for the individual responsible for the collection and transfer of the electronic closeout Documentation package contents.
 - f. Review a complete listing of closeout documentation package contents.
 2. Provide all Documentation to Digital Revolution, Inc. for processing no later than 30 days after the date of Substantial Completion.
 3. Schedule a training conference with the Owner's Representative, Architect, Program Manager and Digital Revolution, Inc. to present the completed Electronic Closeout Documentation Package.
 4. Cost of this service will be paid by RPS 205 directly to BHFX.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.
- B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.
 1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:
 - a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
 - d. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - e. Remove snow and ice to provide safe access to building.
 - f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - h. Sweep concrete floors broom clean in unoccupied spaces.
 - i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
 - j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 - k. Remove labels that are not permanent.
 - l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
 - m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
 - n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
 - o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
 - p. Leave Project clean and ready for occupancy.
- C. Pest Control: Comply with pest control requirements in Section 015000 "Temporary Facilities and Controls." Prepare written report.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700



PUNCH LIST

Project: _____

From (A/E): _____

Site Visit Date: _____

To (Contractor): _____

A/E Project Number: _____

Contract For: _____

The following items require the attention of the Contractor for completion or correction. This list may not be all-inclusive, and the failure to include any items on this list does not alter the responsibility of the Contractor to complete all Work in accordance with the Contract Documents.

Item Number	Room Number	Location (Area)	Description	Correction/Completion Date	Verification A/E Check
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☐ Attachments

Signed by: _____ Date: _____

Copies: ☐ Owner ☐ Consultants ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ _____ ☐ File

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.

1.2 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
- C. Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's comments and prior to commencing demonstration and training.

PART 2 - PRODUCTS

2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.
- B. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
 - 1. Title page.
 - 2. Table of contents.

3. Manual contents.
- C. Title Page: Include the following information:
1. Subject matter included in manual.
 2. Name and address of Project.
 3. Name and address of Owner.
 4. Date of submittal.
 5. Name and contact information for Contractor.
 6. Name and contact information for Program Manager.
 7. Name and contact information for Architect.
 8. Name and contact information for Commissioning Authority.
 9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 10. Cross-reference to related systems in other operation and maintenance manuals.
- D. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
- E. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
- F. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.
- G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: (2) Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.

4. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.2 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 1. Type of emergency.
 2. Emergency instructions.
 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
 1. Fire.
 2. Flood.
 3. Gas leak.
 4. Water leak.
 5. Power failure.
 6. Water outage.
 7. System, subsystem, or equipment failure.
 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 1. Instructions on stopping.
 2. Shutdown instructions for each type of emergency.
 3. Operating instructions for conditions outside normal operating limits.
 4. Required sequences for electric or electronic systems.
 5. Special operating instructions and procedures.

2.3 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 2. Performance and design criteria if Contractor is delegated design responsibility.
 3. Operating standards.
 4. Operating procedures.
 5. Operating logs.
 6. Wiring diagrams.
 7. Control diagrams.

8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.4 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
- D. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
- E. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
- F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
 - 1. Record Drawings.
 - 2. Record Specifications.
 - 3. Record Product Data.
- B. Related Requirements:
 - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.2 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit one set of marked-up record prints.
- B. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit one paper copy of each submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
 - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Record data as soon as possible after obtaining it.
 - c. Record and check the markup before enclosing concealed installations.
 - 2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
 - 3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect and Program Manager. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
 1. Format: Annotated PDF electronic file with comment function enabled.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect through Program Manager for resolution.
 4. Architect will furnish Contractor one set of digital data files of the Contract Drawings for use in recording information.
- C. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
 1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Format: Annotated PDF electronic file with comment function enabled.
 3. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 4. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect and Program Manager.
 - e. Name of Contractor.

2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. Note related Change Orders, record Product Data, and record Drawings where applicable.
- B. Format: Submit record Specifications as annotated PDF electronic file paper copyscanned PDF electronic file(s) of marked-up paper copy of Specifications.

2.3 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 1. Give particular attention to information on concealed products and installations that can-

- not be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file paper copyscanned PDF electronic file(s) of marked-up paper copy of Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
- B. Format: Submit miscellaneous record submittals as PDF electronic file paper copyscanned PDF electronic file(s) of marked-up miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Program Manager's reference during normal working hours.

END OF SECTION 017839

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.2 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

1.3 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training.

1.4 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 - 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.

- m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
 - 3. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Program Manager, with at least seven days' advance notice.

- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a written performance-based test.

END OF SECTION 017900

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
- B. Related Requirements:
 - 1. Section 007250.10 "Clean Construction and Demolition Debris and Backfill Requirements".
 - 2. Section 011000 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
 - 3. Section 017300 "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.
- B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.
 - 1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property , for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.
- B. Schedule of Selective Demolition Activities: Indicate the following:
 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 2. Interruption of utility services. Indicate how long utility services will be interrupted.
 3. Coordination for shutoff, capping, and continuation of utility services.
 4. Use of elevator and stairs.
 5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.
- C. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.
- D. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

- A. Inventory: Submit a list of items that have been removed and salvaged.
- B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- C. Clean Construction and Demolition Debris (CCDD) records: Indicate receipt and acceptance of CCDD by a landfill facility licensed to accept CCDD.

1.8 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - 1. Hazardous materials will be removed by Owner before start of the Work.
 - 2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped before starting selective demolition operations.
- B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.
- C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Perform Engage a professional engineer to perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
 - 2. Steel Tendons: Locate tensioned steel tendons and include recommendations for de-tensioning.

- F. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
 - 1. Comply with requirements specified in Section 013233 "Photographic Documentation."
 - 2. Inventory and record the condition of items to be removed and salvaged. Provide photographs of conditions that might be misconstrued as damage caused by salvage operations.
 - 3. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
 - 1. Comply with requirements for existing services/systems interruptions specified in Section 011000 "Summary."
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
 - 2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - c. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Comply with requirements for access and protection specified in Section 015000 "Temporary Facilities and Controls."
- B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
 - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
 - 2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
 4. Cover and protect furniture, furnishings, and equipment that have not been removed.
 5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Section 015000 "Temporary Facilities and Controls."
- C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.
1. Strengthen or add new supports when required during progress of selective demolition.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain **fire watch** and portable fire-suppression devices during flame-cutting operations.
 5. Maintain adequate ventilation when using cutting torches.
 6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 9. Dispose of demolished items and materials promptly.
- B. Reuse of Building Elements: Project has been designed to result in end-of-Project rates for reuse of building elements as follows. Do not demolish building elements beyond what is indicated on Drawings without Architect's approval.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings."
- E. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 075423 Thermoplastic Polyolefin (TPO) Roofing" for new roofing requirements.
 - 1. Remove existing roof membrane, flashings, copings, and roof accessories.
 - 2. Remove existing roofing system down to substrate.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be[recycled,] reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
 - 1. Do not allow demolished materials to accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
 - 3. As a condition for Payment, provide landfill manifest or other documentation to prove materials were disposed of legally.
 - 4. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
 - 5. Comply with requirements specified in Section 017419 "Construction Waste Management and Disposal."
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Foundation walls.
 - 3. Slabs-on-grade.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- E. Samples: For waterstops vapor retarder.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
- D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- F. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- G. Preinstallation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, semirigid joint fillers, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 1. Plywood, metal, or other approved panel materials.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- D. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 1. Furnish units that will leave no corrodible metal closer than 1 inch to the plane of exposed concrete surface.

2. Furnish ties that, when removed, will leave holes no larger than 1 inch in diameter in concrete surface.
3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.
- C. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- D. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 1. Portland Cement: ASTM C 150, Type I, gray .
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride. Do not use admixtures containing more than 0.05 percent chloride ions.
 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
 4. High-Range, Water-Reducing Admixture, Superplasticizer: ASTM C 494/C 494M, Type F.

5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Axim Italcementi Group, Inc.; CATEXOL CN-CI.
 - b. BASF Construction Chemicals - Building Systems; Rheocrete CNI.
 - c. Euclid Chemical Company (The), an RPM company; ARRMATECT EUCON BCN EUCON CIA.
 - d. Grace Construction Products, W. R. Grace & Co.; DCI.
 - e. Sika Corporation; Sika CNI.
- D. Non-Chloride, Non-Corrosive Accelerating Admixture: The admixture shall conform to ASTM C494, Type C and E, and not contain more chloride ions than are present in municipal drinking water. The admixture manufacturer must have long term non-corrosive test data from an independent testing laboratory (of at least one year's duration) using an acceptable accelerated corrosion test method such as that using electrical potential measures. Provide the following:
1. Accelguard 80, Accelguard 90 or NCA by the Euclid Chemical Co.
 2. Viscosity Modifying Admixture (VMA): Liquid admixture used to optimize viscosity of Self-Consolidating Concrete (SCC). Subject to compliance with requirements, provide one of the following:
 - a. Viscrol by The Euclid Chemical Company
 - b. Boral SL by Boral Material Technologies
 - c. Rheomac VMA Series by Master Builders
 3. Certification: Written conformance to the above-mentioned requirements and the chloride ion content of admixtures will be required from the admixture manufacturer prior to mix design review by the Engineer.
 4. Prohibited Admixtures: Calcium chloride thiocyanates or admixtures containing more than 0.05 percent chloride ions are not permitted.
- E. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals - Building Systems; Rheocrete 222+.
 - b. Grace Construction Products, W. R. Grace & Co.; DCI-S.
 - c. Sika Corporation; FerroGard 901.
- 2.6 WATERSTOPS
- A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Greenstreak.
 - b. Williams Products, Inc.
 - c. BoMetals, Inc
 2. Profile: Flat, dumbbell with center bulb .
 3. Dimensions: 6 inches by 3/8 inch thick; nontapered.
- B. Self-Expanding Rubber Strip Waterstops: Manufactured rectangular or trapezoidal strip, bentonite-free hydrophilic polymer modified chloroprene rubber, for adhesive bonding to concrete, 3/8 by 3/4 inch.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Adeka Ultra Seal/OCM, Inc.; Adeka Ultra Seal.
 - b. Greenstreak; Hydrotite.
 - c. Vinylex Corp.; Swellseal.

2.7 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A, **except with maximum perm rating of** less than 0.01 perms after mandatory conditioning tests per ASTM E1745 (7.1.1-7.1.5). Include manufacturer's recommended adhesive or pressure-sensitive tape.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
 - b. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
 - c. Meadows, W. R., Inc.; Perminator 15 mil.
 - d. Raven Industries Inc.; Vapor Block 15.
 - e. Reef Industries, Inc.; Griffolyn Type-105.
 - f. Stego Industries, LLC; Stego Wrap 15 mil Class A.

2.8 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Construction Chemicals - Building Systems; Confilm.
 - b. ChemMasters; SprayFilm.
 - c. Dayton Superior Corporation; Sure Film (J-74).
 - d. Euclid Chemical Company (The), an RPM company; Eucobar.
 - e. L&M Construction Chemicals, Inc.; E-CON.
 - f. Sika Corporation; SikaFilm.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

- D. Water: Potable.
- E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - b. BASF Construction Chemicals - Building Systems; Kure 200.
 - c. Conspec by Dayton Superior; W.B. Resin Cure.
 - d. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
 - e. L&M Construction Chemicals, Inc.; L&M Cure R.
 - f. Meadows, W. R., Inc.; 1100-CLEAR.
 - g. SpecChem, LLC; Spec Rez Clear.

2.9 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types I and II, non-load bearing and Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Reglets: Fabricate reglets of not less than 0.022-inch- thick, galvanized-steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.
- F. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.10 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.
 - 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 - 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
 - 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.

4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.
 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
 2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.11 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.12 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as specified on structural drawings.
- B. Foundation Walls: Proportion normal-weight concrete mixture as specified on structural drawings.
- C. Slabs-on-Grade: Proportion normal-weight concrete mixture as specified on structural drawings.

2.13 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.14 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and ASTM C 1116/C 1116M, and furnish batch ticket information.
 - 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
 - 1. Class A, 1/8 inch for smooth-formed finished surfaces.
 - 2. Class B, 1/4 inch for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
 - 1. Install keyways, reglets, recesses, and the like, for easy removal.
 - 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer Do not chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 - 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
 - 3. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
 - 1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 - 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.
- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
 - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
 - 2. Repair and seal damaged areas – seal all penetrations

3.5 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
 2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Section 079200 "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
- E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.8 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces exposed to public view,.
- C. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 45; and of levelness, F(L) 35; with minimum local values of flatness, F(F) 30; and of levelness, F(L) 24.
 - 3. Finish and measure surface so gap at any point between concrete surface and an unveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch.
- D. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.12 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing

operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer[unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project].

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inchwide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without

- coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 6. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each

- composite sample.
- b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
- 7. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
- 8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- 9. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- 10. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- 11. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- 12. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
- 13. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 14. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

1. Concrete masonry units.
2. Face brick.
3. Stone trim units.
4. Mortar and grout.
5. Steel reinforcing bars.
6. Masonry joint reinforcement.
7. Ties and anchors.
8. Embedded flashing.
9. Miscellaneous masonry accessories.
10. Cavity-wall insulation.

- B. Related Sections:

1. Section 033000 "Cast-in-Place Concrete" for installing dovetail slots for masonry anchors.
2. Section 051200 "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural steel frame.
3. Section 055000 "Metal Fabrications" for furnishing steel lintels and shelf angles for unit masonry.
4. Section 072716 "Field Applied Membrane Air Barrier" for air barrier membrane to be applied to cavity face of backup wythes of cavity walls.
5. Section 076200 "Sheet Metal Flashing and Trim" for exposed sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 1. Clay Masonry Unit Test: For each type of unit required, according to ASTM C 67 for

- compressive strength.
- 2. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
- 3. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
- 4. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
- 5. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
- 6. Prism Test: For each type of construction required, according to ASTM C 1314.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - 2. Stone Trim Units: Show sizes, profiles, and locations of each stone trim unit required.
 - 3. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."
 - 4. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.
- C. Samples for Verification: For each type and color of the following:
 - 1. Decorative CMUs.
 - 2. Concrete facing brick.
 - 3. Face brick, in the form of straps of five or more bricks.
 - 4. Special brick shapes.
 - 5. Stone trim.
 - 6. Pigmented and mortar. Make Samples using same sand and mortar ingredients to be used on Project.
 - 7. Weep holes.
 - 8. Accessories embedded in masonry.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
 - 1. Masonry units.
 - a. Include material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C 67.
 - d. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
 - 2. Cementitious materials. Include brand, type, and name of manufacturer.
 - 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 - 4. Grout mixes. Include description of type and proportions of ingredients.
 - 5. Reinforcing bars.

6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Section 014000 "Quality Requirements" for mockups.
1. Build sample panels for typical exterior wall in sizes approximately 48 inches long by 48 inches high by full thickness.
 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
 3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
 4. Protect approved sample panels from the elements with weather-resistant membrane.
 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.

- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.
- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 2. Provide bullnose units for outside corners unless otherwise indicated.
- B. CMUs: ASTM C 90.
 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
 2. Density Classification: Normal weight.
 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
 5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.3 AND MASONRY LINTELS

- A. General: Provide one of the following:
- B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 BRICK

- A. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- B. Face Brick: Facing brick complying with ASTM C 216.
1. Products: Subject to compliance with requirements, provide brick to match existing. The following bricks have been determined by the Architect to match existing. Provide the following:
 - a. Field Brick: Rock Valley Brick "Belden" Mod Indian Red full range A 09-29.
 - b. 8 x 8 "Belden" Quad 8632 Dark A.
 - c. Note: For Accent Bands, use "Belden" 8632 Dark A unit in full brick size.
 2. Grade: SW.
 3. Type: FBX.
 4. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 6600 psi.
 5. Initial Rate of Absorption: Less than 30 g/30 sq. in. per minute when tested per ASTM C 67.
 6. Efflorescence: Provide brick that has been tested according to ASTM C 67 and is rated "not effloresced."
 7. Surface Coating: Brick with colors or textures produced by application of coatings shall withstand 50 cycles of freezing and thawing per ASTM C 67 with no observable difference in the applied finish when viewed from 10 feet or shall have a history of successful use in Project's area.

2.5 STONE TRIM UNITS

- A. Limestone: ASTM C 568, Classification II Medium Density.
1. Variety and Sources: Indiana oolitic limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.
 - a. Grade and Color: Select, buff, according to grade and color classification established by ILI.
- B. Varieties and Sources:
1. Insert, in separate subparagraphs, names of varieties and producers, distributors, or importers Match existing.
- C. Finish: Match existing.
- D. Provide stone units accurately shaped, with exposed faces dressed true, and with beds and joints

at right angles to faces.

1. For limestone, comply with recommendations in ILI's "Indiana Limestone Handbook."

2.6 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- D. Aggregate for Mortar: ASTM C 144.
 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- E. Aggregate for Grout: ASTM C 404.
- F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
 - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.
- G. Water: Potable.

2.7 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
 1. Interior Walls: Hot-dip galvanized, carbon steel.
 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 3. Wire Size for Side Rods: 0.148-inch diameter.
 4. Wire Size for Cross Rods: 0.148-inch diameter.
 5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- D. Masonry Joint Reinforcement for Multiwythe Masonry:
 1. Ladder type with 1 side rod at each face shell of hollow masonry units more than 4 inches

- wide, plus 1 side rod at each wythe of masonry 4 inches wide or less.
2. Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.
 3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches. Size ties to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face. Ties have hooks or clips to engage a continuous horizontal wire in the facing wythe.

2.8 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 641/A 641M, Class 1 coating.
 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
 3. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304.
 4. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60zinc coating.
 5. Steel Sheet, Galvanized after Fabrication: ASTM A 1008/A 1008M, Commercial Steel, with ASTM A 153/A 153M, Class B coating.
 6. Stainless-Steel Sheet: ASTM A 666, Type 304.
 7. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.
- C. Individual Wire Ties: Rectangular units with closed ends and not less than 4 inches wide.
1. Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches long may be used for masonry constructed from solid units.
 2. Where wythes do not align, use adjustable ties with pintle-and-eye connections having a maximum adjustment of 1-1/4 inches.
 3. Wire: Fabricate from 3/16-inch- diameter, hot-dip galvanized steel wire.
- D. Partition Top anchors: 4 x 4 x 3/16 angle 8 inches long steel, hot-dip galvanized after fabrication.

2.9 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with Section 076200 "Sheet Metal Flashing and Trim" and as follows:
1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
 2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
 3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
 4. Fabricate through-wall flashing with snaplock receiver on exterior face where indicated to receive counterflashing.

5. Fabricate through-wall flashing with drip edge unless otherwise indicated. Fabricate by extending flashing 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
 6. Metal Drip Edge: Fabricate from stainless steel. Extend at least 3 inches into wall and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.
- B. Flexible Flashing: Use the following unless otherwise indicated:
1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
 - 2) Grace Construction Products, W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
 - 3) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
 - 4) W. R. Meadows, Inc.; Air-Shield Thru-Wall Flashing.
 - b. Accessories: Provide preformed corners, end dams, other special shapes, and seaming materials produced by flashing manufacturer.
- C. Application: Unless otherwise indicated, use the following:
1. Where flashing is indicated to receive counterflashing, use metal flashing.
 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 3. Where flashing is partly exposed and is indicated to terminate at the wall face, use metal flashing with a drip edge or flexible flashing with a metal drip edge.
 4. Where flashing is fully concealed, use flexible flashing.
- D. Solder and Sealants for Sheet Metal Flashings: As specified in Section 076200 "Sheet Metal Flashing and Trim."
1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
 2. Elastomeric Sealant: ASTM C 920, chemically curing urethane sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.
- 2.10 MISCELLANEOUS MASONRY ACCESSORIES
- A. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- B. Weep/Vent Products: Use the following unless otherwise indicated:
1. Rectangular Plastic Weep/Vent Tubing: Clear butyrate, 3/8 by 1-1/2 by 3-1/2 inches long.

- C. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Mortar Net USA, Ltd.; Mortar Net.
 - 2. Provide one of the following configurations:
 - a. Strips, full-depth of cavity and 10 inches high, with dovetail shaped notches 7 inches deep that prevent clogging with mortar droppings.
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.

2.11 CAVITY-WALL INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type IV, closed-cell product extruded with an integral skin.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.12 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.13 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime mortar cement mortar unless otherwise indicated.
 - 3. For exterior masonry, use portland cement-lime mortar cement mortar.
 - 4. For reinforced masonry, use portland cement-lime mortar cement mortar.

5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.
 1. For masonry below grade or in contact with earth, use Type M.
 2. For reinforced masonry, use Type S.
 3. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 4. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- D. Grout for Unit Masonry: Comply with ASTM C 476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, Table 1.
 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.

- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds 30 g/30 sq. in. per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch.
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch.
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
 - 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2 inch maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
 - 7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
 - 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Match existing; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 1. Fasten partition top anchors to structure above and build into top of partition. Space anchors 48 inches o.c. staggered, unless otherwise indicated.
 2. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078446 "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow brick and CMUs as follows:
 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.

4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 2. Allow cleaned surfaces to dry before setting.
 3. Wet joint surfaces thoroughly before applying mortar.
- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
 1. For glazed masonry units, use a nonmetallic jointer 3/4 inch or more in width.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
 1. Individual Metal Ties: Provide ties as shown installed in horizontal joints, but not less than one metal tie for 1.77 sq. ft. of wall area spaced not to exceed 16 inches o.c. horizontally and 16 inches o.c. vertically. Stagger ties in alternate courses. Provide additional ties within 12 inches of openings and space not more than 36 inches apart around perimeter of openings. At intersecting and abutting walls, provide ties at no more than 24 inches o.c. vertically.
 - a. Where bed joints of wythes do not align, use adjustable (two-piece) type ties.
 - b. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type ties to allow for differential movement regardless of whether bed joints align.
 2. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
 - c. Where one wythe is of clay masonry and the other of concrete masonry, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties to allow for differential movement regardless of whether bed joints align.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

- D. Apply air barrier to face of backup wythe to comply with Section 072726 "Fluid-Applied Membrane Air Barriers."
- E. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.
 - 1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at[**corners,**] returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - 2. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 - 3. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.
- C. Form expansion joints in brick as follows:
 - 1. Build flanges of metal expansion strips into masonry. Lap each joint 4 inches in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
 - 2. Build flanges of factory-fabricated, expansion-joint units into masonry.

3. Form open joint full depth of brick wythe and of width indicated, but not less than 1/2 inch for installation of sealant and backer rod specified in Section 079200 "Joint Sealants."
 - D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Section 079200 "Joint Sealants," but not less than 3/8 inch.
 1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.
- 3.9 LINTELS
- A. Install steel lintels where indicated.
 - B. Provide or masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
 - C. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.
- 3.10 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS
- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. Install vents at shelf angles, ledges, and other obstructions to upward flow of air in cavities, and where indicated.
 - B. Install flashing as follows unless otherwise indicated:
 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
 2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of 8 inches, and 1-1/2 inches into the inner wythe. Form 1/4-inch hook in edge of flashing embedded in inner wythe.
 3. At lintels and shelf angles, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches to form end dams.
 4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than 1-1/2 inches or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 5. Install metal drip edges with ribbed sheet metal flashing by interlocking hemmed edges to form hooked seam. Seal seam with elastomeric sealant complying with requirements in Section 079200 "Joint Sealants" for application indicated.
 6. Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.
 7. Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

8. Cut flexible flashing off flush with face of wall after masonry wall construction is completed.
9. At cavity walls, if flexible flashing is used, provide solid insulation blocking in the cavity to allow the flashing to be continuously adhered. Seal all laps and joints in flashing with mastic in accordance with manufacturer's instructions.

- C. Install single-wythe CMU flashing system in bed joints of CMU walls where indicated to comply with manufacturer's written instructions. Install CMU cell pans with upturned edges located below face shells and webs of CMUs above and with weep spouts aligned with face of wall. Install CMU web covers so that they cover upturned edges of CMU cell pans at CMU webs and extend from face shell to face shell.
- D. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- E. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
 1. Use specified weep/vent products or open head joints to form weep holes.
 2. Space weep holes formed from plastic tubing or 16 inches o.c.
- F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
- G. Provide inspection openings by leaving out areas of brick, two bricks wide by four bricks high at approximately eight feet on center with saw thooth sides. Fill in openings after inspection of flashing by Architect.

3.11 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than 60 inches.

3.12 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections

and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

- B. Inspections: Level 1 special inspections according to the "International Building Code."
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Clay Masonry Unit Test: For each type of unit provided, according to ASTM C 67 for compressive strength.
- F. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- G. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.
- H. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for compressive strength.
- I. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- J. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- C. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 - 3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.

5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
8. Clean stone trim to comply with stone supplier's written instructions.
9. Clean limestone units to comply with recommendations in ILI's "Indiana Limestone Handbook."

3.14 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 1. Crush masonry waste to less than 4 inches in each dimension.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 044200 - EXTERIOR STONE CLADDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Stone panels set with individual anchors.
- B. Related Requirements:
 - 1. Section 042000 "Unit Masonry".

1.2 ACTION SUBMITTALS

- A. Product Data: For each variety of stone, stone accessory, and manufactured product.
- B. Shop Drawings: Show fabrication and installation details for stone cladding assembly, including dimensions and profiles of stone units.
 - 1. Show locations and details of joints both within stone cladding assembly and between stone cladding assembly and other construction.
 - 2. Show locations and details of anchors and backup structure.
- C. Stone Samples: Sets for each variety, color, and finish of stone required; not less than 12 inches (300 mm) square.
- D. Colored Pointing Mortar Samples: For each color required.
- E. Sealant Samples: For each type and color of joint sealant required.
- F. Delegated-Design Submittal: For stone cladding assembly.

1.3 INFORMATIONAL SUBMITTALS

- A. Material Test Reports:
 - 1. Stone Test Reports: For stone variety proposed for use on Project, by a qualified testing agency, indicating compliance with required physical properties, other than abrasion resistance, according to referenced ASTM standards. Base reports on testing done within previous three years.
- B. Preconstruction test reports.
- C. Source quality-control reports.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

- B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.
 - 1. Build mockups of typical exterior wall area not less than 72 inches (1800 mm) long by 48 inches (1200 mm) high.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Stone Testing Service: General Contractor will engage a qualified testing agency to perform preconstruction testing.
 - 1. Furnish test specimens that are representative of materials proposed for incorporation into the Work.
 - 2. Physical Property Tests: For stone variety proposed for use on Project, tested for compliance with physical property requirements, other than abrasion resistance, according to referenced ASTM standards.
 - 3. Flexural Strength Tests: For stone variety, thickness, orientation of cut, and finish, proposed for use on Project, tested according to ASTM C 880/C 880M, in both wet and dry conditions.
 - 4. Anchorage Tests: For stone variety, orientation of cut, finish, and anchor type proposed for use on Project, tested according to ASTM C 1354/C 1354M.

1.6 FIELD CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Remove and replace stone cladding damaged by frost or freezing conditions. Comply with cold-weather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.
- B. Hot-Weather Requirements: Comply with hot-weather construction and protection requirements for masonry contained in TMS 602/ACI 530.1/ASCE 6.
- C. Environmental Limitations for Sealants: Do not install sealants when ambient and substrate temperatures are outside limits permitted by sealant manufacturer or below 40 deg F (5 deg C) or when joint substrates are wet.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Design stone anchors and anchoring systems according to ASTM C 1242.
 - 1. Stone anchors shall withstand not less than two times the weight of the stone cladding in both compression and tension.
- B. Structural Performance: Stone cladding assembly shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Wind Loads: 90.
- C. Seismic Performance: Stone cladding assembly shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. Component Importance Factor: 1.5.

D. Safety Factors for Stone: Design stone cladding assembly to withstand loads indicated without exceeding stone's allowable working stress determined by dividing stone's average ultimate strength, as established by testing, by the following safety factors:

1. Safety Factor for Dolomitic Limestone: [6] <Insert number>.

2.2 LIMESTONE

A. Material Standard: Comply with ASTM C 568/C 568M.

1. Classification: I Low-Density; compressive strength, 8000 psi (55 MPa).

B. Description: Dolomitic limestone.

C. Varieties and Sources: Subject to compliance with requirements, available stone varieties that may be incorporated into the Work include, but are not limited to, the following:

1. Indiana limestone quarried in Lawrence, Monroe, or Owen Counties, Indiana.

D. Finish: Smooth finish. Match existing building sample, north side adjacent to new gym project.

E. Match existing building sample for color, finish, and other stone characteristics relating to aesthetic effects.

2.3 ANCHORS AND FASTENERS

A. Fabricate shelf angles for limestone from hot-dip galvanized steel, ASTM A 36/A 36M for materials and ASTM A 123/A 123M for galvanizing.

B. Postinstalled Anchor Bolts for Concrete and Masonry: torque-controlled expansion anchors or undercut anchors made from stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 (ASTM F 738M and ASTM F 836M, Alloy Group A1 or A4) for bolts and nuts; ASTM A 240/A 240M, ASTM A 276, or ASTM A 666, Type 304 or 316, for anchors, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed, for masonry, as determined by testing per ASTM E 488/E 488M, conducted by a qualified independent testing agency.

C. Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers.

1. For galvanized-steel shelf angles and backup structure, use carbon-steel bolts, nuts, and washers; for bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); for nuts, ASTM A 563 (ASTM A 563M), Grade A; and for washers, ASTM F 436 (ASTM F 436M); all hot-dip or mechanically zinc coated.

2.4 MORTAR MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction, natural color or white as required to produce mortar color indicated.

1. Low-Alkali Cement: Portland cement for use with limestone shall contain no more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207.
- C. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979/C 979M. Pigments shall have a record of satisfactory performance in mortar.
- D. Aggregate: ASTM C 144; except for joints narrower than 1/4 inch (6 mm) and pointing mortar, 100 percent shall pass No. 16 (1.18-mm) sieve.
- E. Water: Potable.

2.5 STONE ACCESSORIES

- A. Setting Shims: Strips of resilient plastic or vulcanized neoprene, Type A Shore durometer hardness of 50 to 70, nonstaining to stone, of thickness needed to prevent point loading of stone on anchors and of depths to suit anchors without intruding into required depths of pointing materials.
- B. Concealed Sheet Metal Flashing: Fabricated from stainless steel in thicknesses indicated, but not less than 0.0156 inch (0.4 mm) thick, and complying with Section 076200 "Sheet Metal Flashing and Trim."
- C. Cementitious Dampproofing for Limestone: Cementitious formulation recommended by ILI and nonstaining to stone; compatible with joint sealants and noncorrosive to anchors and attachments.
- D. Weep and Vent Tubes: Medium-density polyethylene tubing, 1/4-inch (6-mm) OD, of length required to extend from exterior face of stone to cavity behind.
- E. Sealants for Joints in Stone Cladding: Manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated below that comply with applicable requirements in Section 079200 "Joint Sealants" and do not stain stone:
 1. Joint Sealant: Silicone, nonstaining, S, NS, 100/50, NT.
 2. Joint-Sealant Colors: As selected by Architect from manufacturer's full range of colors.

2.6 STONE FABRICATION

- A. Control depth of stone and back check to maintain minimum clearance of 1-1/2 inches (38 mm) between backs of stone units and surfaces or projections of structural members, fireproofing (if any), backup walls, and other work behind stone.
- B. Dress joints (bed and vertical) straight and at right angle to face unless otherwise indicated. Shape beds to fit supports.
- C. Cut and drill sinkages and holes in stone for anchors, fasteners, supports, and lifting devices as indicated or needed to set stone securely in place.

- D. Finish exposed faces and edges of stone, except sawed reveals, to comply with requirements indicated for finish and to match approved samples and mockups.
- E. Cut stone to produce uniform joints 3/8 inch (10 mm) wide and in locations indicated.
- F. Contiguous Work: Provide chases, reveals, reglets, openings, and similar features as required to accommodate contiguous work.
- G. Fabricate molded work, including washes and drips, to produce stone shapes with a uniform profile throughout entire unit length, with precisely formed arris slightly eased to prevent snipping, and with matching profile at joints between units.

2.7 MORTAR MIXES

- A. General: Comply with referenced standards and with manufacturers' written instructions. Do not use admixtures, unless otherwise indicated.
- B. Portland Cement-Lime Setting Mortar: Comply with ASTM C 270, Proportion Specification, Type N.
- C. Pointing Mortar: Comply with ASTM C 270, Proportion Specification, Type N. Provide pointing mortar mixed to match existing sample.

PART 3 - EXECUTION

3.1 INSTALLING BACKUP STRUCTURE

- A. Installing Miscellaneous Steel Framing: Comply with AISC 303 and install to accommodate construction tolerances specified.

3.2 SETTING STONE CLADDING, GENERAL

- A. Before setting stone, clean surfaces that are dirty or stained by removing soil, stains, and foreign materials. Clean stone by thoroughly scrubbing with fiber brushes and then drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh materials or abrasives.
- B. Execute stone cladding installation by skilled mechanics and employ skilled stone fitters at Project site to do necessary field cutting as stone is set. Use power saws with diamond blades to cut stone.
- C. Set stone to comply with requirements indicated. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure stone cladding in place. Shim and adjust anchors, supports, and accessories to set stone accurately in locations indicated, with uniform joints of widths indicated, and with edges and faces aligned according to established relationships and indicated tolerances.
- D. Provide expansion, control, and pressure-relieving joints of widths and at locations indicated.
 - 1. Sealing expansion and other joints is specified in Section 079200 "Joint Sealants."
 - 2. Keep expansion joints free of mortar and other rigid materials.

- E. Install concealed flashing at continuous shelf angles, lintels, ledges, and similar obstructions to downward flow of water, to divert water to building exterior. Extend flashing 6 inches (150 mm) at ends and turn up not less than 2 inches (50 mm) to form end dams.
- F. Keep cavities open where unfilled space is indicated between back of stone units and backup wall; do not fill cavities with mortar or grout.
 - 1. Place weep holes in joints where moisture may accumulate, including at base of cavity walls and above shelf angles and flashing. Locate weep holes at intervals not exceeding 24 inches (600 mm).

3.3 SETTING MECHANICALLY ANCHORED STONE CLADDING

- A. Attach anchors securely to stone and to backup surfaces. Comply with recommendations in ASTM C 1242.
- B. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with sealant indicated for filling kerfs.
- C. Set stone supported on clips or continuous angles on resilient setting shims. Use material of thickness required to maintain uniform joint widths and to prevent point loading of stone on anchors. Hold shims back from face of stone a distance at least equal to width of joint.

3.4 SETTING STONE CLADDING WITH MORTAR

- A. Set stone in full bed of mortar with head joints filled unless otherwise indicated.
 - 1. Provide compressible filler in ends of dowel holes and bottoms of kerfs to prevent end bearing of dowels and anchor tabs on stone. Fill remainder of anchor holes and kerfs with mortar.
- B. Embed ends of sills in mortar; leave remainder of joint open until final pointing.
- C. Rake out joints for pointing with mortar to depths of not less than 1/2 inch (12 mm). Rake joints to uniform depths with square bottoms and clean sides.
- D. Point stone joints by placing pointing mortar in layers not more than 3/8 inch (10 mm). Compact each layer thoroughly and allow to become thumbprint hard before applying next layer.
- E. Tool joints with a round jointer having a diameter 1/8 inch (3 mm) larger than width of joint, when pointing mortar is thumbprint hard.
- F. Rake out mortar from sealant-pointed joints to depths required for sealant and sealant backing, but not less than 1/2 inch (12 mm). Rake joints to uniform depths with square bottoms and clean sides.

3.5 JOINT-SEALANT INSTALLATION

- A. Prepare joints and apply sealants of type and at locations indicated to comply with applicable requirements in Section 079200 "Joint Sealants."

3.6 INSTALLATION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces of walls, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), 3/8 inch in 20 feet (10 mm in 6 m), or 1/2 inch in 40 feet (12 mm in 12 m) or more. For external corners, corners and jambs within 20 feet (6 m) of an entrance, expansion joints, and other conspicuous lines, do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch in 40 feet (10 mm in 12 m) or more.
- B. Variation from Level: For lintels, sills, parapets, horizontal bands, and other conspicuous lines, do not exceed 1/8 inch in 10 feet (3 mm in 3 m), 1/4 inch in 20 feet (6 mm in 6 m), or 3/8 inch (10 mm) maximum.
- C. Variation of Linear Building Line: For positions shown in plan and related portions of walls and partitions, do not exceed 1/4 inch in 20 feet (6 mm in 6 m) or 1/2 inch in 40 feet (12 mm in 12 m) or more.
- D. Variation in Joint Width: Do not vary from average joint width more than plus or minus 1/8 inch (3 mm) or a quarter of nominal joint width, whichever is less. For joints within 60 inches (1500 mm) of each other, do not vary more than 1/8 inch (3 mm) or a quarter of nominal joint width, whichever is less from one to the other.
- E. Variation in Plane between Adjacent Stone Units (Lipping): Do not exceed 1/16-inch (1.5-mm) difference between planes of adjacent units.

3.7 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone cladding as work progresses. Remove mortar fins and smears before tooling joints. Remove excess sealant and smears as sealant is installed.
- B. Final Cleaning: Clean stone cladding no fewer than six days after completion of pointing and sealing, using clean water and stiff-bristle fiber brushes. Do not use wire brushes, acid-type cleaning agents, cleaning agents containing caustic compounds or abrasives, or other materials or methods that could damage stone.

END OF SECTION 044200

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.
- B. Related Sections:
 - 1. Section 014000 "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Section 053100 "Steel Decking" for field installation of shear connectors through deck.
 - 3. Section 055000 "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame, miscellaneous steel fabrications not defined as structural steel.
 - 4. Section 055100 "Metal Stairs." For surface-preparation and priming requirements.
 - 5. Section 078123 "Intumescent Mastic Fire-Proofing".

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
- C. Heavy Sections: Rolled and built-up sections as follows:
 - 1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches.
 - 2. Welded built-up members with plates thicker than 2 inches.
 - 3. Column base plates thicker than 2 inches.
- D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.
- E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 PERFORMANCE REQUIREMENTS

- A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified structural engineer, to withstand loads indicated and comply with other information and restrictions indicated.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - 5. Identify members and connections of the seismic-load-resisting system.
 - 6. Indicate locations and dimensions of protected zones.
 - 7. Identify demand critical welds.
 - 8. For structural-steel connections indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
 - 2. Electrode manufacturer and trade name, for demand critical welds.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer fabricator .
- B. Welding certificates.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
 - 5. Shop primers.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 or SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- E. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- F. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.9 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. W-Shapes: ASTM A 992/A 992M
- B. Channels, Angles, S-Shapes: ASTM A 36/A 36M Materials complying with first option in first paragraph below are widely available; those complying with second option are less so. Third option is a specialty-steel material; verify availability if required.
- C. Plate and Bar: ASTM A 36/A 36M Retain first paragraph below for corrosion-resisting (weathering) structural steel and indicate locations on Drawings.
- D. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.
- C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating finish.
- D. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, heavy-hexhead assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Plain Retain shear connectors in first paragraph below if shop or field welding to steel framing is required.
- E. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.

- F. Unheaded Anchor Rods: ASTM A 572/A 572M, Grade 50
 - 1. Configuration: as noted
 - 2. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
- G. Finish: Plain Headed Anchor Rods: ASTM F 1554, Grade 55, weldable straight.
 - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 2. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 3. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 4. Finish: Plain
- H. Threaded Rods: ASTM A 449 A 572/A 572M, Grade 50.
 - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 2. Washers: A 36/A 36M carbon steel.
 - 3. Finish: Plain
- I. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.
- J. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.3 PRIMER

- A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

2.4 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Pretensioned.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces to be high-strength bolted with slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
- B. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.8 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 1. Liquid Penetrant Inspection: ASTM E 165.
 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 3. Ultrasonic Inspection: ASTM E 164.
 4. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Pretensioned.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds high-strength bolted connections.
- B. Bolted Connections: Bolted connections will be tested and inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
 1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.
- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

END OF SECTION 051200

SECTION 052100 - STEEL JOIST FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. K-series steel joists.
 - 2. KCS-type K-series steel joists.
 - 3. K-series steel joist substitutes.
 - 4. LH- and DLH-series long-span steel joists.
 - 5. Joist accessories.
- B. Related Requirements:
 - 1. Section 033000 "Cast-in-Place Concrete" for installing bearing plates in concrete.
 - 2. Section 042000 "Unit Masonry" for installing bearing plates in unit masonry.
 - 3. Section 051200 "Structural Steel Framing" for field-welded shear connectors.

1.3 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.
- B. Shop Drawings:
 - 1. Include layout, designation, number, type, location, and spacing of joists.
 - 2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
 - 3. Indicate locations and details of bearing plates to be embedded in other construction.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.

- B. Manufacturer certificates.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications"
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

- A. Deliver steel bearing plates to be built into masonry construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
 - 1. Use ASD; data are given at service-load level
 - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:
 - a. Roof Joists: Vertical deflection of 1/360 of the span.

2.2 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.
 - 1. Joist Type: K-series steel joists KCS-type K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Provide holes in chord members for connecting and securing other construction to joists.

- D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- F. Do not camber joists.
- G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.3 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as follows:
 - 1. Joist Type: LH-series steel joists
 - 2. End Arrangement: Underslung LH- and DLH-series joists are available parallel, pitched one way, or pitched two ways. SJI's load tables are based on a standard pitch of 1/8 inch per 12 inches (1:96). Coordinate with roof-slope requirements.
 - 3. Top-Chord Arrangement: Parallel For each reduction in chord area, SJI advises proportionately reducing carrying capacity.
- B. Provide holes in chord members for connecting and securing other construction to joists.
- C. Camber long-span steel joists according to SJI's "Specifications." Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches.

2.4 PRIMERS

- A. Primer: Provide shop primer that complies with Section 099600 "High-Performance Coatings."

2.5 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.
- C. Carbon-Steel Bolts and Threaded Fasteners: ASTM A 307, Grade A, carbon-steel, hex-head bolts and threaded fasteners; carbon-steel nuts; and flat, unhardened steel washers.
 - 1. Finish: Plain, uncoated Hot-dip zinc coating, ASTM A 153/A 153M, Class C
Mechanically deposited zinc coating, ASTM B 695, Class 50.

- D. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts; ASTM A 563 heavy hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.
 - 1. Finish: Plain Hot-dip zinc coating, ASTM A 153/A 153M, Class C Mechanically deposited zinc coating, ASTM B 695, Class 50.
- E. Welding Electrodes: Comply with AWS standards.
- F. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.
- G. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.6 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates, embedded bearing plates, and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJI's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

- D. Bolt joists to supporting steel framework using carbon-steel bolts.
- E. Bolt joists to supporting steel framework using high-strength structural bolts. Comply with Research Council on Structural Connection's "Specification for Structural Joints Using ASTM A 325 or ASTM A 490 Bolts" for high-strength structural bolt installation and tightening requirements.
- F. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect and to perform field tests and inspections and prepare test and inspection reports.
- B. Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, as applicable:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709.
 - c. Ultrasonic Testing: ASTM E 164.
 - d. Radiographic Testing: ASTM E 94.
- C. Visually inspect bolted connections.
- D. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- E. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 052100

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof deck.
 - 2. Acoustical roof deck.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
 - 2. Acoustical roof deck.
- D. Evaluation Reports: For steel deck.

1.5 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

- B. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- C. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 ROOF DECK

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Consolidated Systems, Inc.; Metal Dek Group.
 - 2. Epic Metals Corporation.
 - 3. Nucor Corp.; Vulcraft Group.
- B. Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
 - 1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33 zinc coating.
 - 2. Deck Profile: Type WR, wide rib
 - 3. Design Uncoated-Steel Thickness: As indicated

2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with

requirements indicated.

- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi, not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- E. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi, of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- F. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- G. Recessed Sump Pans: Single-piece steel sheet, 0.0747 inch thick, of same material and finish as deck, with 3-inch- wide flanges and level recessed pans of 1-1/2-inch minimum depth. For drains, cut holes in the field.
- H. Galvanizing Repair Paint: ASTM A 780.
- I. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: 5/8 inch nominal.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds 12 inches apart, maximum.
 - 3. Weld Washers: Install weld washers at each weld location.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps and perimeter edges of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 24 inches, and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
- C. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches, with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum.
- D. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- E. Sound-Absorbing Insulation: Installation into topside ribs of deck as specified in Section 075423 "Thermoplastic Polyolefin (TPO) Roofing."

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.

- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Repair Painting: Wire brush and clean rust spots, welds, and abraded areas on both surfaces of prime-painted deck immediately after installation, and apply repair paint.
 - 1. Apply repair paint, of same color as adjacent shop-primed deck, to bottom surfaces of deck exposed to view.
 - 2. Wire brushing, cleaning, and repair painting of bottom deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- C. Repair Painting: Wire brushing, cleaning, and repair painting of rust spots, welds, and abraded areas of both deck surfaces are included in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
- D. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 053100

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Soffit framing.
- B. Related Requirements:
 - 1. Section 055000 "Metal Fabrications" for masonry shelf angles and connections.
 - 2. Section 061600 "Sheathing" for sheathing board in exterior stud walls.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed steel framing product and accessory.
- B. Shop Drawings:
 - 1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
 - 2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
- C. Delegated-Design Submittal: For cold-formed steel framing.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.
 - 1. Steel sheet.
 - 2. Expansion anchors.

3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

D. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.
- B. Product Tests: Mill certificates or data from a qualified independent testing agency, or in-house testing with calibrated test equipment indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.
- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."
- D. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. AllSteel & Gypsum Products, Inc.
 2. ClarkWestern Building Systems, Inc.
 3. Consolidated Fabricators Corp.; Building Products Division.
 4. Dietrich Metal Framing; a Worthington Industries Company.
 5. MarinoWARE.
 6. Nuconsteel; a Nucor Company.
 7. Steel Construction Systems.
 8. United Metal Products, Inc.
 9. United Steel Manufacturing.

2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000

"Quality Requirements," to design cold-formed steel framing.

- B. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: 30psf live load. 300lbs point load.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/360 of the wall height.
 - 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F.
 - 4. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- C. Cold-Formed Steel Framing Design Standards:
 - 1. Wall Studs: AISI S211.
 - 2. Lateral Design: AISI S213.
- D. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
- E. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 - 1. Grade: As required by structural performance.
 - 2. Coating: G90 or equivalent.

2.4 SOFFIT FRAMING

- A. Exterior Soffit Frame: Manufacturer's standard C-shaped steel sections, of web depths indicated, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: 0.0538 inch.
 - 2. Flange Width: 1-5/8 inches, minimum.

2.5 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B.
- B. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.6 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.
- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush,

even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.
- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 072100 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.4 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Shelf angles.
 - 2. Metal bollards.
- B. Products furnished, but not installed, under this Section:
 - 1. Anchor bolts, steel pipe sleeves, slotted-channel inserts, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
 - 2. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
- C. Related Sections:
 - 1. Section 033000 "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, slotted-channel inserts, wedge-type inserts, and other items cast into concrete.
 - 2. Section 042000 "Unit Masonry" for installing loose lintels, anchor bolts, and other items built into unit masonry.
 - 3. Section 051200 "Structural Steel Framing."
 - 4. Section 055213 "Pipe and Tube Railings."
 - 5. Section 057000 "Decorative Metal."

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design ladders, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Nonslip aggregates and nonslip-aggregate surface finishes.
- B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.

- B. Mill Certificates: Signed by manufacturers of stainless-steel certifying that products furnished comply with requirements.
- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
 - 3. AWS D1.6, "Structural Welding Code - Stainless Steel."

1.7 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages and steel weld plates and angles for casting into concrete. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than [25] <Insert number> percent.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Stainless-Steel Sheet, Strip, and Plate: ASTM A 240/A 240M or ASTM A 666, Type 304.
- D. Stainless-Steel Bars and Shapes: ASTM A 276, [Type 304] [Type 316L].
- E. Rolled-Stainless-Steel Floor Plate: ASTM A 793.
- F. Steel Tubing: ASTM A 500, cold-formed steel tubing.

- G. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.
- H. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
 - 1. Size of Channels: 1-5/8 by 1-5/8 inches.
- I. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.3 FASTENERS

- A. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

- A. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- E. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.

2.5 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.
- G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8 by 1-1/2 inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8 inches from ends and corners of units and 24 inches o.c., unless otherwise indicated.
 2. Fabricate units from slotted channel framing where indicated.
 3. Furnish inserts for units installed after concrete is placed.
- J. Fabricate steel pipe columns for supporting wood frame construction from steel pipe with steel baseplates and top plates as indicated. Drill or punch baseplates and top plates for anchor and connection bolts and weld to pipe with fillet welds all around. Make welds the same size as pipe wall thickness unless otherwise indicated.
1. Unless otherwise indicated, fabricate from Schedule 40 steel pipe.
- K. Galvanize miscellaneous framing and supports where indicated.

2.6 SHELF ANGLES

- A. Fabricate shelf angles from steel angles of sizes indicated and for attachment to concrete framing. Provide horizontally slotted holes to receive 3/4-inch bolts, spaced not more than 6 inches from ends and 24 inches o.c., unless otherwise indicated.
1. Provide mitered and welded units at corners.
 2. Provide open joints in shelf angles at expansion and control joints. Make open joint approximately 2 inches larger than expansion or control joint.
- B. For cavity walls, provide vertical channel brackets to support angles from backup masonry and concrete.
- C. Galvanize shelf angles located in exterior walls.

2.7 MISCELLANEOUS STEEL TRIM

- A. Galvanize exterior miscellaneous steel trim.

2.8 METAL BOLLARDS

- A. Fabricate metal bollards from Schedule 40 steel pipe.
 - 1. Cap bollards with 1/4-inch- thick steel plate.

2.9 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches unless otherwise indicated.
- C. Galvanize loose steel lintels located in exterior walls.

2.10 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
 - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
 - 1. Shop prime with universal shop primer primers specified in Section 099113 "Exterior Painting" primers specified in Section 099123 "Interior Painting" .
- C. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 1. Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Other Items: SSPC-SP 3, "Power Tool Cleaning."
- D. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

PART 3 - EXECUTION

3.1 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported,

including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.2 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting."
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 055133.16 - INCLINED LADDERS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Aluminum Ships Ladders.

1.2 RELATED SECTIONS

- A. Section 05 12 00 - Structural Steel Framing: Roof structure and opening support.
- B. Section 05 55 00 - Metal Stair Treads and Nosings: Miscellaneous metal supports.
- C. Section 06 10 00 - Rough Carpentry: Roof framing and opening support.

1.3 SUBMITTALS

- A. Submit under provisions of Section 01 30 00.
- B. Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings for Ladders:
 - 1. Field measure existing parapets to new roof construction layout
 - 2. Plan and section of ladder installation.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store ladder until installation inside under cover. If stored outside, under a tarp or suitable cover.

1.5 WARRANTY

- A. Limited Warranty: One year against defective material and workmanship, covering parts only, no labor or freight. Defective parts, if deemed so by the manufacturer, will be replaced at no charge, freight excluded, upon inspection at manufacturer's plant which warrants same.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design Product: Subject to compliance with requirements, provide product indicated on the drawings, or equivalent product by one of the following:

1. O'Keeffe's, Inc.
2. Precision Ladders, LLC
3. ALACO Ladder Co
4. Royalite Manufacturing, Inc

2.2 ALUMINUM SHIPS LADDER

- A. Aluminum Ships Ladder and Components: Ladder, mounting brackets and handrails on both sides.
1. Capacity: Unit shall support a 500 lb (227 kg) total load without failure.
 2. Ladder Mounting Brackets:
 - a. Floor Bracket: 2 inch by 3 inch by 1/4 inch (51 mm by 76 mm by 6 mm) aluminum angle.
 - b. Top Bracket: 4-3/4 inch by 5 inch by 1/4 inch (121 mm by 127 mm by 6 mm) aluminum angle.
- B. Ladders: Provide ladders that comply with OSHA and local building codes, with all edges rounded, clean and smooth burr free, dimensions as indicated in drawings.
- C. Ladder Treads: Extruded aluminum, 6063-T5 alloy, with self cleaning serrated top surface with rounded front and back edges. They are fastened to handrails with concealed stainless steel screws capable of withstanding and exceeding all OSHA load requirements per tread without damage. Rung cross section for vertical ladders is minimum 2 inches (50.8mm) horizontal and 1 nominal inch (25mm) vertical. For ship's ladders minimum 4 inches (101mm) horizontal and nominal 1 inch (25mm) vertical.
- D. Vertical Ladder Rails (supporting treads): Custom extruded aluminum, 6063-T5 alloy, with rounded corners, approximately 4 inches (101mm) deep; mounted so that the center line of the tread is minimum 7 inches (178mm) from face of wall. Wall brackets are bent aluminum strap 2 inches (50.8mm) wide by 3/16 inch (4.7mm) thick. Base brackets are 2"x2"x2" x 1/8" (50.8mm x 50.8mm x 50.8mm x 3mm) aluminum angles. Bottom Wall Mount brackets include an additional diagonal angle brace of the same material.
- E. Ship's Ladder Rails (supporting treads): Extruded aluminum channel stringers, 6 inch (152mm) with 2 inch (50.8mm) legs 1/8" (3mm) thick.
- F. Ship's Ladder Handrails: Extruded aluminum pipe 1.9 inches (48.2mm) outside diameter with 1/4 inch (48.2mm) wall thickness are formed with radius elbow and bolted to stringers.
- G. Extended Rails: Aluminum tubing 0.875 inches (22mm) diameter is formed with two parallel tubes for each length of rail with radius corners assembled with stainless steel fasteners.
1. Walk Through Hand Rails: At top of ladders leading to roofs or landings hand rails extend a minimum 42 inches (1066.8mm) vertically above the top of the parapet or landing and project a minimum of 10 inches (254mm) past the edge of the roof or landing.

- H. Landing or Rest Platforms: Typically constructed of 2 inch (50.8mm) by 1 inch (25mm) ladder treads placed flush adjacent to each other to form desired typical platform size. Custom sizes or other decking materials are available when required.
- I. Utility Line Bridge Base: Ship's ladder type components are mounted to 1/8 inch (3mm) checker plate base with all joints mitered and welded for placement or mounting on roof surface.
- J. Anchor Bolts: Hot-dipped galvanized or stainless steel bolts. Diameter as specified by the ladder manufacturer. Fastener length as required to provide adequate anchorage to substrate provided by project contractor as determined by the project engineer.

2.3 FABRICATION

- A. Completely fabricate ladder ready for installation before shipment to the site.
- B. Completely fabricate handrail components ready for field assembly to ladder before shipment to site.

2.4 FINISHES

- A. Mill finish on aluminum components is standard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- B. Examine materials upon arrival at site. Notify the carrier and manufacturer of any damage.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.3 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END: SECTION 055133.16

SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel pipe railings.
- B. Related Sections:
 - 1. Section 099600 "High Performance Coatings" for final painting of railings.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design railings, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. General: In engineering railings to withstand structural loads indicated, determine allowable design working stresses of railing materials based on the following:
 - 1. Steel: 72 percent of minimum yield strength.
- C. Structural Performance: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. applied in any direction.
 - b. Concentrated load of 200 lbf applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.
 - 2. Infill of Guards:
 - a. Concentrated load of 50 lbf applied horizontally on an area of 1 sq. ft..
 - b. Infill load and other loads need not be assumed to act concurrently.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on exterior metal fabrications by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.
- E. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
- C. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified professional engineer.
- B. Mill Certificates: Signed by manufacturers of stainless-steel products certifying that products furnished comply with requirements.
- C. Welding certificates.
- D. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of railing from single source from single manufacturer.
- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.8 COORDINATION AND SCHEDULING

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.2 STEEL AND IRON

- A. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads.
- B. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.

2.3 FASTENERS

- A. General: Provide the following:
 - 1. Ungalvanized-Steel Railings: Plated steel fasteners complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 for zinc coating.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Fasteners for Interconnecting Railing Components:
 - 1. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless otherwise indicated.
 - 2. Provide concealed fasteners for interconnecting railing components and for attaching them to other work, unless exposed fasteners are unavoidable or are the standard fastening method for railings indicated.
 - 3. Provide tamper-resistant flat-head machine screws for exposed fasteners unless otherwise indicated.
- D. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

- B. Shop Primers: Provide primers that comply with Section 099113 "Exterior Painting," Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.
- D. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.5 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Assemble railings in the shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces smooth and blended so no roughness shows after finishing and welded surface matches contours of adjoining surfaces.
- I. Form changes in direction as follows:
 - 1. By bending or by inserting prefabricated elbow fittings.
- J. Bend members in jigs to produce uniform curvature for each configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.

- L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch or less.
- M. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, flanges, miscellaneous fittings, and anchors to interconnect railing members to other work unless otherwise indicated.
 - 1. At brackets and fittings fastened to plaster or gypsum board partitions, provide crush-resistant fillers, or other means to transfer loads through wall finishes to structural supports and prevent bracket or fitting rotation and crushing of substrate.
- N. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.
- O. For railing posts set in concrete, provide stainless-steel sleeves not less than 6 inches long with inside dimensions not less than 1/2 inch greater than outside dimensions of post, with metal plate forming bottom closure.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- D. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.

2.7 STEEL AND IRON FINISHES

- A. For nongalvanized steel railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors to be embedded in exterior concrete or masonry.
- B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 1. Other Railings: SSPC-SP 3, "Power Tool Cleaning."
- C. Primer Application: Apply shop primer to prepared surfaces of railings unless otherwise indicated. Comply with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Primer need not be applied to surfaces to be embedded in concrete or masonry.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements have been clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.
- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that have been coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet.
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet.
- C. Corrosion Protection: Coat concealed surfaces of aluminum that will be in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.

3.4 ANCHORING POSTS

- A. Form or core-drill holes not less than 5 inches deep and 3/4 inch larger than OD of post for installing posts in concrete. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink, nonmetallic grout, mixed and placed to comply with anchoring material manufacturer's written instructions.
- B. Cover anchorage joint with flange of same metal as post, welded to post after placing anchoring material.
- C. Leave anchorage joint exposed with 1/8-inch buildup, sloped away from post.
- D. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:

1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ATTACHING RAILINGS

- A. Anchor railing ends at walls with round flanges anchored to wall construction and welded to railing ends or connected to railing ends using nonwelded connections.
- B. Anchor railing ends to metal surfaces with flanges bolted to metal surfaces and welded to railing ends or connected to railing ends using nonwelded connections.
- C. Attach railings to wall with wall brackets, except where end flanges are used. Provide brackets with 1-1/2-inch clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
 1. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt.
 2. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- D. Secure wall brackets and railing end flanges to building construction as follows:
 1. For concrete and solid masonry anchorage, use drilled-in expansion shields and hanger or lag bolts.
 2. For hollow masonry anchorage, use toggle bolts.
 3. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.

3.6 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099113 "Exterior Painting", Section 099123 "Interior Painting," and Section 099600 "High-Performance Coatings."

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wood blocking, cants, and nailers.
 - 2. Plywood backing panels.

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.
- B. Lumber grading agencies, and the abbreviations used to reference them, include the following:
 - 1. NeLMA: Northeastern Lumber Manufacturers' Association.
 - 2. NLGA: National Lumber Grades Authority.
 - 3. SPIB: The Southern Pine Inspection Bureau.
 - 4. WCLIB: West Coast Lumber Inspection Bureau.
 - 5. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
 - 1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
 - 2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
 - 3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.
- B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

- A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preserved-treated wood.
2. Shear panels.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.
1. Factory mark each piece of lumber with grade stamp of grading agency.
 2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
 3. Provide dressed lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

- A. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.
1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
- B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

- C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.
- D. Application: Treat all rough carpentry unless otherwise indicated.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
 - 1. Blocking.
 - 2. Nailers.
 - 3. Cants.
- B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber and any of the following species:
 - 1. Hem-fir (north); NLGA.
 - 2. Mixed southern pine; SPIB.
 - 3. Spruce-pine-fir; NLGA.
 - 4. Hem-fir; WCLIB or WWP.
 - 5. Spruce-pine-fir (south); NeLMA, WCLIB, or WWP.
 - 6. Western woods; WCLIB or WWP.
 - 7. Northern species; NLGA.
 - 8. Eastern softwoods; NeLMA.
- C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.4 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: DOC PS 1, Exterior, C-C Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than [1/2-inch] [3/4-inch] nominal thickness.

2.5 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F 1667.
- C. Power-Driven Fasteners: NES NER-272.
- D. Wood Screws: ASME B18.6.1.

- E. Lag Bolts: ASME B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.
- G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.
 - 1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- B. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.
- C. Shear Wall Panels: Install shear wall panels to comply with manufacturer's written instructions.
- D. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.
- E. Do not splice structural members between supports unless otherwise indicated.
- F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
 - 1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.
- G. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:
 - 1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.
 - 2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal- thickness.
 - 3. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

- H. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
- I. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use inorganic boron for items that are continuously protected from liquid water.
 - 2. Use copper naphthenate for items not continuously protected from liquid water.
- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. NES NER-272 for power-driven fasteners.
 - 2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
 - 3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.
- K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

- A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
- B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
- C. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous flexible flashing separator between wood and metal decking.

3.3 PROTECTION

- A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.
- B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061600 - SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Wall sheathing.
 - 2. Sheathing joint and penetration treatment.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for plywood backing panels.
 - 2. Section 072727 "Fluid Applied Membrane Air Barrier" for water-resistive barrier applied over wall sheathing.
 - 3. Section 054000 "Cold Formed Metal Framing"
 - 4. Section 074213.23 "Metal Composite Material Wall Panels"
 - 5. Section 092216 "Non-Structural Metal Framing"

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Fire-Resistance Ratings: Indicated by design designations from UL's "Fire Resistance Directory." GA-600, "Fire Resistance Design Manual."

2.2 WALL SHEATHING

- A. Glass-Mat Gypsum Wall Sheathing: ASTM C 1177/1177M.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corporation; GlasRoc.
 - b. G-P Gypsum Corporation; Dens-Glass Gold.
 - c. National Gypsum Company; Gold Bond e(2)XP.
 - d. Temple-Inland Inc.; GreenGlass
 - e. United States Gypsum Co.; Securock.
 - 2. Type and Thickness: Type X, 5/8 inch thick.
 - 3. Size: 48 by 108 inches for vertical installation.

2.3 FASTENERS

- A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
 - 1. For roof and wall sheathing, provide fasteners of Type 304 stainless steel.
- B. Power-Driven Fasteners: NES NER-272.
- C. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B 117.
 - 1. For steel framing less than 0.0329 inch thick, use screws that comply with ASTM C 1002.
 - 2. For steel framing from 0.033 to 0.112 inch thick, use screws that comply with ASTM C 954.

2.4 SHEATHING JOINT-AND-PENETRATION TREATMENT MATERIALS

- A. Sealant for Glass-Mat Gypsum Sheathing: Elastomeric, medium-modulus, neutral-curing silicone joint sealant compatible with joint substrates formed by gypsum sheathing and other materials, recommended by sheathing manufacturer for application indicated and complying with requirements for elastomeric sealants specified in Section 079200 "Joint Sealants."
- B. Sealant for Glass-Mat Gypsum Sheathing: Silicone emulsion sealant complying with ASTM

C 834, compatible with sheathing tape and sheathing and recommended by tape and sheathing manufacturers for use with glass-fiber sheathing tape and for covering exposed fasteners.

1. Sheathing Tape: Self-adhering glass-fiber tape, minimum 2 inches wide, 10 by 10 or 10 by 20 threads/inch, of type recommended by sheathing and tape manufacturers for use with silicone emulsion sealant in sealing joints in glass-mat gypsum sheathing and with a history of successful in-service use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Securely attach to substrate by fastening as indicated, complying with the following:
 1. NES NER-272 for power-driven fasteners.
 2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."
- D. Use common wire nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.
- E. Coordinate wall and sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- F. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.
- G. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

- A. Comply with GA-253 and with manufacturer's written instructions.
 1. Fasten gypsum sheathing to cold-formed metal framing with screws.
 2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
 3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.
- B. Apply fasteners so heads bear tightly against face of sheathing, but do not cut into facing.

- C. Horizontal Installation: Install sheathing with V-grooved edge down and tongue edge up. Interlock tongue with groove to bring long edges in contact with edges of adjacent boards without forcing. Abut ends of boards over centers of studs, and stagger end joints of adjacent boards not less than one stud spacing. Attach boards at perimeter and within field of board to each steel stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
 - 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- D. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.
 - 1. Space fasteners approximately 8 inches o.c. and set back a minimum of 3/8 inch from edges and ends of boards.
 - 2. For sheathing under stucco cladding, boards may be initially tacked in place with screws if overlying self-furring metal lath is screw-attached through sheathing to studs immediately after sheathing is installed.
- E. Seal sheathing joints according to sheathing manufacturer's written instructions.
 - 1. Apply elastomeric sealant to joints and fasteners and trowel flat. Apply sufficient amount of sealant to completely cover joints and fasteners after troweling. Seal other penetrations and openings.
 - 2. Apply glass-fiber sheathing tape to glass-mat gypsum sheathing joints and apply and trowel silicone emulsion sealant to embed entire face of tape in sealant. Apply sealant to exposed fasteners with a trowel so fasteners are completely covered. Seal other penetrations and openings.

END OF SECTION 061600

SECTION 071413 - HOT FLUID-APPLIED RUBBERIZED ASPHALT WATERPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Rubberized-asphalt waterproofing membrane, unreinforced.
- B. Related Sections:
 - 1. Section 079500 "Expansion Control" for expansion-joint systems.

1.3 DELIVERY, STORAGE, AND HANDLING

- A. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by waterproofing manufacturer.
- B. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- C. Protect stored materials from direct sunlight.

1.4 PROJECT CONDITIONS

- A. Environmental Limitations: Apply waterproofing within the range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate, or when temperature is below 0 deg F.
 - 1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace waterproofing and sheet flashings that do not comply with requirements or that fail to remain watertight within specified warranty period.
 - 1. Warranty insulation will retain 80 percent of original published thermal value.
 - 2. Warranty Period: 10 years from date of Substantial Completion.
- B. Special Installer's Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of two years.
 - 1. Warranty includes removing and reinstalling protection board, drainage panels, insulation, pedestals, and pedestal-mounted pavers on plaza decks.

END OF SECTION 071413

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Foam-plastic board insulation.
 - 2. Glass-fiber blanket insulation.
 - 3. Vapor retarders.
- B. Related Sections:
 - 1. Section 033000 "Concrete."
 - 2. Section 042000 "Unit Masonry" for insulation installed in cavity walls.
 - 3. Section 061600 "Sheathing" for foam-plastic board sheathing over wood or steel framing.
 - 4. Section 075423 "Thermoplastic Polyolefin (TPO) Roofing."

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
- B. Protect foam-plastic board insulation as follows:
 - 1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. DiversiFoam Products.
 - b. Dow Chemical Company (The).
 - c. Owens Corning.
 - d. Pactiv Building Products.
 2. Type IV, 25 psi.
 3. Type VI, 40 psi.
- B. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates without damaging insulation and substrates.

2.2 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. CertainTeed Corporation.
 2. Johns Manville.
 3. Knauf Insulation.
 4. Owens Corning.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 40 percent.
- C. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
- D. Foil-Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (reflective faced), Class B (faced surface with a flame-propagation resistance of 0.12 W/sq. cm); Category 1 (membrane is a vapor barrier), faced with foil scrim, foil-scrim kraft, or foil-scrim polyethylene.
- E. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:
 1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
 2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.4 SPRAY POLYURETHANE FOAM INSULATION

- A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. BASF Corporation.
 - b. Dow Chemical Company (The).
 - c. Henry Company.

2.3 VAPOR RETARDERS

- A. Fire-Retardant, Reinforced-Polyethylene Vapor Retarders: Two outer layers of polyethylene film laminated to an inner reinforcing layer consisting of either nonwoven grid of nylon cord or polyester scrim and weighing not less than 22 lb/1000 sq. ft., with maximum permeance rating of 0.1317 perm and with flame-spread and smoke-developed indexes of not more than 5 and 60, respectively, per ASTM E 84.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Raven Industries Inc.; DURA-SKRIM 2FR.
 - b. Reef Industries, Inc.; Griffolyn T-55 FR.
- B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.
- C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.
- D. Single-Component Nonsag Urethane Sealant: ASTM C 920, Type I, Grade NS, Class 25, Use NT related to exposure, and Use O related to vapor-barrier-related substrates.
- E. Adhesive for Vapor Retarders: Product recommended by vapor-retarder manufacturer and has demonstrated capability to bond vapor retarders securely to substrates indicated.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.
 - 1. If not otherwise indicated, extend insulation a minimum of 24 inches in from exterior walls.

3.4 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Foam-Plastic Board Insulation: Seal joints between units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
 - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
 - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
 - 4. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
 - 5. Vapor-Retarder-Faced Blankets: Tape joints and ruptures in vapor-retarder facings, and seal each continuous area of insulation to ensure airtight installation.
 - a. Exterior Walls: Set units with facing placed toward [interior of construction.

3.5 INSTALLATION OF VAPOR RETARDERS

- A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to

extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

- B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.
 - 1. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
- C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.
- D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.6 PROTECTION

- A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.7 INSULATION SCHEDULE

- A. Insulation Type 072000.A02: Type IV extruded-polystyrene board insulation.
 - 1. Location: At perimeter of foundation walls and under slabs on grade.
- B. Insulation Type 072000.A08: Unfaced, glass-fiber blanket insulation.
 - 1. Location: Miscellaneous use. Stuffed in area to complete thermal line of defense.
- C. Insulation Type 072000.A09: Faced, glass-fiber blanket insulation.
 - 1. Location: Miscellaneous use. Stuffed in area to complete thermal line of defense where vapor barrier is to be maintained. Tape joints.
- D. Insulation Type 072100.A15: Polyurethane spray foam insulation.
 - 1. Location: At joints and penetrations in air and vapor barriers.
 - 2. Location: To fill gaps and cracks in thermal barrier.

END OF SECTION 072100

SECTION 072726 - FLUID-APPLIED MEMBRANE AIR BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes fluid-applied, vapor-retarding and vapor-permeable membrane air barriers.
- B. Related Requirements:
 - 1. Section 061600 "Sheathing" for wall sheathings and wall sheathing joint-and-penetration treatments.
 - 2. Section 042000 "Unit Masonry".

1.3 DEFINITIONS

- A. Air-Barrier Material: A primary element that provides a continuous barrier to the movement of air.
- B. Air-Barrier Accessory: A transitional component of the air barrier that provides continuity.
- C. Air-Barrier Assembly: The collection of air-barrier materials and accessory materials applied to an opaque wall, including joints and junctions to abutting construction, to control air movement through the wall.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review air-barrier requirements and installation, special details, mockups, air-leakage and bond testing, air-barrier protection, and work scheduling that covers air barriers.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written instructions for evaluating, preparing, and treating substrate; technical data; and tested physical and performance properties of products.
- B. Shop Drawings: For air-barrier assemblies.
 - 1. Show locations and extent of air barrier. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, and tie-ins with adjoining construction.

2. Include details of interfaces with other materials that form part of air barrier.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer. Include list of ABAA-certified installers and supervisors employed by the Installer, who work on Project.
- B. Product Certificates: From air-barrier manufacturer, certifying compatibility of air barriers and accessory materials with Project materials that connect to or that come in contact with the barrier.
- C. Product Test Reports: For each air-barrier assembly, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
 1. Installer shall be licensed by ABAA according to ABAA's Quality Assurance Program and shall employ ABAA-certified installers and supervisors on Project.
- B. Mockups: Build mockups to set quality standards for materials and execution.
 1. Build integrated mockups of exterior wall assembly as shown on Drawings, incorporating backup wall construction, external cladding, window, storefront, door frame and sill, insulation, ties and other penetrations, and flashing to demonstrate surface preparation, crack and joint treatment, application of air barriers, and sealing of gaps, terminations, and penetrations of air-barrier assembly.
 - a. Coordinate construction of mockups to permit inspection by Owner's testing agency of air barrier before external insulation and cladding are installed.
 - b. Include junction with roofing membrane, building corner condition, and foundation wall intersection.
 - c. If Architect determines mockups do not comply with requirements, reconstruct mockups and apply air barrier until mockups are approved.
 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- B. Protect stored materials from direct sunlight.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Apply air barrier within the range of ambient and substrate temperatures recommended by air-barrier manufacturer.
 - 1. Protect substrates from environmental conditions that affect air-barrier performance.
 - 2. Do not apply air barrier to a damp or wet substrate or during snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Source Limitations: Obtain primary air-barrier materials and air-barrier accessories from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

- A. General: Air barrier shall be capable of performing as a continuous vapor-retarding permeable air barrier and as a liquid-water drainage plane flashed to discharge to the exterior incidental condensation or water penetration. Air-barrier assemblies shall be capable of accommodating substrate movement and of sealing substrate expansion and control joints, construction material changes, penetrations, tie-ins to installed waterproofing, and transitions at perimeter conditions without deterioration and air leakage exceeding specified limits.
- B. Air-Barrier Assembly Air Leakage: Maximum 0.04 cfm/sq. ft. of surface area at 1.57 lbf/sq. ft., when tested according to ASTM E 283 or ASTM E 2357.

2.3 VAPOR-RETARDING MEMBRANE AIR BARRIER

- A. Fluid-Applied, Vapor-Retarding Membrane Air Barrier: Elastomeric, modified bituminous or synthetic polymer membrane.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Elastomeric, Modified Bituminous Membrane:
 - 1) Carlisle Coatings & Waterproofing Inc.; or Barriseal S.
 - 2) Henry Company; Air-Bloc 06 WB.
 - 3) Hohmann & Barnard, Inc.; Textroflash Liquid.
 - 4) Meadows, W. R., Inc.; Air-Shield LM.
 - 5) Tremco Incorporated, an RPM company; ExoAir 120SP/R.
 - b. Synthetic Polymer Membrane:
 - 1) Grace, W. R., & Co. - Conn.; Perm-A-Barrier Liquid.
 - 2) Henry Company; Air-Bloc 32.
 - 3) Sto Corp.; VaporSeal in three-component assembly.
 - 2. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
 - b. Vapor Permeance: Maximum 0.1 perm; ASTM E 96/E 96M.
 - c. Ultimate Elongation: Minimum 500 percent; ASTM D 412, Die C.

2.4 VAPOR-PERMEABLE MEMBRANE AIR-BARRIER

- A. Fluid-Applied, Vapor-Permeable Membrane Air Barrier: Elastomeric, modified bituminous synthetic polymer membrane.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Elastomeric, Modified Bituminous Membrane:
 - 1) Henry Company; Air-Bloc 07.
 - 2) Hohmann & Barnard, Inc.; Textroflash Liquid VP.
 - 3) Meadows, W. R., Inc.; Air-Shield LMP.
 - 4) Tremco Incorporated, an RPM company; ExoAir 220R.
 - b. Synthetic Polymer Membrane:
 - 1) Carlisle Coatings & Waterproofing Inc.; Barritech VP.
 - 2) Grace, W. R., & Co. - Conn.; Perm-A-Barrier VP.
 - 3) Henry Company; Air-Bloc 31.
 - 4) Rubber Polymer Corporation, Inc.; Rub-R-Wall Airtight VP.
 - 5) Tremco Incorporated, an RPM company; ExoAir 230.
 2. Physical and Performance Properties:
 - a. Air Permeance: Maximum 0.004 cfm/sq. ft. of surface area at 1.57-lbf/sq. ft. pressure difference; ASTM E 2178.
 - b. Vapor Permeance: Minimum 10 perms; ASTM E 96/E 96M.
 - c. Ultimate Elongation: Minimum 200 percent; ASTM D 412, Die C.

2.5 ACCESSORY MATERIALS

- A. General: Accessory materials recommended by air-barrier manufacturer to produce a complete air-barrier assembly and compatible with primary air-barrier material.
- B. Primer: Liquid waterborne primer recommended for substrate by air-barrier material manufacturer.
- C. Counterflashing Strip: Modified bituminous, 40-mil- thick, self-adhering sheet consisting of 32 mils of rubberized asphalt laminated to an 8-mil- thick, cross-laminated polyethylene film with release liner backing.
- D. Butyl Strip: Vapor retarding, 30 to 40 mils thick, self-adhering; polyethylene-film-reinforced top surface laminated to layer of butyl adhesive with release liner backing.
- E. Modified Bituminous Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.
- F. Joint Reinforcing Strip: Air-barrier manufacturer's glass-fiber-mesh tape.
- G. Substrate-Patching Membrane: Manufacturer's standard trowel-grade substrate filler.
- H. Adhesive and Tape: Air-barrier manufacturer's standard adhesive and pressure-sensitive adhesive tape.
- I. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, 0.0187 inch thick, and Series 300 stainless-steel fasteners.

- J. Modified Bituminous Transition Strip: Vapor retarding, 40 mils thick, smooth surfaced, self-adhering; consisting of 36 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner backing.
- K. Adhesive-Coated Transition Strip: Vapor-permeable, 17-mil- thick, self-adhering strip consisting of an adhesive coating over a permeable laminate with a permeance value of 37 perms.
- L. Elastomeric Flashing Sheet: ASTM D 2000, minimum 50- to 65-mil- thick, cured sheet neoprene with manufacturer-recommended contact adhesives and lap sealant with stainless-steel termination bars and fasteners.
- M. Preformed Silicone-Sealant Extrusion: Manufacturer's standard system consisting of cured low-modulus silicone extrusion, sized to fit opening widths, with a single-component, neutral-curing, Class 100/50 (low-modulus) silicone sealant for bonding extrusions to substrates.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 123 Silicone Seal.
 - b. Momentive Performance Materials Inc.; US11000 UltraSpan.
 - c. Pecora Corporation; Sil-Span.
 - d. Tremco Incorporated, an RPM company; Spectrem Simple Seal.
- N. Joint Sealant: ASTM C 920, single-component, neutral-curing silicone; Class 100/50 (low modulus), Grade NS, Use NT related to exposure, and, as applicable to joint substrates indicated, Use O. Comply with Section 079200 "Joint Sealants."
- O. Termination Mastic: Air-barrier manufacturer's standard cold fluid-applied elastomeric liquid; trowel grade.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
 - 1. Verify that substrates are sound and free of oil, grease, dirt, excess mortar, or other contaminants.
 - 2. Verify that concrete has cured and aged for minimum time period recommended by air-barrier manufacturer.
 - 3. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 4. Verify that masonry joints are flush and completely filled with mortar.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SURFACE PREPARATION

- A. Clean, prepare, treat, and seal substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for air-barrier application.

- B. Mask off adjoining surfaces not covered by air barrier to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids in concrete with substrate-patching membrane.
- E. Remove excess mortar from masonry ties, shelf angles, and other obstructions.
- F. At changes in substrate plane, apply sealant or termination mastic beads at sharp corners and edges to form a smooth transition from one plane to another.
- G. Cover gaps in substrate plane and form a smooth transition from one substrate plane to another with stainless-steel sheet mechanically fastened to structural framing to provide continuous support for air barrier.

3.3 JOINT TREATMENT

- A. Concrete and Masonry: Prepare, treat, rout, and fill joints and cracks in substrate according to ASTM C 1193 and air-barrier manufacturer's written instructions. Remove dust and dirt from joints and cracks complying with ASTM D 4258 before coating surfaces.
 - 1. Prime substrate and apply a single thickness of air-barrier manufacturer's recommended preparation coat extending a minimum of 3 inches along each side of joints and cracks. Apply a double thickness of fluid air-barrier material and embed a joint reinforcing strip in preparation coat.
- B. Gypsum Sheathing: Fill joints greater than 1/4 inch with sealant according to ASTM C 1193 and air-barrier manufacturer's written instructions. Apply first layer of fluid air-barrier material at joints. Tape joints with joint reinforcing strip after first layer is dry. Apply a second layer of fluid air-barrier material over joint reinforcing strip.

3.4 TRANSITION STRIP INSTALLATION

- A. General: Install strips, transition strips, and accessory materials according to air-barrier manufacturer's written instructions to form a seal with adjacent construction and maintain a continuous air barrier.
 - 1. Coordinate the installation of air barrier with installation of roofing membrane and base flashing to ensure continuity of air barrier with roofing membrane.
 - 2. Install butyl modified bituminous strip on roofing membrane or base flashing so that a minimum of 3 inches of coverage is achieved over each substrate.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
- C. Connect and seal exterior wall air-barrier material continuously to roofing-membrane air barrier, concrete below-grade structures, floor-to-floor construction, exterior glazing and window systems, glazed curtain-wall systems, storefront systems, exterior louvers, exterior door framing, and other construction used in exterior wall openings, using accessory materials.

- D. At end of each working day, seal top edge of strips and transition strips to substrate with termination mastic.
- E. Apply joint sealants forming part of air-barrier assembly within manufacturer's recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Wall Openings: Prime concealed, perimeter frame surfaces of windows, curtain walls, storefronts, and doors. Apply modified bituminous transition strip adhesive-coated transition strip elastomeric flashing sheet preformed silicone-sealant extrusion so that a minimum of 3 inches of coverage is achieved over each substrate. Maintain 3 inches of full contact over firm bearing to perimeter frames with not less than 1 inch of full contact.
 - 1. Modified Bituminous Transition Strip: Roll firmly to enhance adhesion.
 - 2. Adhesive-Coated Transition Strip: Roll firmly to enhance adhesion.
 - 3. Elastomeric Flashing Sheet: Apply adhesive to wall, frame, and flashing sheet. Install flashing sheet and termination bars, fastened at 6 inches o.c. Apply lap sealant over exposed edges and on cavity side of flashing sheet.
 - 4. Preformed Silicone-Sealant Extrusion: Set in full bed of silicone sealant applied to walls, frame, and air-barrier material.
- G. Seal strips and transition strips around masonry reinforcing or ties and penetrations with termination mastic.
- H. Seal top of through-wall flashings to air barrier with an additional 6-inch- wide, modified bituminous counterflashing strip.
- I. Seal exposed edges of strips at seams, cuts, penetrations, and terminations not concealed by metal counterflashings or ending in reglets with termination mastic.
- J. Repair punctures, voids, and deficient lapped seams in strips and transition strips. Slit and flatten fishmouths and blisters. Patch with transition strips extending 6 inches beyond repaired areas in strip direction.

3.5 FLUID AIR-BARRIER MEMBRANE INSTALLATION

- A. General: Apply fluid air-barrier material to form a seal with strips and transition strips and to achieve a continuous air barrier according to air-barrier manufacturer's written instructions. Apply fluid air-barrier material within manufacturer's recommended application temperature ranges.
 - 1. Apply primer to substrates at required rate and allow it to dry.
 - 2. Limit priming to areas that will be covered by fluid air-barrier material on same day. Reprime areas exposed for more than 24 hours.
- B. Membrane Air Barriers: Apply a continuous unbroken air-barrier membrane to substrates according to the following thickness. Apply air-barrier membrane in full contact around protrusions such as masonry ties.
 - 1. Vapor-Retarding Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil dry film thickness, applied in two equal coats.

2. Vapor-Permeable Membrane Air Barrier: Total dry film thickness as recommended in writing by manufacturer to meet performance requirements, but not less than 40-mil dry film thickness, applied in two equal coats.
- C. Apply strip and transition strip a minimum of 1 inch onto cured air-barrier material or strip and transition strip over cured air-barrier material overlapping 3 inches onto each surface according to air-barrier manufacturer's written instructions.
- D. Do not cover air barrier until it has been tested and inspected by Owner's testing agency.
- E. Correct deficiencies in or remove air barrier that does not comply with requirements; repair substrates and reapply air-barrier components.

3.6 CLEANING AND PROTECTION

- A. Protect air-barrier system from damage during application and remainder of construction period, according to manufacturer's written instructions.
 1. Protect air barrier from exposure to UV light and harmful weather exposure as required by manufacturer. If exposed to these conditions for more than 30 days, remove and replace air barrier or install additional, full-thickness, air-barrier application after repairing and preparing the overexposed membrane according to air-barrier manufacturer's written instructions.
 2. Protect air barrier from contact with incompatible materials and sealants not approved by air-barrier manufacturer.
- B. Clean spills, stains, and soiling from construction that would be exposed in the completed work using cleaning agents and procedures recommended by manufacturer of affected construction.
- C. Remove masking materials after installation.

END OF SECTION 072726

SECTION 075423 - THERMOPLASTIC POLYOLEFIN (TPO) ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Adhered TPO membrane roofing system.
 - 2. Roof insulation.
- B. Related Sections:
 - 1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 076200 "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings.
 - 3. Section 077129 "Manufactured Roof Expansion Joints" for proprietary manufactured roof expansion-joint assemblies.
 - 4. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.
 - 5. Section 221423 "Storm Drainage Piping Specialties" for roof drains.

1.3 DEFINITIONS

- A. TPO: Thermoplastic polyolefin.
- B. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. FM Approvals Listing: Provide membrane roofing, base flashings, and component materials that comply with requirements in FM Approvals 4450 and FM Approvals 4470 as part of a membrane roofing system, and that are listed in FM Approvals' "RoofNav" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals markings.
 - 1. Fire/Windstorm Classification: Class 1A-60 .

2. Hail Resistance: SH.

D. Energy Performance: Provide roofing system that is listed on the DOE's ENERGY STAR "Roof Products Qualified Product List" for low -slope roof products.

E. Energy Performance: Provide roofing system with initial solar reflectance not less than 0.70 and emissivity not less than 0.75 when tested according to CRRC-1.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.

1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

C. Samples for Verification: For the following products:

1. Sheet roofing, of color specified, including T-shaped side and end lap seam.
2. Roof insulation.
3. Walkway pads or rolls.
4. Metal termination bars.
5. Six insulation fasteners of each type, length, and finish.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and manufacturer.

B. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

D. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is UL listed for membrane roofing system identical to that used for this Project.

- B. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by membrane roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.
- C. Source Limitations: Obtain components including roof insulation for membrane roofing system approved by membrane roofing manufacturer.
- D. Preinstallation Roofing Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, third party testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
 - 7. Review governing regulations and requirements for insurance and certificates if applicable.
 - 8. Review temporary protection requirements for roofing system during and after installation.
 - 9. Review roof observation and repair procedures after roofing installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 - 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.10 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.11 WARRANTY

- A. Special Warranty: Manufacturer's standard or customized form, without monetary limitation, in which manufacturer agrees to repair or replace components of membrane roofing system that fail in materials or workmanship within specified warranty period.
 - 1. Special warranty includes membrane roofing, base flashings, roof insulation, cover boards, perimeter metal work and other components of membrane roofing system.
 - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 TPO MEMBRANE ROOFING

- A. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878, internally fabric or scrim reinforced, uniform, flexible fabric backed TPO sheet.
 - 1. Basis of Design: Subject to compliance with requirements, provide products by Carlisle SynTec Incorporated, or equivalent products by one of the following manufacturers:
 - a. Firestone Building Products Company.
 - b. Johns Manville.
 - c. Mule-Hide Products Co., Inc.
 - 2. Thickness: 60 mils, nominal.
 - 3. Exposed Face Color: White.

2.2 AUXILIARY MEMBRANE ROOFING MATERIALS

- A. General: Auxiliary membrane roofing materials recommended by roofing system manufacturer for intended use, and compatible with membrane roofing.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
- B. Sheet Flashing: Manufacturer's standard unreinforced thermoplastic polyolefin sheet flashing, 55 mils thick, minimum, of same color as sheet membrane.
- C. Bonding Adhesive: Manufacturer's standard bonding adhesive.
- D. Slip Sheet: Manufacturer's standard, of thickness required for application.
- E. Metal Termination Bars: Manufacturer's standard, predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.
- F. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.3 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by TPO membrane roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2, felt or glass-fiber mat facer on both major surfaces.
- C. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches unless otherwise indicated.
- D. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.4 INSULATION ACCESSORIES

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- C. Full-Spread Applied Insulation Adhesive: Insulation manufacturer's recommended spray-applied, low-rise, two-component urethane adhesive formulated to attach roof insulation to substrate or to another insulation layer.
- D. Cover Board Option: ASTM C 1177/C 1177M, glass-mat, water-resistant gypsum substrate, 1/4 inch thick, factory primed.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Georgia-Pacific Corporation; Dens Deck Prime.
- E. Cover Board Option: ASTM C 1278/C 1278M, cellulosic-fiber-reinforced, water-resistant gypsum substrate, 1/4 inch thick.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. USG Corporation; Securock.

2.5 WALKWAYS

- A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch thick, and acceptable to membrane roofing system manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:
 - 1. Verify that roof openings and penetrations are in place and curbs are set and braced and that roof drain bodies are securely clamped in place.
 - 2. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Section 053100 "Steel Decking."
 - 4. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 - 5. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 6. Verify that concrete curing compounds that will impair adhesion of roofing components to roof deck have been removed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- C. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.
- D. Install acoustical roof deck rib insulation strips, specified in Section 053100 "Steel Decking," according to acoustical roof deck manufacturer's written instructions, immediately before installation of overlying construction and to remain dry.

3.3 INSULATION INSTALLATION

- A. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Comply with membrane roofing system and insulation manufacturer's written instructions for installing roof insulation.
- C. Install tapered insulation under area of roofing to conform to slopes indicated.

- D. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.7 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
 - 1. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
- E. Trim surface of insulation where necessary at roof drains so completed surface is flush and does not restrict flow of water.
- F. Install insulation with long joints of insulation in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.
 - 1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.
- G. Mechanically Fastened and Adhered Insulation: Install each layer of insulation and secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.
 - 1. Fasten first layer of insulation according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Set each subsequent layer of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place.
- H. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck.
 - 1. Fasten cover boards according to requirements in FM Approvals' "RoofNav" for specified Windstorm Resistance Classification.
 - 2. Set cover-board to subsequent layers of insulation in a uniform coverage of full-spread insulation adhesive, firmly pressing and maintaining insulation in place

3.4 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere membrane roofing over area to receive roofing and install according to membrane roofing system manufacturer's written instructions.
- B. Start installation of membrane roofing in presence of membrane roofing system manufacturer's technical personnel.
- C. Accurately align membrane roofing and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- D. Bonding Adhesive: Apply to substrate and underside of membrane roofing at rate required by manufacturer and allow to partially dry before installing membrane roofing. Do not apply to splice area of membrane roofing.
- E. In addition to adhering, mechanically fasten membrane roofing securely at terminations, penetrations, and perimeter of roofing.
- F. Apply membrane roofing with side laps shingled with slope of roof deck where possible.

- G. Seams: Clean seam areas, overlap membrane roofing, and hot-air weld side and end laps of membrane roofing and sheet flashings according to manufacturer's written instructions to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet membrane.
 - 2. Verify field strength of seams a minimum of twice daily and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing that does not comply with requirements.
- H. Spread sealant bed over deck drain flange at roof drains and securely seal membrane roofing in place with clamping ring.
- I. Install membrane roofing and auxiliary materials to tie in to existing roofing to maintain weathertightness of transition and to not void warranty for existing membrane roofing system.

3.5 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories and adhere to substrates according to membrane roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.6 WALKWAY INSTALLATION

- A. Flexible Walkways: Install walkway products in locations indicated. Heat weld to substrate or adhere walkway products to substrate with compatible adhesive according to roofing system manufacturer's written instructions.

3.7 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and furnish daily reports to the Architect; and to perform tests and inspections.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
- C. Repair or remove and replace components of membrane roofing system where inspections indicate that they do not comply with specified requirements.

- D. Additional inspections, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction will not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements; repair substrates; and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075423

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Formed low-slope roof sheet metal fabrications.
 - 2. Formed equipment support flashing.

- B. Related Requirements:

- 1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 075423 "Thermoplastic Polyolefin (TPO) Roofing" for materials and installation of sheet metal flashing and trim integral with roofing.
 - 3. Section 074213.23 "Metal Composite Material Wall Panels" for sheet metal flashing and trim integral with metal wall panels.
 - 4. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, vents, and other manufactured roof accessory units.

1.3 COORDINATION

- A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
- B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leakproof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
 - 3. Review requirements for insurance and certificates if applicable.
 - 4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components

and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.
9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.
12. Detail formed flashing and trim at scale of not less than 3 inches per 12 inches.

C. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Anodized Aluminum Samples: Samples to show full range to be expected for each color required.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For fabricator.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to extent necessary for period of sheet metal flashing and trim installation.

1.9 WARRANTY

- A. Special Warranty on Finishes: Manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Code Compliance: Comply with IBC 2009. Specifically Chapter 15 Section 1504.5 Edge securement for low slope roofs. Design and install for wide loads in accordance with Chapter 16 and tested for resistance in accordance with ANSI/SPRI ES-1. Verification of compliance with ANSI/SPRI ES-1 from coping manufacturer will be required for Issuance of Certificate of Occupancy.
- C. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Stainless-Steel Sheet: ASTM A 240/A 240M[or ASTM A 666], Type 304, dead soft, fully annealed; with smooth, flat surface.
 - 1. Finish: 2D (dull, cold rolled) .
- C. Metallic-Coated Steel Sheet: Provide aluminum-zinc alloy-coated steel sheet according to ASTM A 792/A 792M, Class AZ50 coating designation, Grade 40; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
 - 1. Surface: Smooth, flat .

2. Exposed Coil-Coated Finish:
 - a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
3. Color: Custom color to match existing metal.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal[or manufactured item].
 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 2. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
 3. Fasteners for Zinc-Tin Alloy-Coated Stainless-Steel Sheet: Series 300 stainless steel.
 4. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Solder:
 1. For Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.
- D. Elastomeric Sealant: ASTM C 920, elastomeric [polyurethane] [polysulfide] [silicone] polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Epoxy Seam Sealer: Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.
- F. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
 - 1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 2. Obtain field measurements for accurate fit before shop fabrication.
 - 3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."
- D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
 - 2. Use lapped expansion joints only where indicated on Drawings.
- E. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard and by FM Global Property Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.
- H. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.
- I. Do not use graphite pencils to mark metal surfaces.

2.5 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Base Flashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:
 - 1. Stainless Steel: 0.019 inch thick.
- B. Counterflashing: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Stainless Steel: 0.019 inch thick.
- C. Flashing Receivers: Fabricate from the following materials:
 1. Stainless Steel: 0.016 inch thick.
- D. Roof-Penetration Flashing: Fabricate from the following materials:
 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.018 inch thick.
- E. Roof-Drain Flashing: Fabricate from the following materials:
 1. Zinc-Tin Alloy-Coated Stainless Steel: 0.015 inch thick.

2.6 MISCELLANEOUS SHEET METAL FABRICATIONS

- A. Equipment Support Flashing: Fabricate from the following materials:
 1. Stainless Steel: 0.019 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, and other conditions affecting performance of the Work.
 1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
 3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners[, **solder**], protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
 5. Torch cutting of sheet metal flashing and trim is not permitted.

6. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 1. Coat concealed side of and stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction.
 1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
 1. Do not solder metallic-coated steel sheet.
 2. Do not pre-tin .
 3. Do not use torches for soldering.
 4. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 5. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and cited sheet metal standard. Provide

concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

- B. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
- C. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.
- D. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with elastomeric sealant and clamp flashing to pipes that penetrate roof.

3.4 MISCELLANEOUS FLASHING INSTALLATION

- A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.5 ERECTION TOLERANCES

- A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.6 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.
- E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:

- 1. Copings.
 - 2. Roof-edge flashings.

- B. Related Sections:

- 1. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 2. Section 075423 "Thermoplastic Polyolefin (TPO) Roofing for project warranty requirements.
 - 3. Section 076200 "Sheet Metal Flashing and Trim" for custom- and site-fabricated sheet metal flashing and trim.
 - 4. Section 077129 "Manufactured Roof Expansion Joints" for manufactured roof expansion-joint cover assemblies.
 - 5. Section 077200 "Roof Accessories" for set-on-type curbs, equipment supports, roof hatches, vents, and other manufactured roof accessory units.
 - 6. Section 079200 "Joint Sealants" for field-applied sealants between roof specialties and adjacent materials.
 - 7. Section 079500 "Expansion Control" for manufactured sheet metal expansion-joint covers.

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. FM Approvals' Listing: Manufacture and install copings and roof-edge flashings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-60. Identify materials with FM Approvals' markings.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: For roof specialties. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work. Include the following:
 - 1. Details of special conditions.
- B. Samples for Verification: For copings roof-edge flashings made from 12-inch lengths of full-size components including fasteners, cover joints, accessories, and attachments.

1.5 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for copings and roof-edge flashings.

1.6 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects roof specialties including installers of roofing materials and accessories.
 - 2. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 3. Review special roof details, roof drainage, and condition of other construction that will affect roof specialties.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.
- B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof specialties installation.

1.8 WARRANTY

- A. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.
- B. Special Warranty: Metal work shall be included in Roofing Special Warranty.

PART 2 - PRODUCTS

2.1 EXPOSED METALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.
 - 1. Surface: Smooth, flat finish.
 - 2. Exposed Coil-Coated Finishes: Prepainted by the coil-coating process to comply with ASTM A 755/A 755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
 - a. Two-Coat Fluoropolymer: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

2.2 CONCEALED METALS

- A. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, protective coatings, sealants, and other miscellaneous items required by manufacturer for a complete installation.
- B. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:
 - 1. Exposed Penetrating Fasteners: Gasketed screws with hex washer heads matching color of sheet metal.
 - 2. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Series 300 stainless steel or hot-dip zinc-coated steel according to ASTM A 153/A 153M or ASTM F 2329.
- C. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

2.4 COPINGS

- A. Copings: Manufactured coping system consisting of formed-metal coping cap in section lengths not exceeding [12 feet] <Insert dimension>, concealed anchorage; corner units, end cap units, and concealed splice plates with same finish as coping caps.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville.
 - b. Metal-Era, Inc.
 - c. Metal-Fab Manufacturing, LLC.
 - d. MM Systems Corporation.
 - 2. Coping-Cap Material: Zinc-coated steel, nominal 0.028-inch thickness.
 - a. Finish: Two-coat fluoropolymer.

- b. Color: As selected by Architect from manufacturer's full range.
- 3. Corners: Factory mitered and soldered.
- 4. Special Fabrications: Two-way sloped coping cap.
- 5. Coping-Cap Attachment Method: Face leg hooked to continuous cleat with back leg fastener exposed, fabricated from coping-cap material.
- 6. Face Leg Cleats: Concealed, continuous galvanized-steel sheet.

2.5 ROOF-EDGE FLASHINGS

- A. Canted Roof-Edge Fascia: Manufactured, two-piece, roof-edge fascia consisting of snap-on metal fascia cover in section lengths not exceeding 12 feet and a continuous formed galvanized-steel sheet cant, 0.028 inch thick, minimum, with extended vertical leg terminating in a drip-edge cleat. Provide matching corner units.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Johns Manville.
 - b. Metal-Era, Inc.
 - c. Metal-Fab Manufacturing, LLC.
 - d. MM Systems Corporation.
 - 2. Fascia Cover: Fabricated from the following exposed metal:
 - a. Zinc-Coated Steel: Nominal 0.028-inch thickness .
 - 3. Corners: Factory mitered and soldered.
 - 4. Splice Plates: Concealed, of same material, finish, and shape as fascia cover.
 - 5. Fascia Accessories: Fascia extenders with continuous hold-down cleats .
- B. Zinc-Coated Steel Finish: Two-coat fluoropolymer.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine walls, roof edges, and parapets for suitable conditions for roof specialties.

- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. General: Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.
 - 1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 2. Provide uniform, neat seams with minimum exposure of solder and sealant.
 - 3. Install roof specialties to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
 - 4. Torch cutting of roof specialties is not permitted.
 - 5. Do not use graphite pencils to mark metal surfaces.
- B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.
 - 1. Coat concealed side of roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
- C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.
 - 1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise shown on Drawings.
 - 2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.
- D. Fastener Sizes: Use fasteners of sizes that will penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws.
- E. Seal joints with butyl sealant as required by roofing-specialty manufacturer.
- F. Seal joints as required for watertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 COPING INSTALLATION

- A. Install cleats, anchor plates, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor copings to meet performance requirements.
 - 1. Interlock face leg drip edge into continuous cleat anchored to substrate at 16-inch centers. Anchor back leg of coping with screw fasteners and elastomeric washers at 16-inch centers .

3.4 ROOF-EDGE FLASHING INSTALLATION

- A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.
- B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder and sealants.
- C. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.
- D. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 077129 - MANUFACTURED ROOF EXPANSION JOINTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Bellows-type roof expansion joints.
- B. Related Requirements:
 - 1. Section 061000 "Rough Carpentry" for wooden curbs or cants for mounting roof expansion joints.
 - 2. Section 075423 "Thermoplastic Polyolefin (TPO) Roofing" for roofing system.
 - 3. Section 076200 "Sheet Metal Flashing and Trim" for shop- and field-fabricated sheet metal expansion-joint systems, flashing, and other sheet metal items.
 - 4. Section 077200 "Roof Accessories" for manufactured and prefabricated metal roof curbs.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For roof expansion joints.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Include details of splices, intersections, transitions, fittings, method of field assembly, and location and size of each field splice.
 - 3. Provide isometric drawings of intersections, terminations, and changes in joint direction or planes, depicting how components interconnect with each other and adjacent construction to allow movement and achieve waterproof continuity.
- C. Samples: For each exposed product and for each color specified, 6 inches in size.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Test Reports: For each fire-barrier provided as part of a roof-expansion-joint assembly, for tests performed by a qualified testing agency.

- C. Sample Warranties: For special warranties.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installer of roofing membrane.

1.7 WARRANTY

- A. Special Warranty: Manufacturer and Installer agree to repair or replace roof expansion joints and components that leak, deteriorate beyond normal weathering, or otherwise fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Painted Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace roof expansion joints that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than five Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Roof expansion joints shall withstand exposure to weather, remain watertight, and resist the movements indicated without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint seals, failure of connections, and other detrimental effects.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 BELLOWS-TYPE ROOF EXPANSION JOINTS

- A. Source Limitations: Obtain bellows-type roof expansion joints approved by roofing manufacturer and that are part of roofing membrane warranty.
- B. Flanged Bellows Roof Expansion Joint : Manufactured, continuous, waterproof, joint-cover assembly, consisting of exposed membrane bellows, laminated to flexible, closed-cell support foam, and secured along each edge to a 3- to 4-inch- wide metal flange for nailing to substrate. Provide each size and type indicated, factory-fabricated units for corner and joint intersections and horizontal and vertical transitions including those to other building expansion joints, splicing units, adhesives, and other components as recommended by roof-expansion-joint

manufacturer for complete installation. Fabricate each assembly specifically for installation configuration indicated on Drawings.

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - a. Balco, Inc.
 - b. C/S Group.
 - c. MM Systems Corporation.
 - d. Watson Bowman Acme Corp.
2. Joint Movement Capability: Plus and minus 50 percent of joint size.
3. Bellows: TPO flexible membrane, nominal 60 mils thick.
 - a. Color: White.
4. Flanges: Stainless steel, 0.019 inch thick.
5. Cover Membrane: TPO flexible membrane, factory laminated to bellows and covering entire joint assembly and curbs.
 - a. Color: White.
6. Secondary Seal: Continuous, waterproof membrane within joint and attached to substrate on sides of joint below the primary bellows assembly.
 - a. Drain-Tube Assemblies: Equip secondary seal with drain tubes and seals to direct collected moisture to exterior-wall expansion joint cover.
 - b. Thermal Insulation: Fill space above secondary seal with mineral-fiber blanket insulation; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84.

2.3 MATERIALS

- A. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304.
- B. Fabric-Reinforced Thermoplastic Polyolefin Sheet: ASTM D 6878
- C. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to withstand design loads.
 1. Exposed Fasteners: Gasketed. Use screws with hex washer heads matching color of material being fastened.
- D. Mineral-Fiber Blanket: ASTM C 665.
- E. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D 1187.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Examine roof-joint openings, inside surfaces of parapets, and expansion-control joint systems that interface with roof expansion joints, for suitable conditions where roof expansion joints will be installed.

- C. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written instructions for handling and installing roof expansion joints.
 - 1. Anchor roof expansion joints securely in place, with provisions for required movement. Use fasteners, protective coatings, sealants, and miscellaneous items as required to complete roof expansion joints.
 - 2. Install roof expansion joints true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
 - 3. Provide for linear thermal expansion of roof expansion joint materials.
 - 4. Provide uniform profile of roof expansion joint throughout its length; do not stretch or squeeze membranes.
 - 5. Provide uniform, neat seams.
 - 6. Install roof expansion joints to fit substrates and to result in watertight performance.
 - 7. Torch cutting of roof expansion joints is not permitted.
 - 8. Do not use graphite pencils to mark aluminum surfaces.
- B. Directional Changes and Other Expansion-Control Joint Systems: Coordinate installation of roof expansion joints with other expansion-control joint systems to result in watertight performance. Install factory-fabricated units at directional changes and at transitions between roof expansion joints and exterior expansion-control joint systems specified in Section 079500 "Expansion Control" to provide continuous, uninterrupted, and watertight joints.
- C. Splices: Splice roof expansion joints with materials provided by roof-expansion-joint manufacturer for this purpose, to provide continuous, uninterrupted, and waterproof joints.
 - 1. Install waterproof splices and prefabricated end dams to prevent leakage of secondary-seal membrane.
- D. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

3.3 PROTECTION

- A. Protect roof expansion joints from foot traffic, displacement, or other damage.
- B. Remove and replace roof expansion joints and components that become damaged by moisture or otherwise.

END OF SECTION 077129

SECTION 078123 - INTUMESCENT MASTIC FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes mastic and intumescent fire-resistive coatings (MIFRC).
- B. Related Sections:
 - 1. Section 051200 "Structural Steel Framing"
 - 2. Section 055000 "Metal Fabrications".

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard dimensions in size.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of fireproofing.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is 50 deg F or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing for each fire-resistance design from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. VOC Content: Products shall comply with VOC content limits of authorities having jurisdiction
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.
 - 4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 5. Fireproofing Exterior Coatings: 350 g/L.
- E. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

- A. MIFRC : Manufacturer's standard, factory-mixed formulation, and complying with indicated fire-resistance design.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Albi Manufacturing, Division of StanChem Inc.; Albi Clad 800 .
 - b. Carboline Company, subsidiary of RPM International, Fireproofing Products Div.; AD Firefilm III .
 - c. International Paint Limited, subsidiary of Akzo Nobel N. V.; Chartek 7 .
 - d. Isolatek International; Cafco SprayFilm-WB 3.
 - 2. Application: Designated for "conditioned interior space purpose" use by a qualified testing agency acceptable to authorities having jurisdiction.
 - 3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.

4. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
5. Hardness: Not less than 80, Type D durometer, according to ASTM D 2240.
6. Finish: Spray-textured finish.
 - a. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design. Verify compliance with the following:
 1. Substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 2. Objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 3. Substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Conduct tests according to fireproofing manufacturer's written recommendations to verify that substrates are free of substances capable of interfering with bond.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Spray apply fireproofing to maximum extent possible. Following the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- E. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- F. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- G. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- H. Cure fireproofing according to fireproofing manufacturer's written recommendations.
- I. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- J. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Spray-Textured Finish: Finish left as spray applied with no further treatment.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the IBC, 1704.11.
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.

2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.

- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing will be without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078123

SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Penetrations in fire-resistance-rated walls.
- B. Related Sections:
 - 1. Section 078446 "Fire-Resistive Joint Systems" for joints in or between fire-resistance-rated construction, at exterior walls, existing interior walls / existing floor intersections, and in smoke barriers.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule : For each penetration fire stopping system. Include location and design designation of qualified testing and inspecting agency.
 - 1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer. Provide FM 4991 or UL Accredited Certificate.
- B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with specifications and code requirements and manufacturer's written recommendations.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.
- D. Proof of Attendance: Written verification letter stating the name(s) of the companies, person(s) in attendance and date of the onite firestop training required by Quality Assurance article.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements."
- B. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- C. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
 - 1. Penetration firestopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
 - 2. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
 - a. Penetration firestopping products bear classification marking of qualified testing and inspecting agency.
 - b. Classification markings on penetration firestopping correspond to designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
 - 2) Intertek ETL SEMKO in its "Directory of Listed Building Products."
 - 3) FM Global in its "Building Materials Approval Guide."
- D. Pre-installation conference: Conduct a pre-installation firestop conference at the jobsite to coordinate firestop installation with other trades and to minimize installation conflicts. All firestop submittals, including UL systems and Engineering Judgments, if necessary, must have been submitted, reviewed and commented by the architect prior to the meeting. All relevant parties, including the architect and owner should be notified 72 hr prior to conference
- E. On-site training: Conduct on-site training at the direction of a manufacturer's direct representative, not a distributor or agent, to train contractor personnel in proper selection and installation procedures.
- F. Mock-up: Provide a mock-up of all typical firestop applications to show the quality of workmanship. Approved mock-ups may be left in place as part of the finished project and will constitute the standard for remaining work

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.

1.7 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Subject to compliance with requirements, provide products by Hilti, Inc., or equivalent products by one of the following:
 - 1. A/D Fire Protection Systems Inc.
 - 2. Grace Construction Products.
 - 3. Hilti, Inc.
 - 4. 3M Fire Protection Products.
 - 5. USG Corporation.

2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
 - 1. Fire-resistance-rated walls include fire walls and fire partitions.
 - 2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. W-Rating: Provide penetration firestopping floor systems showing no evidence of water leakage when tested according to UL 1479.
- D. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- E. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.

2.3 FILL MATERIALS

- A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial

extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

- B. Post installed drop-in firestop devices: Devices for use with noncombustible and combustible pipes (closed or open) systems) and conduit penetrating concrete floors.
- C. Cable Management Device: Re-penetrable cable management device for floor or wall applications
- D. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
- E. Acrylic Sealants: Acrylic based firestop sealant that provided movement capability
- F. Firestop Collars: Ready to use firestop collar made of galvanized steel and lined with intumescent material sized to fit specific diameter of combustible penetrant.
- G. Intumescent Composite Sheets: Firestop Board: Ready-to-use firestop board designed for large opening with cable trays and multiple penetrations
- H. Intumescent Putties: Moldable firestop putty containing no solvents, inorganic fibers, or silicone compounds.
- I. Outlet and switch box protection: Ready-to-use intumescent insert to provide protection to outlet and switch boxes in fire rated assemblies
- J. Intumescent Wrap Strips: Single-components intumescent flexible strips for use with in place plastic and insulated pipe penetrations.
- K. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- L. Blocks: non-curing, repenetrable, materials used for large opening and complex penetrations made to accommodate cable trays and bundles and multiple metallic pipes and busways.
- M. Firestop Plug: ready-to-use intumescent and reusable plug for small openings
- N. Foams: Multi-component liquid foam which, when mixed, expands and cures in place to produce a repenetrable, non-shrinking foam.
- O. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING

- A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other

items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
 - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
 - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
 - 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.

3.3 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- C. Install fill materials for firestopping by proven techniques to produce the following results:
 - 1. Fill voids and cavities formed by openings, forming materials, accessories, and

- penetrating items as required to achieve fire-resistance ratings indicated.
2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION

- A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop systems installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels, or similar manufacturer's approved pre-printed label:
 1. Date of installation.
 2. Firestop system number or manufacturer's EJ number
 3. Installer's company name.
 4. Firestop manufacturer's name.
 5. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."

3.5 CLEANING AND PROTECTION

- A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

3.6 PENETRATION FIRESTOPPING SCHEDULE

THROUGH-PENETRATION UL CLASSIFICATION SYSTEM

Fire Stopping Systems

UL Classification System

	Construction	Type Of Construction	System Identification
	Penetrated		
1 No Penetrating Items:	F, W, C	A, B, J, K, L	0001-0999
2 Metallic Pipes, Conduit or Tubing:	F, W, C	A, B, J, K, L	1001-1999
3 Nonmetallic Pipe, Conduit or Tubing:	F, W, C	A, B, J, K, L	2001-2999
4 Electric Cables:	F, W, C	A, B, J, K, L	3001-3999
5 Cable, Trays with Electric Cables:	F, W, C	A, B, J, K, L	4001-4999
6 Insulated Pipes:	F, W, C	A, B, J, K, L	5001-5999
7 Electrical Bussduct Penetrations:	F, W, C	A, B, J, K, L	6001-6999
8 Mechanical Ductwork Penetrations:	F, W, C	A, B, J, K, L	7001-7999
9 Multiple Penetrations Through Common Openings:	F, W, C	A, B, J, K, L	8000-8999

Construction Penetration

- F Floor penetration
- W Wall penetration
- C Either floor or wall penetration

Type of Construction

- A- Concrete floors equal to or less than 5-inches thick
- B- Concrete floors greater than 5-inches thick
- J- Concrete or masonry walls equal to or less than 8-inches thick
- K- Concrete or masonry walls greater than 8-inches thick
- L- Framed walls

END OF SECTION 078413

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Urethane joint sealants.
 - 3. Latex joint sealants.
 - 4. Acoustical joint sealants.
- B. Related Sections:
 - 1. Section 042000 "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
 - 2. Section 079500 "Expansion Control" for building expansion joints.
 - 3. Section 078446 "Fire-Resistive Joint Systems" for sealing joints in fire-resistance-rated construction.
 - 4. Section 088000 "Glazing" for glazing sealants.

1.3 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
 - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
 - 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.4 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Verification: For each kind and color of joint sealant required, provide Samples

with joint sealants in 1/2-inch- wide joints formed between two 6-inch- long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Test joint sealants using a qualified testing agency.
1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
 2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.
- D. Preinstallation Conference: Conduct conference at Project site.

1.7 PROJECT CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 2. When joint substrates are wet.
 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

- A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 5 years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
 - 1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
- C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- D. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
- E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 790 .
 - b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
 - c. May National Associates, Inc.; Bondaflex Sil 290 .
 - d. Pecora Corporation; 301 NS .
 - e. Sika Corporation, Construction Products Division; SikaSil-C990.
 - f. Tremco Incorporated; Spectrem 1 .
- B. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; 790.
 - b. May National Associates, Inc.; Bondaflex Sil 728 NS.
 - c. Pecora Corporation; 301 NS.
 - d. Tremco Incorporated; Spectrem 800.
- C. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
1. Products: Subject to compliance with requirements, provide the following:
 - a. Pecora Corporation; 898.

2.3 URETHANE JOINT SEALANTS

- A. Single-Component, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920, Type S, Grade P, Class 25, for Use T.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems; Sonolastic SL 1.
 - b. Bostik, Inc.; Chem-Calk 950.
 - c. May National Associates, Inc.; Bondaflex PUR 35 SL.
 - d. Pecora Corporation; Urexpan NR-201.
 - e. Polymeric Systems, Inc.; Flexiprene 952.
 - f. Schnee-Morehead, Inc.; Permathane SM7101.
 - g. Sika Corporation. Construction Products Division; Sikaflex - 1CSL.
 - h. Tremco Incorporated; Vulkem 45.

2.4 LATEX JOINT SEALANTS

- A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. BASF Building Systems; Sonolac.
 - b. Bostik, Inc.; Chem-Calk 600.
 - c. May National Associates, Inc.; Bondaflex 600.
 - d. Pecora Corporation; AC-20+.

- e. Schnee-Morehead, Inc.; SM 8200.
- f. Tremco Incorporated; Tremflex 834.

2.5 ACOUSTICAL JOINT SEALANTS

- A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Pecora Corporation; AC-20 FTR.
 - b. USG Corporation; SHEETROCK Acoustical Sealant.

2.6 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
 - a. Concrete.
 - b. Masonry.
 - c. Unglazed surfaces of ceramic tile.
 - d. Exterior insulation and finish systems.
 - 3. Remove laitance and form-release agents from concrete.
 - 4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
 - a. Metal.
 - b. Glass.
 - c. Porcelain enamel.
 - d. Glazed surfaces of ceramic tile.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
 - 4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
 - 5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
 - a. Use masking tape to protect surfaces adjacent to recessed tooled joints.
- G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
 - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 - 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
 - 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.

4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

- H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.
- I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-1.
 1. Joint Locations:
 - a. Isolation and contraction joints in cast-in-place concrete slabs.
 2. Urethane Joint Sealant: Single component, pourable, traffic grade.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces JS-3 .
 1. Joint Locations:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between plant-precast architectural concrete units.
 - c. Control and expansion joints in unit masonry.
 - d. Joints in glass unit masonry assemblies.
 - e. Joints between metal panels.
 - f. Joints between different materials listed above.
 - g. Perimeter joints between materials listed above and frames of **doors, windows, and louvers.**
 - h. Control and expansion joints in **ceilings and other overhead surfaces.**

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50 .
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-4 .
1. Joint Locations:
 - a. Isolation joints in cast-in-place concrete slabs.
 - b. Control and expansion joints in tile flooring.
 2. Silicone Joint Sealant: Single component, nonsag, traffic grade, neutral curing .
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- D. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces JS-5 .
1. Joint Locations:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated.
 - c. Tile control and expansion joints.
 - d. Vertical joints on exposed surfaces of **interior unit masonry, concrete, walls and partitions.**
 - e. Joints on underside of plant-precast structural concrete **beams and planks.**
 - f. Perimeter joints between interior wall surfaces and frames of **interior doors, windows and elevator entrances.**
 2. Joint Sealant: Latex.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-6 .
1. Joint Sealant Location:
 - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b. Tile control and expansion joints where indicated.
 2. Joint Sealant: Mildew resistant, single component, nonsag, neutral curing, Silicone.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- F. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Location:
 - a. Acoustical joints where indicated.
 - b. Other joints as indicated.
 2. Joint Sealant: Acoustical.
 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200

SECTION 079500 - EXPANSION CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior expansion control systems.
 - 2. Exterior wall expansion control systems.
- B. Related Requirements:
 - 1. Section 077129 "Manufactured Roof Expansion Joints" for factory-fabricated roof expansion control.
 - 2. Section 078446 "Fire-Resistive Joint Systems" for liquid-applied joint sealants in fire-resistive building joints.
 - 3. Section 079200 "Joint Sealants" for liquid-applied joint sealants and for elastomeric sealants without metal frames
 - 4. Section 042000 Unit Masonry..

1.3 ACTION SUBMITTALS

- A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, breakout requirement, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.
- B. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches long in size.
- C. Samples for Verification: For each type of expansion control system indicated, full width by 6 inches long in size.
- D. Product Schedule: Prepared by or under the supervision of the supplier. Include the following information in tabular form:
 - 1. Manufacturer and model number for each expansion control system.
 - 2. Expansion control system location cross-referenced to Drawings.
 - 3. Nominal joint width.
 - 4. Movement capability.
 - 5. Classification as thermal or seismic.
 - 6. Materials, colors, and finishes.
 - 7. Product options.
 - 8. Fire-resistance ratings.

1.4 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

- A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.
 - 1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
 - 2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

2.2 INTERIOR EXPANSION CONTROL SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or a comparable product by one of the following:
 - 1. Architectural Art Mfg., Inc.; Division of Pittcon Industries.
 - 2. Balco, Inc.
 - 3. Construction Specialties, Inc.
 - 4. Michael Rizza Company, LLC.
 - 5. MM Systems Corporation.
 - 6. Watson Bowman Acme Corp.; a BASF Construction Chemicals business.
- B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.
- C. Wall Corner EJ-2:
 - 1. Basis-of-Design Product: C/S AFWC-200.
 - 2. Design Criteria:
 - a. Nominal Joint Width: 2".
 - b. Movement Capability: -25 percent/+75 percent.
 - c. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than 2 hours.
 - 3. Type: Clip-in cover .
 - a. Metal: Aluminum.
 - 1) Finish: Clear anodic, Class I .

2.3 EXTERIOR WALL EXPANSION CONTROL SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or a comparable product by one of the following:

1. Balco, Inc.
 2. EMSEAL Corporation.
 3. Michael Rizza Company, LLC.
 4. MM Systems Corporation.
 5. Watson Bowman Acme Corp.; a BASF Construction Chemicals business.
- B. Source Limitations: Obtain expansion control systems from single source from single manufacturer.
- C. Wall-to-Wall EJ-1:
1. Basis-of-Design Product: C/S SF-200.
 2. Design Criteria:
 - a. Nominal Joint Width: 2".
 - b. Movement Capability: -25 percent/+75 percent.
 - c. Type of Movement: Thermal.
 - d. Fire-Resistance Rating: Provide expansion control system and fire-barrier assembly with a rating not less than 2 hours .
 3. Type: Preformed cellular foam.
 - a. Foam Material: Manufacturer's standard.
 - 1) Color: As selected by Architect from manufacturer's full range.

2.4 ACCESSORIES

- A. Moisture Barriers: Manufacturer's standard moisture barrier consisting of a continuous, waterproof membrane within joint and attached to substrate on sides of joint below the primary cover.
1. Drain-Tube Assemblies: Equip moisture barrier with drain tubes and seals to direct collected moisture to exterior-wall expansion control system.

2.5 MATERIALS

- A. Aluminum: ASTM B 221, Alloy 6063-T5 for extrusions; ASTM B 209, Alloy 6061-T6 for sheet and plate.
1. Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.
- B. Cellular Foam Seals: Extruded, compressible foam designed to function under compression.
- C. Elastomeric Concrete: Modified epoxy or polyurethane extended into a prepackaged aggregate blend, specifically designed for bonding to concrete substrates.
- D. Fire Barriers: Any material or material combination, when fire tested after cycling, designated to resist the passage of flame and hot gases through a movement joint and to meet performance criteria for required fire-resistance rating.
- E. Moisture Barrier: Flexible elastomeric material, EPDM, minimum 45 mils thick.

- F. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive, nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.
- G. Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.6 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare substrates according to expansion control system manufacturer's written instructions.
- B. Coordinate and furnish anchorages, setting drawings, and instructions for installing expansion control systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of expansion control systems.

3.3 INSTALLATION

- A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.
- B. Foam Seals: Install with adhesive recommended by manufacturer.
- C. Terminate exposed ends of expansion control systems with field- or factory-fabricated

termination devices.

- D. Fire-Resistance-Rated Assemblies: Coordinate installation of expansion control system materials and associated work so complete assemblies comply with assembly performance requirements.
 - 1. Fire Barriers: Install fire barriers to provide continuous, uninterrupted fire resistance throughout length of joint, including transitions and field splices.
- E. Moisture Barrier: Provide at all exterior joints and where indicated on Drawings. Provide drainage fittings at a maximum of 50 feet or where indicated on Drawings.

3.4 PROTECTION

- A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.
- B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 079500

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes hollow-metal work.
- B. Related Requirements:
 - 1. Section 081113 - "Hollow Metal Doors & Frames".
 - 2. Section 081416 - "Flush Wood Doors".
 - 3. Section 087100 - "Finish Hardware".

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or SDI A250.8.

1.4 COORDINATION

- A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.
- B. Shop Drawings: Include the following:
 - 1. Elevations of each door type.
 - 2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.

3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Verification:

1. For each type of exposed finish required, prepared on Samples of not less than 3 by 5 inches.
2. For "Doors" and "Frames" subparagraphs below, prepare Samples approximately 12 by 12 inches to demonstrate compliance with requirements for quality of materials and construction:
 - a. Doors: Show vertical-edge, top, and bottom construction; core construction; and hinge and other applied hardware reinforcement. Include separate section showing glazing if applicable.
 - b. Frames: Show profile, corner joint, floor and wall anchors, and silencers. Include separate section showing fixed hollow-metal panels and glazing if applicable.

D. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.7 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.
1. Provide additional protection to prevent damage to factory-finished units.
- B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.
- C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: Subject to compliance with requirements, provide Mesker NVS – Seamless Construction or equivalent products by one of the following :

1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Steelcraft; an Ingersoll-Rand company.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Smoke- and Draft-Control Assemblies: Provide an assembly with gaskets listed and labeled for smoke and draft control by a qualified testing agency acceptable to authorities having jurisdiction, based on testing according to UL 1784 and installed in compliance with NFPA 105.

B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 2.

1. Physical Performance: Level B according to SDI A250.4.
2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches.
 - c. Face: Metallic-coated, cold-rolled steel sheet, minimum thickness of 0.042 inch.
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch.
 - b. Construction: Full profile welded.
4. Exposed Finish: Prime.

2.4 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Basis of Design: Subject to compliance with requirements, provide Mesker NVS – Seamless Construction or equivalent products by one of the following: construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:
 - a. Type: As indicated in the Door and Frame Schedule.
 - b. Thickness: 1-3/4 inches
 - c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
 - d. Edge Construction: Model 1, Full Flush.
 - e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
3. Frames:
 - a. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch, with minimum A40 coating.
 - b. Construction: Full profile welded.
4. Exposed Finish: Prime.

2.5 FRAME ANCHORS

- A. Jamb Anchors:
 1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
 2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch, and as follows:
 1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

2.6 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
- B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
 1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.
- E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

- F. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.
- G. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
- I. Glazing: Comply with requirements in Section 088000 "Glazing."
- J. Bituminous Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Doors:
 - 1. Steel-Stiffened Door Cores: Provide minimum thickness 0.026 inch, steel vertical stiffeners of same material as face sheets extending full-door height, with vertical webs spaced not more than 6 inches apart. Spot weld to face sheets no more than 5 inches o.c. Fill spaces between stiffeners with glass- or mineral-fiber insulation.
 - 2. Fire Door Cores: As required to provide fire-protection and temperature-rise ratings indicated.
 - 3. Vertical Edges for Single-Acting Doors: Provide beveled or square edges at manufacturer's discretion.
 - 4. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
 - 5. Bottom Edge Closures: Close bottom edges of doors where required for attachment of weather stripping with end closures or channels of same material as face sheets.
 - 6. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.
 - 7. Astragals: Provide overlapping astragal on one leaf of pairs of doors where required by NFPA 80 for fire-performance rating or where indicated. Extend minimum 3/4 inch beyond edge of door on which astragal is mounted or as required to comply with published listing of qualified testing agency.
- C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
 - 1. Sidelight and Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.

2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
 5. Jamb Anchors: Provide number and spacing of anchors as follows:
 - a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:
 - 1) Two anchors per jamb up to 60 inches high.
 - 2) Three anchors per jamb from 60 to 90 inches high.
 - 3) Four anchors per jamb from 90 to 120 inches high.
 - 4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.
 - b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:
 - 1) Three anchors per jamb up to 60 inches high.
 - 2) Four anchors per jamb from 60 to 90 inches high.
 - 3) Five anchors per jamb from 90 to 96 inches high.
 - 4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
 6. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
 7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.
 - a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
 - b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
- D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.
- E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.
 2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
- F. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
 2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
 3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
 4. Provide loose stops and moldings on inside of hollow-metal work.
 5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
 - 1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

2.9 ACCESSORIES

- A. Louvers: Provide louvers for interior doors, where indicated, which comply with SDI 111C, with blades or baffles formed of 0.020-inch- thick, cold-rolled steel sheet set into 0.032-inch-thick steel frame.
 - 1. Sightproof Louver: Stationary louvers constructed with inverted-V or inverted-Y blades.
- B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.
- B. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

- A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.
- B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
 - a. At fire-rated openings, install frames according to NFPA 80.
 - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
 - c. Install frames with removable stops located on secure side of opening.
 - d. Install door silencers in frames before grouting.
 - e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
 - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
 - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
 - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
 3. Metal-Stud Partitions: Coat inside of frames with asphaltic coating and pre-fill with plaster. Solidly pack mineral-fiber insulation at all voids inside frames.
 4. Masonry Walls: Coat inside of frames with asphaltic coating. Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
 5. In-Place Metal -Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
 6. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
 - a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
 - b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
 - c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
 - d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.
- C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.
1. Non-Fire-Rated Steel Doors:
 - a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch.
 - b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
 - c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch.
 - d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch.
 2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
 3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.
- D. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

- A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 083326 - OVERHEAD COILING GRILLES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Open-curtain overhead coiling grilles.
- B. Related Sections:
 - 1. Section 055000 "Metal Fabrications" for miscellaneous steel supports.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design overhead coiling grilles, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Operation Cycles: Provide overhead coiling grille components and operators capable of operating for not less than number of cycles indicated for each grille. One operation cycle is complete when a grille is opened from the closed position to the fully open position and returned to the closed position.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type and size of overhead coiling grille and accessory. Include the following:
 - 1. Construction details, material descriptions, dimensions of individual components, profiles for curtain components, and finishes.
 - 2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 2. Wiring Diagrams: For power, signal, and control wiring.
- C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.

1. Include similar Samples of accessories involving color selection.
- D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.
 1. Open-Curtain Grille: 18-inch- square assembly with full-size components consisting of rods, spacers, and links as required to illustrate each assembly.
- 1.5 INFORMATIONAL SUBMITTALS
 - A. Qualification Data: For qualified Installer.
- 1.6 CLOSEOUT SUBMITTALS
 - A. Maintenance Data: For overhead coiling grilles to include in maintenance manuals.
- 1.7 QUALITY ASSURANCE
 - A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
 - B. Source Limitations: Obtain overhead coiling grilles from single source from single manufacturer.
 1. Obtain operators and controls from overhead coiling grille manufacturer.

PART 2 - PRODUCTS

- 2.1 GRILLE CURTAIN MATERIALS AND CONSTRUCTION
 - A. Open-Curtain Grilles: Fabricate metal grille curtain as an open network of horizontal rods, spaced at regular intervals, that are interconnected with vertical links, which are formed and spaced as indicated and are free to rotate on the rods.
 1. Stainless-Steel Grille Curtain: ASTM A 666, Type 300 series.
 - B. Endlocks: Continuous end links, chains, or other devices at ends of rods; locking and retaining grille curtain in guides against excessive pressures, maintaining grille curtain alignment, and preventing lateral movement.
 - C. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, finished to match grille.
 1. Astragal: Equip each grille bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.
 - D. Grille Curtain Jamb Guides: Manufacturer's standard shape having curtain groove with return lips or bars to retain curtain. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise; with removable stops on guides to prevent overtravel of curtain.
 1. Removable Posts and Jamb Guides: Manufacturer's standard.

2.2 HOODS AND ACCESSORIES

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
 - 1. Stainless Steel: 0.025-inch- thick stainless-steel sheet, Type 304, complying with ASTM A 666.
- B. Push/Pull Handles: Equip each push-up-operated or emergency-operated grille with lifting handles on each side of grille, finished to match grille.
 - 1. Provide pull-down straps or pole hooks for grilles more than 84 inches high.

2.3 LOCKING DEVICES

- A. Slide Bolt: Fabricate with side-locking bolts to engage through slots in tracks for locking by padlock, located on both left and right jamb sides, operable from coil side.

2.4 COUNTERBALANCING MECHANISM

- A. General: Counterbalance grilles by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.
- B. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.
- C. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.5 MANUAL GRILLE OPERATORS

- A. Equip grille with manufacturer's recommended manual grille operator unless another type of grille operator is indicated.
- B. Push-up Grille Operation: Design counterbalance mechanism so required lift or pull for grille operation does not exceed 25 lbf.

2.6 OPEN-CURTAIN GRILLE ASSEMBLY

- A. Open-Curtain Grille: Overhead coiling grille with a curtain having a network of horizontal rods that interconnect with vertical links.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Alpine Overhead Doors, Inc.

- b. Cornell Iron Works, Inc.
 - c. Overhead Door Corporation.
 - d. Raynor.
 - e. Windsor Door.
 - B. Operation Cycles: Not less than 20,000.
 - 1. Include tamperproof cycle counter.
 - C. Grille Curtain Material: Stainless steel.
 - 1. Space rods at approximately 1-1/2 inches o.c.
 - 2. Space links approximately 6 inches apart in a brick (staggered) pattern.
 - 3. Spacers: Metal tubes matching curtain material.
 - D. Curtain Jamb Guides: Stainless steel with exposed finish matching curtain slats. Provide continuous integral wear strips to prevent metal-to-metal contact and to minimize operational noise.
 - E. Hood: Stainless steel .
 - 1. Shape: Square.
 - 2. Mounting: Face of wall .
 - F. Locking Devices: Equip grille with slide bolt for padlock.
 - G. Manual Grille Operator: Push-up operation.
 - 1. Provide operator with through-wall shaft operation.
 - 2. Provide operator with manufacturer's standard removable operating arm.
 - H. Grille Finish:
 - 1. Stainless-Steel Finish: No. 4 (polished directional satin).
- 2.7 GENERAL FINISH REQUIREMENTS
- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
 - B. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.
- 2.8 STAINLESS-STEEL FINISHES
- A. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
 - B. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
 - 1. Run grain of directional finishes with long dimension of each piece.
 - 2. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
 - 3. Directional Satin Finish: No. 4.

- C. Bright, Cold-Rolled, Unpolished Finish: No. 2B.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.
- B. Examine locations of electrical connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install overhead coiling grilles and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Install overhead coiling grilles, hoods, and operators at the mounting locations indicated for each grille.
- C. Accessibility: Install overhead coiling grilles, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 ADJUSTING

- A. Adjust hardware and moving parts to function smoothly so that grilles operate easily, free of warp, twist, or distortion.
- B. Lubricate bearings and sliding parts as recommended by manufacturer.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain overhead coiling grilles.

END OF SECTION 083326

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Exterior storefront framing.
 - 2. Exterior manual-swing entrance doors and door-frame units.
- B. Related Sections:
 - 1. Section 088000 "Glazing" for glass to be incorporated in aluminum framed entrances and storefront.
 - 2. Section 079200 "Joint Sealants".
 - 3. Section 087100 "Finish Hardware".

1.3 DEFINITIONS

- A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

- A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:
 - 1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
 - 2. Dimensional tolerances of building frame and other adjacent construction.
 - 3. Failure includes the following:
 - a. Deflection exceeding specified limits.
 - b. Thermal stresses transferring to building structure.
 - c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
 - d. Noise or vibration created by wind and by thermal and structural movements.
 - e. Loosening or weakening of fasteners, attachments, and other components.
 - f. Sealant failure.
 - g. Failure of operating units.

- B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- C. Structural Loads:
 - 1. Wind Loads: per ASCE 7-05.
 - a. Basic Wind Speed: 85 mph.
 - b. Importance Factor: II.
 - c. Exposure Category: B.
- D. Deflection of Framing Members:
 - 1. Deflection Normal to Wall Plane: Limited to edge of glass in a direction perpendicular to glass plane shall not exceed $L/175$ of the glass edge length for each individual glazing lite or an amount that restricts edge deflection of individual glazing lites to $3/4$ inch, whichever is less.
 - 2. Deflection Parallel to Glazing Plane: Limited to amount not exceeding that which reduces glazing bite to less than 75 percent of design dimension and that which reduces edge clearance between framing members and glazing or other fixed components directly below them to less than $1/8$ inch and clearance between members and operable units directly below them to less than $1/16$ inch.
- E. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:
 - 1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
 - 2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
 - 3. Test Durations: As required by design wind velocity, but not fewer than 10 seconds.
- F. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 1.57 lbf/sq. ft..
- G. Water Penetration under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
- H. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft..
 - 1. Maximum Water Leakage: According to AAMA 501.1. Water leakage does not include water controlled by flashing and gutters that is drained to exterior and water that cannot damage adjacent materials or finishes.
- I. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain

and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
 2. Test Performance: No buckling; stress on glass; sealant failure; excess stress on framing, anchors, and fasteners; or reduction of performance when tested according to AAMA 501.5.
 - a. High Exterior Ambient-Air Temperature: That which produces an exterior metal-surface temperature of 180 deg F.
 - b. Low Exterior Ambient-Air Temperature: 0 deg F.
 3. Interior Ambient-Air Temperature: 75 deg F.
- J. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 45 when tested according to AAMA 1503.
- K. Thermal Conductance: Provide aluminum-framed systems with fixed glazing and framing areas having an average U-factor of not more than 0.57 Btu/sq. ft. x h x deg F when tested according to AAMA 1503.
- L. Sound Transmission: Provide aluminum-framed systems with fixed glazing and framing areas having the following sound-transmission characteristics:
1. Sound Transmission Class (STC): Minimum 30 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
 2. Outdoor-Indoor Transmission Class (OITC): Minimum 30 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.
- B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.
1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
 2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.
- C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.
- D. Other Action Submittals:
1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

- E. Delegated-Design Submittal: For aluminum-framed systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 - 1. Detail fabrication and assembly of aluminum-framed systems.
 - 2. Include design calculations.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Preconstruction Test Reports: For sealant.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

1.7 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.
 - 1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.
- D. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
- E. Preinstallation Conference: Conduct conference at Project site.

1.9 PROJECT CONDITIONS

- A. Field Measurements: Verify actual locations of structural supports for aluminum-framed

systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Noise or vibration caused by thermal movements.
 - c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - d. Water leakage through fixed glazing and framing areas.
 - e. Failure of operating components.
2. Warranty Period: 10 years from date of Substantial Completion.

1.11 MAINTENANCE SERVICE

A. Entrance Door Hardware:

1. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of entrance door hardware.
2. Initial Maintenance Service: Beginning at Substantial Completion, provide six months' full maintenance by skilled employees of entrance door hardware Installer. Include quarterly preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper entrance door hardware operation at rated speed and capacity. Provide parts and supplies the same as those used in the manufacture and installation of original equipment.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide EFCO Series 433 or comparable product by one of the following:

1. Cross Aluminum.
2. EFCO Corporation.
3. Pittco Architectural Metals, Inc.
4. Tubelite.
5. Kawneer.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209.
 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221.
 3. Extruded Structural Pipe and Tubes: ASTM B 429.
 4. Structural Profiles: ASTM B 308/B 308M.
 5. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.
- B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.
1. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
 2. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
 3. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

2.3 FRAMING SYSTEMS

- A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: Nonthermal Thermally improved Thermally broken Insert description.
 2. Glazing System: Retained mechanically with gaskets on four sides .
 3. Glazing Plane: As indicated.
- B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.
1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
 2. Reinforce members as required to receive fastener threads.
 3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.
- D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A 123/A 123M or ASTM A 153/A 153M.
- E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

2.4 GLAZING SYSTEMS

- A. Glazing: As specified in Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.
- C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.5 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
 - 1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch- thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
 - 2. Door Design: Wide stile; 5-inch nominal width.
 - a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.
 - 3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.
- B. Entrance Door Hardware: As specified in Section 087100 "Door Hardware."

2.6 ACCESSORY MATERIALS

- A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 079200 "Joint Sealants."

2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.
- C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:
 - 1. Profiles that are sharp, straight, and free of defects or deformations.
 - 2. Accurately fitted joints with ends coped or mitered.
 - 3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
 - 4. Physical and thermal isolation of glazing from framing members.
 - 5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
 - 6. Provisions for field replacement of glazing from interior for vision glass and exterior for spandrel glazing or metal panels.
 - 7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- E. Storefront Framing: Fabricate components for assembly using shear-block system.
- F. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - 1. At exterior doors, provide compression weather stripping at fixed stops.

2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.
- G. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 2. At exterior doors, provide weather sweeps applied to door bottoms.
- H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
- B. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with AAMA 2604 and containing not less than 70 percent PVDF resin by weight in color coat.
 1. Color and Gloss: As selected by Architect from manufacturer's full range

PART 1 - EXECUTION

1.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

1.2 INSTALLATION

- A. General:
 1. Comply with manufacturer's written instructions.
 2. Do not install damaged components.
 3. Fit joints to produce hairline joints free of burrs and distortion.
 4. Rigidly secure nonmovement joints.
 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection:
 1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
 2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
- D. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.
- E. Install components plumb and true in alignment with established lines and grades, and without warp or rack.
- F. Install glazing as specified in Section 088000 "Glazing."
- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.
 - 1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
 - 2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.
- H. Install perimeter joint sealants as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

1.3 ERECTION TOLERANCES

- A. Install aluminum-framed systems to comply with the following maximum erection tolerances:
 - 1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
 - 2. Alignment:
 - a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
 - b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.
- B. Diagonal Measurements: Limit difference between diagonal measurements to 1/8 inch.

1.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections.
- B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive phases as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.
 - 1. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.
- C. Repair or remove work if test results and inspections indicate that it does not comply with specified requirements.
- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

- E. Aluminum-framed assemblies will be considered defective if they do not pass tests and inspections.
- F. Prepare test and inspection reports.

1.5 ADJUSTING

- A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.
 - 1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3 inches from the latch, measured to the leading door edge.

END OF SECTION 084113

SECTION 084523 - TRANSLUCENT WALL PANEL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
 - 1. Section 042000 - "Unit Masonry".
 - 2. Section 051200 - "Structural Steel Framing".
 - 3. Section 076200 - "Sheet Metal Flashing and Trim".
 - 4. Section 079200 - "Joint Sealants".

1.2 SUMMARY

- A. Section includes aluminum-framed assemblies incorporating fiberglass-sandwich panels as follows:
 - 1. Wall assemblies.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum components of panel assemblies.
- B. Shop Drawings: For panel assemblies. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Include details of provisions for assembly expansion and contraction and for draining moisture within the assembly to the exterior.
- C. Samples for Initial Selection: For units with factory-applied color finishes.
- D. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for panel assemblies.
- C. Preconstruction Test Reports: Prepared by a qualified preconstruction testing agency, for panel assemblies.
- D. Field quality-control reports.

- E. Warranties: Sample of special warranties.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For panel assemblies to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Manufacturers to have a minimum of 10 years experience in the fabrication of wall and skylight systems required for this type of project, and be capable of providing field service representation during installation.
- B. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of panel assemblies required for this Project.
- C. Product Options: Information on Drawings and in Specifications establishes requirements for panel assemblies' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including testing conducted by an independent testing agency and in-service performance.
- D. Preconstruction Testing: Provide panel assemblies that comply with test-performance requirements indicated, as evidenced by reports of tests performed on manufacturer's standard panel assemblies by a qualified independent testing agency.
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockup of typical panel assemblies as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- F. Preinstallation Conference: Conduct conference at Project site.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of panel assemblies that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Structural failures including, but not limited to, excessive deflection.
 - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - c. Water leakage.
 - 2. Warranty Period: Ten years from date of Substantial Completion.

- B. Special Fiberglass-Sandwich-Panel Warranty: Manufacturer's standard form in which manufacturer agrees to replace panels that exhibit defects in materials or workmanship.
 - 1. Defects include, but are not limited to, the following:
 - a. Fiberbloom.
 - b. Delamination of coating, if any, from exterior face sheet.
 - c. Color change exceeding requirements.
 - d. Delamination of panel face sheets from panel cores.
 - 2. Warranty Period: 20 years from date of Substantial Completion.
 - 3. Color Change Warranty Period: 20 years from date of Substantial Completion.
- C. Special Aluminum-Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.
 - 1. Failures include, but are not limited to, checking, crazing, peeling, chalking, and fading of finishes.
 - 2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Major Industries, Inc.; Guardian 275 Translucent Panel Systems or comparable product by one of the following:
 - 1. Kalwall Corporation.

2.2 PERFORMANCE REQUIREMENTS

- A. General Performance: Fiberglass-sandwich-panel assemblies shall withstand the effects of the following forces without failure due to defective manufacture, fabrication, installation, or other defects in construction:
 - 1. Structural loads.
 - 2. Thermal movements.
 - 3. Movements of supporting structure.
 - 4. Dimensional tolerances of building frame and other adjacent construction.
 - 5. Failure includes, but is not limited to, the following:
 - a. Deflection exceeding specified limits.
 - b. Water leakage.
 - c. Thermal stresses transferred to building structure.
 - d. Loosening or weakening of fasteners, attachments, and other components.
- B. Structural Loads:
 - 1. Seismic Loads: .2.
 - 2. Wind Loads:
 - a. Basic Wind Speed: 90 mph (40 m/s).
 - b. Importance Factor: 1.0.
 - c. Exposure Category: B.

- C. Deflection Limits:
 - 1. Vertical Panel Assemblies: Limited to 1/120 of clear span for each assembly component.
- D. Structural-Test Performance: Provide panel assemblies tested according to ASTM E 330, as follows:
 - 1. When tested at positive and negative wind-load design pressures, assemblies do not show evidence of deflection exceeding specified limits.
- E. Water Penetration under Static Pressure: Provide panel assemblies that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E.
- F. Thermal Movements: Allow for thermal movements from ambient- and surface-temperature changes. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
 - 1. Temperature Change (Range): 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.
- G. Energy Performance: Provide panel assemblies with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below and certified and labeled according to NFRC:
 - 1. Thermal Transmittance (U-Factor): Fixed glazing and framing areas shall have U-factor of not more than 0.65 Btu/sq. ft. x h x deg F (3.69 W/sq. m x K) as determined according to NFRC 100.
 - 2. Solar-Heat-Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient as determined according to NFRC 200.
 - 3. Air Infiltration: Maximum air leakage through fixed glazing and framing areas of 0.30 cfm/sq. ft. (1.50 L/s per sq. m) of fixed wall area as determined according to ASTM E.

2.3 ALUMINUM FRAMING SYSTEMS

- A. Components: Manufacturer's standard extruded-aluminum members of thickness required and reinforced as required to support imposed loads.
 - 1. Construction: Thermally broken, extruded aluminum.
- B. Aluminum: Alloy and temper recommended in writing by manufacturer for type of use and finish indicated.
 - 1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
 - 2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning skylight components.
- D. Fasteners and Accessories: Manufacturer's standard, corrosion-resistant, nonstaining, and nonbleeding fasteners and accessories; compatible with adjacent materials.
 - 1. At closures, retaining caps, or battens, use 18-8 stainless-steel screws with gasketed sealing washers.
 - 2. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

3. At movement joints, use slip-joint linings, spacers, and sleeves of material and type recommended in writing by manufacturer.
- E. Concealed Flashing: Corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.
- F. Exposed Flashing and Closures: Aluminum sheet not less than 0.050 inch (1.27 mm) thick, finished to match framing.
- G. Framing Gaskets: Manufacturer's standard.
- H. Frame-System Sealants: As recommended in writing by manufacturer.
 1. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 2. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.4 FIBERGLASS-SANDWICH PANELS

- A. Description: Assembly of uniformly colored, translucent, thermoset, fiberglass-reinforced-polymer face sheets bonded to both sides of a grid core.
 1. Self-Ignition Temperature: 650 deg F (343 deg C) or more per ASTM D 1929.
 2. Smoke-Developed Index: 300 or less per ASTM E 84, or 75 or less per ASTM D 2843.
 3. Flame-Spread Index: Not more than 10 per ASTM E 84.
 4. Combustibility Classification: Class CC1 per ASTM D 635.
 5. Interior Finish Classification: Class A per ASTM E 84.
- B. Panel Thickness: 4 inches.
- C. Panel Strength Characteristics:
 1. Maximum Panel Deflection: Less than 3 percent when tested according to ASTM E 72, permanent set after 5 minutes less than 5 percent.
 2. Panel Support Strength: Capable of supporting, without failure, a 400-lbf (1779-N) concentrated load when applied to a 3-inch- (76-mm-) diameter disk according to ASTM E 661.
- D. Grid Core: Mechanically interlocked, extruded-aluminum I-beams, with a minimum flange width of 7/16 inch (11.1 mm).
 1. Extruded Aluminum: ASTM B 221 (ASTM B 221M), in alloy and temper recommended in writing by manufacturer.
 2. I-Beam Construction: Thermally broken, extruded aluminum.
 3. Grid Pattern: rectangle, nominal 12 by 24 inches (305 by 610 mm).
- E. Exterior Face Sheet:
 1. Thickness: 0.070 inches (1.78 mm).
 2. Color: As selected by Architect from manufacturer's full range.
 3. Color Change: Not more than 3.0 units Delta E when measured according to ASTM D 2244.

4. Protective Weathering Surface: Factory applied, with a minimum thickness of 1.0 mils (0.03 mm). Field Repairable. Manufacturer's standard.
5. Impact Resistance: No fracture or tear at impact of 60 ft. x lbf (81 J) by a 3-1/4-inch- (83-mm-) diameter, 5-lb (2.3-kg) freefalling ball according to UL 972 test procedure.

F. Interior Face Sheet:

1. Thickness: 0.045 inch (1.14 mm).
2. Color: As selected by Architect from manufacturer's full range.

G. Fiberglass-Sandwich-Panel Adhesive:

1. Compatible with facing and core materials.
2. Tensile and shear bond strength of aged adhesive ensures permanent adhesion of facings to cores, as evidenced by testing tensile strength according to ASTM C 297 and shear bond strength according ASTM D 1002.

2.5 FABRICATION

A. Frame System Fabrication:

1. Fabricate components before finishing.
2. Fabricate components that, when assembled, have the following characteristics:
 - a. Profiles that are sharp, straight, and free of defects or deformations.
 - b. Accurately fitted joints with ends coped or mitered.
 - c. Internal guttering systems or other means to drain water passing through joints, condensation occurring within components, and moisture migrating within assembly to exterior.
3. Fabricate sill closures with weep holes and for installation as continuous component.
4. Reinforce components as required to receive fastener threads.

B. Panel Fabrication: Factory assemble and seal panels.

1. Laminate face sheets to grid core under a controlled process using heat and pressure to produce straight adhesive bonding lines that cover width of core members and that have sharp edges.
 - a. White spots indicating lack of bond at intersections of grid-core members are limited in number to four for every 40 sq. ft. (3.7 sq. m) of panel and limited in diameter to 3/64 inch (1.2 mm).
2. Fabricate with grid pattern that is symmetrical about centerlines of each panel.
3. Fabricate panel to allow condensation within panel to escape.
4. Reinforce panel corners.

2.6 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints between aluminum components to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure nonmovement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion, electrolytic deterioration, and immobilization of moving joints.
 - 6. Seal joints watertight unless otherwise indicated.
- B. Metal Protection: Where aluminum components will contact dissimilar materials, protect against galvanic action by painting contact surfaces with corrosion-resistant coating or by installing nonconductive spacers as recommended in writing by manufacturer for this purpose.
- C. Install components to drain water passing through joints, condensation occurring within aluminum members and panels, and moisture migrating within assembly to exterior.
- D. Install components plumb and true in alignment with established lines and elevations.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.
 - 1. Water-Spray Test: Before installation of interior finishes has begun, panel assemblies shall be tested according to AAMA 501.2 and shall not show evidence of water penetration.
- B. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- D. Prepare test and inspection reports.

END OF SECTION 084523

SECTION 085113 - ALUMINUM WINDOWS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes aluminum windows for exterior locations.
- B. Related Requirements:
 - 1. Section 079200 "Joint Sealants".
 - 2. Section 088000 "Glazing".
 - 3. Section 122413 "Roller Window Shades".

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
 - 3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchorage, flashing, sealing perimeters, and protecting finishes.
 - 4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
 - 5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified, 2 by 4 inches (50 by 100 mm) in size.

- D. Samples for Initial Selection: For units with factory-applied color finishes.
 - 1. Include similar Samples of hardware and accessories involving color selection.
- E. Samples for Verification: For aluminum windows and components required, showing full range of color variations for finishes, and prepared on Samples of size indicated below:
 - 1. Exposed Finishes: 2 by 4 inches (50 by 100 mm).
 - 2. Exposed Hardware: Full-size units.
- F. Product Schedule: For aluminum windows. Use same designations indicated on Drawings.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and Installer.
- B. Product Test Reports: For each type of aluminum window, for tests performed by a qualified testing agency.
- C. Field quality-control reports.
- D. Sample Warranties: For manufacturer's warranties.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating aluminum windows that meet or exceed performance requirements indicated and of documenting this performance by test reports, and calculations.
- B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.
- C. Mockups: Install mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Install mockup - locations as per Sheet WA3.0 of the Construction Documents.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Failure to meet performance requirements.
 - b. Structural failures including excessive deflection, water leakage, condensation, and air infiltration.
 - c. Faulty operation of movable sash and hardware.
 - d. Deterioration of materials and finishes beyond normal weathering.
 - e. Failure of insulating glass.

2. Warranty Period:
 - a. Window: 10 years from date of Substantial Completion.
 - b. Glazing Units: 10 years from date of Substantial Completion.
 - c. Aluminum Finish: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide EFCO Series 403 2700 vented window system, or comparable product by one of the following: (Note that if contractor wishes to use any manufacturer other than those listed below, contractor must follow the guidelines listed in Section 012500 "Substitution Procedures"):
 1. EFCO Corporation; a Pella company.
 2. Kawneer North America; an Alcoa company.
 3. TRACO.
 4. Wausau Window and Wall Systems.
 5. YKK AP America Inc.
- B. Must submit the following information
 1. A sample window, 36" (914 mm) x 24" (610 mm), single unit, as per requirements of Architect.
 2. Test reports documenting compliance with requirements of Section 2.2.

2.2 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
 1. Window Certification: AMMA certified with label attached to each window.
- B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
 1. Minimum Performance Class: CW.
 2. Minimum Performance Grade: 30.
- C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.30 Btu/sq. ft. x h x deg F (1.71 W/sq. m x K).
- D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of:
 1. Base Bid: SHGC of 0.23.
- E. Condensation-Resistance Factor (CRF): Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 52.
- F. Thermal Movements: Provide aluminum windows, including anchorage, that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of

joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C) material surfaces.
- G. Sound Transmission Class (STC): Rated for not less than 30 STC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 413.
- H. Outside-Inside Transmission Class (OITC): Rated for not less than 30 OITC when tested for laboratory sound transmission loss according to ASTM E 90 and determined by ASTM E 1332.

2.3 ALUMINUM WINDOWS

- A. Operating Types: Provide the following operating types in locations indicated on Drawings:
1. Awning: Project out.
 2. Awning: Project in
 3. Egress Casement: Project out a minimum of 24" clear.
- B. Frames and Sashes: Aluminum extrusions complying with AAMA/WDMA/CSA 101/I.S.2/A440.
1. Thermally Improved Construction: Fabricate frames, sashes, and muntins with an integral, concealed, low-conductance thermal barrier located between exterior materials and window members exposed on interior side in a manner that eliminates direct metal-to-metal contact.
- C. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.
1. Kind: Fully tempered.
- D. Insulating-Glass Units: ASTM E 2190, certified through IGCC as complying with requirements of IGCC.
1. Glass: ASTM C 1036, Type 1, Class 1, q3.
 - a. Tint: Clear.
 - b. Kind: Fully tempered.
 2. Lites: Two.
 3. Filling: Fill space between glass lites with argon.
 4. Low-E Coating: Sputtered on second surface.
- E. Base Bid: Tempered Solarban R100.
- F. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.
1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.
- G. Projected Window Hardware:

1. Gear-Type Rotary Operators (dual arm rotos): Complying with AAMA 901 when tested according to ASTM E 405, Method A. Provide operators that function without requiring the removal of interior screens or using screen wickets.
 - a. Type and Style: As selected by Architect from manufacturer's full range of types and styles.
 2. Concealed Hinges: Two stainless steel, four bar adjustable friction hinges per vent meeting AAMA 904.1.
 3. Lock: Lever handle and cam-action lock with keeper.
- H. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- I. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 ACCESSORIES

- A. Integral Ventilating System/Device: Where indicated, provide weather-stripped, adjustable, horizontal fresh-air vent, with a free airflow slot, full width of window sash by approximately 3 inches (75 mm) when open, complying with AAMA/WDMA/CSA 101/I.S.2/A440. Equip vent bar with an integral insect screen, removable for cleaning.
- B. Subsills: Thermally broken, extruded-aluminum subsills in configurations indicated on Drawings.
- C. Receptor System: Two-piece, snap-together, thermally broken, extruded-aluminum receptor system that anchors windows in place.

2.5 INSECT SCREENS

- A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.
1. Type and Location: Full, inside for project-out sashes.
- B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable aluminum spline/anchor concealing edge of frame.
1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
- C. Aluminum Wire Fabric: 18-by-16 (1.1-by-1.3-mm) mesh of 0.011-inch- (0.28-mm-) diameter, coated aluminum wire.
1. Wire-Fabric Finish: Charcoal gray or Black - verify with Architect.

2.6 FABRICATION

- A. Fabricate aluminum windows in sizes indicated. Include a complete system for assembling components and anchoring windows.
- B. Glaze aluminum windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.
- E. Provide water-shed members above side-hinged sashes and similar lines of natural water penetration.
- F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation.

2.7 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
- C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.8 ALUMINUM FINISHES

- A. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - 1. Color and Gloss: As selected by Architect from full range of industry colors and color densities.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

- B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.
- C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.
- D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
 - 1. Testing and inspecting agency will interpret tests and state in each report whether tested work complies with or deviates from requirements.
- B. Testing Services: Testing and inspecting of installed windows shall take place as follows:
 - 1. Testing Methodology: Testing of windows for air infiltration and water resistance shall be performed according to ASTM E283 and ASTM E547.
 - 2. Air-Infiltration Testing:
 - a. Test Pressure: That required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance class indicated.
 - b. Allowable Air-Leakage Rate: 1.6 times the applicable AAMA/WDMA/CSA 101/I.S.2/A440 rate for product type and performance class rounded down to one decimal place.
 - 3. Water-Resistance Testing:
 - a. Test Pressure: Two-thirds times test pressure required to determine compliance with AAMA/WDMA/CSA 101/I.S.2/A440 performance grade indicated.
 - b. Allowable Water Infiltration: No water penetration.
 - 4. Testing Extent: Three windows of each type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested after perimeter sealants have cured.
 - 5. Test Reports: Prepared according to ASTM E 283 and ASTM E 547.
- C. Remove and replace noncomplying windows and retest as specified above.

- D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- E. Prepare test and inspection reports.

3.4 ADJUSTING, CLEANING, AND PROTECTION

- A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- B. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.
 - 1. Keep protective films and coverings in place until final cleaning.
- C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.
- D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

3.5 OWNER MAINTENANCE STOCK OF CLASSROOM OPERABLE WINDOW UNITS

- A. Provide owner with 15% of classroom operable window maintenances stock material, these items to be boxed and labeled
 - 1. Gear-Type Rotary Operators with handles:
 - 2. Concealed Hinges: Two stainless steel, four bar adjustable friction hinges.
 - 3. Lock: Lever handle and cam-action lock with keeper.
 - 4. Aluminum screens

END OF SECTION 085113

SECTION 087100 - FINISH HARDWARE

Part 1 - GENERAL

- 1.1 Refer to "General and Special Conditions" and "Instructions to Bidders", Division 1 of Specifications. Requirements of these Sections and the project drawings shall govern work in this section.

1.2 SUMMARY

A. Section Includes:

1. Door Hardware, including electric hardware.
2. Storefront and entrance door hardware.
3. Card Access control system.
4. Hold-open closers with fire-alarm interface.
5. Wall or floor mounted electromagnetic hold-open devices.
6. Power supplies for electric hardware.
7. Low energy door operators plus sensors and actuators.
8. Padlocks.
9. Cylinders for doors fabricated with locking hardware.
10. Wiring and riser diagrams for electric hardware.
11. Key Cabinets.

B. Related Sections:

1. Section 079200 - Joint Sealants – exterior thresholds.
2. Section 081113 - Hollow Metal Doors and Frames.
3. Section 084113 - Aluminum Framed Entrances and Storefronts.
4. Section 280010 - Basic Division 28 Requirements.

C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.

1. Windows.
2. Signs, except where scheduled.
3. Toilet accessories, including grab bars.
4. Installation.
5. Rough hardware.

1.3 REFERENCES:

- A. Use date of standard in effect as of Bid date.
- B. American National Standards Institute – ANSI 156.18 – Materials and Finishes.
- C. ANSI A117.1 – Specifications for making buildings and facilities usable by physically handicapped people.
- D. ADA – Americans with Disabilities Act of 1990.
- E. BHMA – Builders Hardware Manufacturers Association.
- F. DHI – Door and Hardware Institute.
- G. NFPA – National Fire Protection Association.

1. NFPA 80 – Fire Doors and Windows
2. NFPA 101 – Life Safety Code
3. NFPA 105 – Smoke and Draft Control Door Assemblies
4. NFPA 252 – Fire Tests of Door Assemblies

H. UL – Underwriters Laboratories.

1. UL10C – Fire Test of Door Assemblies as amended to incorporate positive pressure testing.

I. WHI – Warnock Hersey Incorporated.

J. SDI – Steel Door Institute.

K. AWI – Architectural Woodwork Institute.

1.4 SUBMITTALS & SUBSTITUTIONS

A. SUBMITTALS: Submit six copies of schedule per Division 1. Organize **vertically formatted** schedule into “Hardware Sets” following guidelines established in Door & Hardware Institute Handbook (DHI) Sequence and Format for the Hardware Schedule with index of doors and headings, indicating complete designations of every item required for each door or opening. **Horizontal schedule format will be returned “Not Approved”**. Include following information:

1. Type, style, function, size, quantity and finish of hardware items.
Use BHMA Finish codes per ANSI A156.18.
2. Name, part number and manufacturer of each item.
3. Fastenings and other pertinent information.
4. Location of hardware set coordinated with floor plans and door schedule.
5. Explanation of abbreviations, symbols, and codes contained in schedule.
6. Mounting locations for hardware.
7. Door and frame sizes, materials and degrees of swing.
8. List of manufacturers used and their nearest representative with address and phone number.
9. Catalog cuts.
10. Manufacturer’s technical data and installation instructions for electronic hardware.
11. Date of jobsite visit.

B. Bid and submit manufacturer’s updated/improved item if scheduled item is discontinued.

C. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, manufacturers’ installation, adjustment and maintenance information, and supplier’s final inspection report.

1.4 QUALITY ASSURANCE:

A. Qualifications:

1. Hardware supplier: A recognized architectural finish hardware supplier, with warehousing facilities, who has been furnishing hardware in the project’s vicinity for a period of not less than 2 years. Who is or who employs an experienced Architectural Hardware Consultant (AHC) who is available, at

reasonable times during the course of the Work, for consultation about project's hardware requirements to Owner, Architect and Contractor.

2. Electrified hardware supplier: An experienced door hardware supplier who has completed projects with electrified door hardware similar in material, design and extent to that indicated for this project, who has a record of successful in-service performance and is acceptable to manufacturer of materials. Shall prepare data for electrified door hardware based on testing and engineering analysis of manufacturer's assemblies similar to those in this project.
 3. Responsible for detailing, scheduling and ordering of finish hardware.
- B. Hardware: New, free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.
- C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.
- D. Fire-Rated Openings: In compliance with NFPA 80. Provide proper latching hardware, non-flaming door closers and approved-bearing hinges. Furnish openings complete.
- E. Pre-Installation Meetings: Prior to start of hardware installation, contractor shall schedule and conduct pre-installation meeting with hardware supplier, lock, exit device, and door closer manufacturers' representative(s), installer and related trades, to coordinate materials and techniques, and sequence complex hardware items and systems installation. Proper and correct installation and adjustment of hardware is to be reviewed, and criteria for punch list review will be established. Convene at least one week prior to commencement of related work. Written documentation of date and attendees/participants is to be provided to architect and owner for record.

1.5 DELIVERY, STORAGE AND HANDLING:

- A. Delivery: coordinate delivery to appropriate locations (shop or field).
1. Key cabinet, permanent keys and cores: secured delivery direct to Owner's representative.
- B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers. Shipments direct from manufacturer to Site are not acceptable.
- C. Storage: Provide locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, etc...

1.6 PROJECT CONDITIONS

- A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical as the same operation and quality as type specified, subject to Architect's approval.
- B. Prior to submittal, carefully inspect existing conditions to verify finish hardware required to complete Work, including size, strike plate size, quantities, and sill conditions material. If conflict between the scheduled material and existing conditions, submit request for directions from Architect.

1.7 SEQUENCING AND COORDINATION

- A. Reinforce walls for wall stops.
- B. Coordinate finish floor materials and floor-mounted hardware.
- C. Conduit and raceways as needed for electrical and electronic hardware items.
Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
- D. Furnish manufacturer templates to door and frame fabricators.
- E. Use hardware consultant to check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.

1.8 WARRANTY

- A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' warranties:
 - 1. Bored Locksets: Seven years.
 - 2. Closers: Ten years mechanical, two years electrical.
 - 3. Exit Devices: Three years.
 - 4. Butt Hinges: One year
 - 5. Geared Hinges: Limited Lifetime
 - 6. Other Hardware: One years.

1.9 COMMISSIONING

- A. Test door hardware operation with climate control system pressurization system both at rest and while in full operation.
- B. Test electrical hardware systems for satisfactory operation.
- C. Test hardware interfaced with fire/life-safety system for proper operation and release.

1.10 MAINTENANCE

- A. Furnish operating and maintenance data of manufacturers for door hardware items. Include instructions for operation, adjustments and maintenance and parts list.
- B. Instruct personnel of Owner in proper adjustments and maintenance of door hardware and hardware finishes during final adjustment phase of hardware installation.
- C. Key biting list shall be delivered from lock manufacturer directly to representative of Owner with return receipt. Furnish copy of transmittal letter to Architect.
- D. Furnish a complete set of specialized tools as needed for continued adjustment, maintenance, removal and replacement of door hardware by Owner.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Listed acceptable alternate manufacturers: submit for review products with equivalent function and features of scheduled products.

<u>ITEM:</u>	<u>MANUFACTURER:</u>	<u>ACCEPTABLE SUB:</u>
Hinges	(IVE) Ives	McKinney, Stanley
Continuous Hinges	(IVE) Ives	Pemko, Zero
Key System	(SAR) Sargent	Match Existing School
Locks	(SAR) Sargent	No Substitution
Exit Devices	(SAR) Sargent	No Substitution
Closures	(NOR) Norton	No Substitution
Kickplates	(IVE) Ives	Hiawatha, Trimco
Stops & Holders	(IVE) Ives	Hiawatha, Trimco
Overhead Stops	(GLY) Glynn-Johnson	Preferred
Thresholds	(REE) Reese	NGP, Pemko
Sports Floor Thresholds	NGP	Reese, Pemko
Seals & Bottoms	(REE) Reese	NGP, Pemko

- B. Provide hardware items required to complete the work in accordance with these specifications and manufacturers' instructions.
1. Include items inadvertently omitted from this specification. Note these items in submittal for review. There will not be any extra's allowed for items that should have been picked up during bidding.
 2. Where scheduled item is now obsolete, bid and furnish manufacturers updated item at no additional cost to the project.

2.2 HANGING MEANS:

- A. Conventional Hinges: Hinge open widths minimum, but, of sufficient throw to permit maximum door swing. Steel or stainless steel pins and concealed bearings.
1. Three hinges per leaf to 7 foot, 6 inch height. Add one for each additional 30 inches in height, or any fraction thereof.
 2. Extra heavy weight hinges on doors over 3 foot, 5 inches in width.
 3. Outswinging exterior doors: non-ferrous with non-removable (NRP) pins.
 4. Non-ferrous material exteriors and at doors subject to corrosive atmospheric conditions.
 5. Provide shims and shimming instructions for proper door adjustment.
 6. Scheduled Hinges are Ives 5BB1
 7. Finish of hinges is to be as scheduled
 8. Accepted substitutions: McKinney TB2714, Stanley FBB179
- B. Continuous Hinges: A pinless assembly of three interlocking extrusions applied to the full height of the door and frame without mortising. The door leaf and jamb leaf shall be geared together for the entire length of the hinge and joined by a channel. Hinge knuckle shall be monolithic in appearance. Continuous hinge with visible knuckle separations are not acceptable. Vertical door loads shall be carried on minimum 3/4" acetal bearings through a full 180 degrees. The door leaf and jamb leaf shall have templated screw hole locations for future replacement needs. All heavy duty hinges (HD) shall have a minimum of 32 bearings for a 7' length.
1. Factory machine hinge leaves for electric power transfer device where specified in Hardware Sets.
 2. Scheduled Hinge: Ives 112HD

3. Accepted substitution: Pemko CFM-SLFHD, Zero 910DB / 914DB

2.3 LOCKSETS, LATCHSETS, DEADBOLTS:

- A. Extra Heavy Duty Cylindrical Locks and Latches:
 1. Chassis: cylindrical design, corrosion-resistant plated cold-rolled steel, through-bolted.
 2. Locking Spindle: stainless steel, interlocking design.
 3. Latch Retractors: forged steel. Balance of inner parts: corrosion-resistant plated steel, or stainless steel.
 4. Lever Trim: accessible design, independent operation, spring-cage supported, minimum 2" clearance from lever mid-point to door face.
 5. Strikes: 16 gage curved steel, bronze or brass with 1" deep box construction, lips of sufficient length to clear trim and protect clothing.
 6. Lock Series and Design: Sargent 10-Line, "LL" design.
 7. Certifications:
 - a. ANSI A156.2, 1994, Series 4000, Grade 1.
 - b. UL listed for A label and lesser class single doors up to 4ft x 8ft.
 8. Accepted substitutions: Owner preferred

2.4 KEYING REQUIREMENTS:

- A. Key System: Match each schools existing keyway, non-interchangeable core typically with interchangeable core type operating cylinders for panic hardware and removable mullions. Key blanks available from factory-direct sources and from after-market key blank manufacturers. For estimate use factory GMK charge.
 1. Existing factory registered key system.
 2. Construction keying: furnish cylinders/cores factory construction keyed with 10 construction keys and 2 construction control keys.
- B. Key Cylinders/Cores: utility patented, 6-pin solid brass construction.
- C. Locksets and cylinders/cores: keyed at factory of lock manufacturer where permanent records are maintained. Locks and cylinders same manufacturer.
- D. Permanent keys, cores and bitting list: Secured shipment direct from point of origination to Owner.
- E. Supply three (3) cut keys per cylinder or lock.
- F. Supply four (4) control keys.

2.5 EXIT DEVICES/PANIC HARDWARE

- A. General features:
 1. Independent lab-tested 2,000,000 cycles.
 2. Push-through touch pad design. No exposed touch bar fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
 3. 3/4" throw deadlocking latchbolts.
 4. No exposed screws to show through glass doors.

5. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
6. Releasable with 32 lb. maximum pressure under 250 lb. load to the door.
7. Heavy cast metal flush mounted end caps finished to match exit device.

B. Specific features:

1. Non-Fire rated devices to have cylinder dogging.
2. Lever Trim: Breakaway type (700), forged brass or bronze escutcheon min .130" thickness, match lockset lever design.
3. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware". Vertical rod devices less bottom rod (LBR) unless otherwise scheduled.
4. Electrically Operated Devices: Single manufacturer source for electric latch retraction devices, electrically controlled trim, power transfers, power supplies, monitoring switches and controls.
5. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.
6. Furnish one 80 series parts maintenance kit per project.
7. Scheduled Exit Device: Sargent 80 series
8. Finish of Exit Devices is to be as specified
9. Accepted substitutions: Owner preferred

C. Power Supplies: Power supplies are to provide filtered, regulated power to operate electrical products including electrified exit devices. Output power is to be field-selectable for either 24VDC @ 2 ampere or 12VDC @ 4 ampere. Standard input is to be 120VAC @ 1.0 ampere or 240VAC @ 0.5 ampere. Steel enclosure shall incorporate key lock and have minimum quantity of five knockout holes for conduit connection. Terminal block to accept up to 14 gauge wire.

1. Scheduled Power Supplies: Sargent
2. Accepted substitutions: Owner preferred

D. Electrical Power Transfer Devices: Fully concealed when door is closed, power transfer device is to have two 18 gauge or ten 24 gauge wires as indicated by model scheduled.

1. Scheduled Power Transfer Devices: Von Duprin EPT
2. Accepted substitutions: Owner preferred

2.6 CLOSERS

A. General: One manufacturer for closer units throughout the Work, including surface closers, high security closers, overhead concealed closers, floor closers, low-energy door operators and electromagnetic hold-open closers.

B. Surface Closers:

1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
2. ISO 2000 certified. Units stamped with date-of-manufacture code.
3. Independent lab-tested 8,000,000 cycles.
4. Thru-bolts at wood doors unless doors are provided with closer blocking. Non-sized, non-handed, and adjustable. Place closer inside building, stairs and rooms.

5. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
6. Opening pressure: Exterior doors 8.5 lb., interior doors 5 lb., labeled fire doors 15 lb.
7. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
8. Extra-duty arms (PR) at all doors scheduled with parallel arm units.
9. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
10. Exterior doors do not require seasonal adjustments in temperatures from 120 degrees F to -30 degrees F, furnish data on request.
11. Non-flaming fluid will not fuel door or floor covering fires.
12. Scheduled Closer: Norton 7500
13. Finish of Door Closers is to be as specified
14. Accepted substitutions: Owner preferred

2.7 OVERHEAD STOPS AND HOLDERS

- A. Surface mounted and concealed overhead stops and holders shall be heavy duty 300 series stainless steel, brass/bronze and steel materials, as required for specified finish, with finished metal end caps. Holders shall incorporate selective, adjustable hold-open mechanism. Templating of both surface and concealed overhead stops and holders allows for 85 to 115 degree stop/hold open position.
 1. Scheduled surface mounted overhead stops and holders are Glynn-Johnson 90 Series; scheduled concealed overhead stops and holders are Glynn-Johnson 100 series.
 2. Finish is to be as scheduled
 3. Accepted substitutions: Owner preferred.

2.8 OTHER HARDWARE

- A. Kick Plates: Four beveled edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.
 1. Scheduled kick plates are: Ives 8400
 2. Finish of kick plates is to be as scheduled
 3. Accepted substitutions: Hiawatha J102, Trimco K0050
- B. Door Stops: Provide stops to protect walls, casework or other hardware.
 1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide overhead type.
 2. Scheduled door stops are: Ives WS406CVX
 3. Finish of door stops is to be as scheduled
 4. Accepted substitutions: Hiawatha WC1326R, Trimco 1270WV
- C. Sweeps: Specially formulated to withstand greater temperature extremes while providing maximum protection against air infiltration. Neoprene or nylon brush type as scheduled.
 1. Scheduled sweeps: Reese
 2. Finish of sweeps is to be US28
 3. Accepted substitutions: Pemko, NGP

- D. Thresholds: As scheduled and per details. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.
1. Exteriors: Set in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements in Division 7 "Thermal and Moisture Protection". Non-ferrous ¼ inch fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).
 2. Fire-rated openings, 90min or less duration: use thresholds to interrupt floor covering material under the door where that material has a critical radiant flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, request direction from Architect.
 3. Sound control openings: Set in bed of mastic sealant.
 4. Scheduled thresholds: Reese
 5. Finish of thresholds is to be mill finish aluminum.
 6. Accepted substitutions: Pemko, NGP
- E. Pulls: When specified for use with exit devices pulls shall be 1" round bar offset type with 10" center-to-center offset pulls.
1. Scheduled pulls: Ives 8190-0
 2. Finish of pulls is to be as scheduled
 3. Accepted substitutions: Hiawatha 658A, Trimco 1191-3
- F. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.
- G. Silencers: Interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes.

2.9 FINISH:

- A. Generally BHMA 612 Brushed Chrome
1. Areas using BHMA 612 to have push-plates, pulls and protection plates of BHMA 612.
- B. Door closers: factory powder coated to match other hardware, unless otherwise noted.
- C. Aluminum items: match predominant adjacent material. Seals to coordinate with frame color.

PART 3 - EXECUTION

3.1 ACCEPTABLE INSTALLERS:

- A. Installer must demonstrate suitable competence and experience with installing finish hardware on like projects.

3.2 PREPARATION:

- A. Ensure that walls and frames are square and plumb before hardware installation.

- B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.
 - 1. Notify Architect of any code conflicts before ordering material.
 - 2. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.
- C. Existing frames and doors scheduled to receive new hardware: carefully remove existing hardware, tag and bag, and turn over to Owner. Match new locksets strike plates to existing frame preps.
 - 1. Patch and fill wood frames and doors with solid wood stock or dowel material before cutting for new hardware. Do not reuse existing screw holes - - fill and re-pilot.
 - 2. Metal doors/frames: Weld or fasten with screws: filler pieces in existing hardware cut-outs and mortises not scheduled for re-use by new hardware. Leave surfaces smooth by using non-metallic filler material.
 - 3. Patch all holes, sand smooth and paint existing doors and frames scheduled to receive new hardware.

3.3 INSTALLATION

- A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation.
 - 1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
 - 2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
- B. Drill pilot holes for fasteners in wood doors and/or frames.
- C. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

3.4 ADJUSTING

- A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
 - 1. Hardware damaged by improper installation or adjustment methods to be repaired or replaced to Owner's satisfaction at no additional cost to Owner.
- B. Inspection: Prior to owner's occupancy, the general contractor shall schedule and conduct a post-installation meeting with the hardware supplier and the manufacturer representative who supplied the commercial locks, the exit devices, the door controls/closers, etc.. The purpose is to eliminate any or all institutional door hardware "punch list" items. This will enable the general contractor and the owner to gain approval for their building occupancy permit much quicker.

- C. Follow-up inspection: Installer to provide letter of agreement to Owner that approximately 6 months after substantial completion, installer will visit Project with representatives of the manufacturers of the locking devices and door closers to accomplish following:
 - 1. Re-adjust hardware.
 - 2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner's personnel.
 - 3. Identify items that have deteriorated or failed.
 - 4. Submit written report identifying problems and likely future problems.

3.5 DEMONSTRATION

- A. Demonstrate electrical hardware systems, including adjustment and maintenance procedures.

3.6 PROTECTION/CLEANING

- A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.
- B. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

3.7 SCHEDULE OF FINISH HARDWARE

- A. See door schedule in drawings for hardware set assignments.
- B. Manufacturers and their abbreviations used in this schedule:
 - IVE H. B. Ives
 - NOR Norton
 - REE Reese Products
 - SAR Sargent Lock Company
 - VON Von Duprin
- C. The following is a general listing of finish hardware requirements and is not intended as a final detailed schedule. It is the responsibility of the finish hardware supplier to thoroughly review these plans and specifications, and to include in his bid any items of finish hardware, whether or not specifically called for in the following hardware groups, required by established standards or practices, or as necessary to meet state and local building codes. These items include, but are not specifically limited to, special templates, wiring diagrams, shim kits for exit devices, filler bars and door closer arm mounting brackets for bar type coordinators, drop plates or other door closer accessory items, special fasteners required for attachment of hardware to doors, frames, or other substrates, and filler plates for use as required by the permanent removal of hardware items from existing doors and/or frames. Where there is unclear or conflicting information in the Hardware Sets, the hardware supplier shall make every effort to gain clarity from the architect prior to bid date. If clarification is not made prior to bid date, the hardware supplier is to make note of any ambiguities or conflicts in the documents in his bid, and these issues will be resolved post-bid. There will be no "Extras" or Change Orders to cover errors and/or omissions which should have been evident prior to bidding.

3.8 HARDWARE SETS

HARDWARE GROUP NO. 01

Each To Have:

1	EA	CONT. HINGE	112HD	628	IVE
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	KEYED REMOVABLE MULLION	12-L980	628	SAR
1	EA	ELEC PANIC HARDWARE	56-8804	626	SAR
1	EA	PANIC HARDWARE	16-8810	626	SAR
1	EA	RIM CYLINDER	AS REQUIRED X MKD	626	SAR
2	EA	MORTISE CYLINDER	AS REQUIRED X MKD	626	SAR
2	EA	90 DEG OFFSET PULL	8190 10"	626	IVE
2	EA	OH STOP	690	626	SAR
2	EA	SURFACE CLOSER	PR 7500	689	NOR
2	EA	DOOR SWEEP	323A	AL	REE
1	EA	THRESHOLD	S405A 10-24 MSA	AL	REE
1	EA	POWER SUPPLY	3500 SERIES	LGR	SAR
2	EA	DROP PLATE	7788	689	NOR

Card Reader: Refer to Electrical
Weather-stripping by door manufacturer

HARDWARE GROUP NO. 02

Each To Have:

2	EA	CONT. HINGE	112HD	628	IVE
1	EA	KEYED REMOVABLE MULLION	12-L980	628	SAR
1	EA	PANIC HARDWARE	16-8804	626	SAR
1	EA	PANIC HARDWARE	16-8810	626	SAR
1	EA	RIM CYLINDER	AS REQUIRED X MKD	626	SAR
2	EA	MORTISE CYLINDER	AS REQUIRED X MKD	626	SAR
2	EA	90 DEG OFFSET PULL	8190 10"	626	IVE
2	EA	OH STOP	690	626	SAR
2	EA	SURFACE CLOSER	PR 7500	689	NOR
2	EA	DOOR SWEEP	323A	AL	REE
1	EA	THRESHOLD	S405A 10-24 MSA	AL	REE
2	EA	DROP PLATE	7788	689	NO

Weather-stripping by door manufacturer

HARDWARE GROUP NO. 03

Each To Have:

1	EA	CONT. HINGE	112HD	628	IVE
1	EA	CONT. HINGE	112HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	KEYED REMOVABLE MULLION	12-L980	689	SAR
2	EA	PANIC HARDWARE	16-8810	628	SAR
1	EA	RIM CYLINDER	AS REQUIRED	628	SAR
2	EA	MORTISE CYLINDER	AS REQUIRED	628	SAR
2	EA	90 DEG OFFSET PULL	8190 10"	628	IVE
2	EA	OH STOP	690	628	SAR
2	EA	SURFACE CLOSER	PR 7500	689	NOR
2	EA	DOOR SWEEP	323A	AL	REE
1	EA	THRESHOLD	8133, 8145, (2) BAR 1, 8150, 8168N, 8139 Provide REC'S Returned Closed Ends (Gym Side)	AL	NGP
2	EA	DROP PLATE	7788	689	NOR
2	EA	RAIN DRIP	R201A	689	REE

THE POWER TRANSFER IS FOR FUTURE USE BY SECURITY SYSTEM

Reinforce & Prep H.M. frame for future Card Reader by Owner

Weather stripping by Door Manufacturer

HARDWARE GROUP NO. 03A

Each To Have:

1	EA	CONT. HINGE	224HD	628	IVE
1	EA	CONT. HINGE	224HD EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	KEYED REMOVABLE MULLION	12-L980	689	SAR
2	EA	PANIC HARDWARE	16-8810	628	SAR
1	EA	RIM CYLINDER	AS REQUIRED	628	SAR
2	EA	MORTISE CYLINDER	AS REQUIRED	628	SAR
2	EA	90 DEG OFFSET PULL	8190 10"	628	IVE
2	EA	OH STOP	690	628	SAR
2	EA	SURFACE CLOSER	PR 7500	689	NOR
2	EA	DOOR SWEEP	323A	AL	REE
1	EA	THRESHOLD	8133, 8145, (2) BAR 1, 8150, 8168N, 8139 Provide REC'S Returned Closed Ends (Gym Side)	AL	NGP
2	EA	DROP PLATE	7788	689	NOR
2	EA	RAIN DRIP	R201A	689	REE

THE POWER TRANSFER IS FOR FUTURE USE BY SECURITY SYSTEM

Reinforce & Prep H.M. frame for future Card Reader by Owner

Weather stripping by Door Manufacturer

HARDWARE GROUP NO. 03B

Each To Have:

2	EA	CONT. HINGE	224HD	628	IVE
1	EA	KEYED REMOVABLE MULLION	12-L980	689	SAR
2	EA	PANIC HARDWARE	16-8810	628	SAR
1	EA	RIM CYLINDER	AS REQUIRED	628	SAR
2	EA	MORTISE CYLINDER	AS REQUIRED	628	SAR
2	EA	90 DEG OFFSET PULL	8190 10"	628	IVE
2	EA	OH STOP	690	628	SAR
2	EA	SURFACE CLOSER	PR 7500	689	NOR
2	EA	DOOR SWEEP	323A	AL	REE
1	EA	THRESHOLD	S405A 10-24 MSA	AL	REE
2	EA	DROP PLATE	7788	689	NOR
2	EA	RAIN DRIP	R201A	689	REE

Weather stripping by Door Manufacturer

HARDWARE GROUP NO. 04

Each To Have:

2	EA	CONT. HINGE	224HD	628	IVE
1	EA	EXIT DEVICE SVR	12-PP8713 ETB	628	SAR
1	EA	EXIT DEVICE SVR	12-PP8710	628	SAR
1	EA	RIM CYLINDER	AS REQUIRED	628	SAR
2	EA	OH STOP	690	628	SAR
2	EA	SURFACE CLOSER	PR 7500	689	NOR
2	EA	WALL STOP	WS406CCV	628	IVE
1	EA	THRESHOLD	8133, 8145, (2) BAR 1, 8150, 8168N, 8139 Provide REC'S Returned Closed Ends (Gym Side)	AL	NGP
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	DOOR SEAL	797B	BLK	REE
1	SET	DOOR SEAL	798B	BLK	REE

HARDWARE GROUP NO. 05

Each To Have:

4	EA	HINGE	5BB1 1HW	630	IVE
2	EA	EXIT DEVICE SVR	12-PR8710	626	SAR
2	EA	SURFACE CLOSER	PR 7500	630	NOR
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7840	689	LCN
1	SET	DOOR SEAL	797B	BLK	REE
1	SET	DOOR SEAL	798B	BLK	REE
1	EA	WALL STOP	WS406CCV	630	IVE

HARDWARE GROUP NO. 06

Each To Have:

2	EA	CONT. HINGE	224HD	628	IVE
2	EA	EXIT DEVICE SVR	12-PR8710	626	SAR
2	EA	SURFACE CLOSER	PR 7500	630	NOR
2	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	SET	DOOR SEAL	797B	BLK	REE
1	SET	DOOR SEAL	798B	BLK	REE
1	EA	WALL STOP	WS406CCV	630	IVE

HARDWARE GROUP NO. 07

Each To Have:

1	EA	CONT. HINGE	224HD	630	IVE
1	EA	STORAGE LOCK	28-10G04 LL	630	SAR
1	EA	SURFACE CLOSER	PR7500	691	NOR
1	EA	ELEC. STRIKE	HES 1006J	630	VON
1	EA	KICK PLATE	8400 32" X 2" LDW	630	IVE
1	EA	WALL STOP	WS406CCV	630	IVE
1	SET	DOOR SEAL	797B	BLK	REE

Card Reader: Refer to Electrical
 Refer to Electrical

HARDWARE GROUP NO. 08

Each To Have:

1	EA	CONT. HINGE	224HD	630	IVE
1	EA	STORAGE LOCK	28-10G04 LL	630	SAR
	EA	ELEC. STRIKE	HES 1006J	630	VON
1	EA	SURFACE CLOSER	PR7500	691	NOR
1	EA	KICK PLATE	8400 32" X 2" LDW	630	IVE
1	EA	WALL STOP	WS406CCV	630	IVE

Card Reader: Refer to Electrical
 Refer to Electrical

HARDWARE GROUP NO. 09

Each To Have:

1	EA	CONT. HINGE	224HD	630	IVE
1	EA	ENTRY LOCK	28-10G05 LL (See Note Below)	630	SAR
1	EA	SURFACE CLOSER	PR7500	691	NOR
1	EA	KICK PLATE DR128D	8400 32" X 2" LDW	630	IVE
1	SET	DOOR SEAL	797B	BLK	REE
1	EA	WALL STOP	WS406CCV	630	IVE
1	EA	THRESHOLD DR. 128D ONLY	8133, 8145, (2) BAR 1, 8150, 8168N, 8139 Provide REC'S Returned Closed Ends (Gym Side)	AL	NGP

FUTURE ELECTRIFIED LOCK.

Reinforce & prep H.M. frame for future electric door strike. Card Reader by Owner

HARDWARE GROUP NO. 10

Each To Have:

1	EA	CONT. HINGE	224HD	630	IVE
1	EA	OVERHEAD STOP	690	630	SAR
1	EA	PRIVACY BATHROOM	28-10U65 LL	630	SAR
1	EA	SURFACE CLOSER	PR7500	691	NOR
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS406CCV	630	IVE

HARDWARE GROUP NO. 11

Each To Have:

1	EA	CONT. HINGE	224HD	630	IVE
1	EA	OVERHEAD STOP	690	630	SAR
1	EA	STORAGEROOM	28-10G26 LL	630	SAR
1	EA	SURFACE CLOSER	PR7500	691	NOR
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS406CCV	630	IVE
1	SET	DOOR SEAL	797B	BLK	REE

FUTURE ELECTRIFIED LOCK

Reinforce & prep H.M. frame for future electric door strike. Card Reader by Owner

HARDWARE GROUP NO. 12

Each To Have:

1	EA	CONT. HINGE	224HD	630	IVE
1	EA	OVERHEAD STOP	690	630	SAR
1	EA	CLASSROOM	28-10G37 LL	630	SAR
1	EA	SURFACE CLOSER	PR7500	691	NOR
1	EA	KICK PLATE	8400 10" X 2" LDW	630	IVE
1	EA	WALL STOP	WS406CCV	630	IVE
1	SET	DOOR SEAL	797B	BLK	REE

HARDWARE GROUP NO. 13 WEST LIFT FOR BOTH CORRIDORS TO LIFT ADD

Each To Have:

2	SET	DOOR SEAL	797B	BLK	REE
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END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
 - 1. Windows.
 - 2. Doors.
 - 3. Storefront framing.
 - 4. Glazed entrances.
 - 5. Interior borrowed lites.
- B. Related Sections:
 - 1. Section 084113 "Aluminum Framed Entrances and Storefronts."
 - 2. Section 084413 "Aluminum Windows."

1.3 DEFINITIONS

- A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
- B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
- C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
- B. Delegated Design: Design glass, including comprehensive engineering analysis according to ASTM E 1300 by a qualified professional engineer, using the following design criteria:
 - 1. Design Wind Pressures: Determine design wind pressures applicable to Project according to ASCE/SEI 7, based on heights above grade indicated on Drawings.
 - a. Basic Wind Speed: 85 mph.

- b. Importance Factor: II.
 - c. Exposure Category: B.
 - 2. Vertical Glazing: For glass surfaces sloped 15 degrees or less from vertical, design glass to resist design wind pressure based on glass type factors for short-duration load.
 - 3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
 - 4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
- 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Adhesion and Compatibility Testing: Test each glazing material type, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.
- 1. Testing will not be required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 - 2. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - 3. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 - 4. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
 - 5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

1.6 ACTION SUBMITTALS

- A. Product Data: For each glass product and glazing material indicated.
- B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
- 1. Fire-resistive glazing products.
 - 2. Insulating glass.
- C. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.
- D. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installers manufacturers of insulating-glass units with sputter-coated, low-e coatings.
- B. Product Certificates: For glass and glazing products, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for insulating glass .
 - 1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- D. Warranties: Sample of special warranties.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.
- B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
- C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
- D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
- E. Source Limitations for Glass: Obtain insulating glass from single source from single manufacturer for each glass type.
- F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.
- G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.
 - 1. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."
- H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.
- I. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 2. Review temporary protection requirements for glazing during and after installation.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.
- B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.10 PROJECT CONDITIONS

- A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.
 - 1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.11 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form in which coated-glass manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- B. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

- A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.
 - 1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.
 - 2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass as needed to comply with "Performance

Requirements" Article. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass as needed to comply with "Performance Requirements" Article. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

- C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:
1. For monolithic-glass lites, properties are based on units with lites 6.0 mm thick.
 2. For laminated-glass lites, properties are based on products of construction indicated.
 3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
 4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
 5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
 6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

2.2 GLASS PRODUCTS

- A. Float Glass: ASTM C 1036, Type I, Quality-Q3, Class I (clear) unless otherwise indicated.
- B. Heat-Treated Float Glass: ASTM C 1048; Type I; Quality-Q3; Class I (clear) unless otherwise indicated; of kind and condition indicated.
1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
 2. For uncoated glass, comply with requirements for Condition A.
 3. For coated vision glass, comply with requirements for Condition C (other coated glass).

2.3 INSULATING GLASS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. PPG Industries.
 2. Viracon.
 3. Oldcastle Glass.
- B. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements specified.
1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
 2. Spacer: Manufacturer's standard spacer material and construction .
 3. Desiccant: Molecular sieve or silica gel, or blend of both.
- C. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in "Insulating-Glass Types" Article.

2.4 FIRE-PROTECTION-RATED GLAZING

- A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door assemblies.
- B. Monolithic Ceramic Glazing: Clear, ceramic flat glass; 3/16-inch nominal thickness.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products); Premium FireLite .
 - b. Safti First; SuperLite C/P.
 - c. Vetrotech Saint-Gobain; SGG Keralite FR-R.
- C. Laminated Glass with Intumescent Interlayers: Laminated glass made from multiple plies of uncoated, clear float glass; with intumescent interlayers; complying with testing requirements in 16 CFR 1201 for Category II materials.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. InterEdge, Inc., a subsidiary of AFG Industries, Inc.; Pyrobel.
 - b. Pilkington Group Limited (distributed by Technical Glass Products); PyroStop.
 - c. Vetrotech Saint-Gobain; SGG Contraflam N2.

2.5 GLAZING GASKETS

- A. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene EPDM silicone or thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and hardness required to maintain watertight seal.
 - 1. Application: Use where soft compression gaskets will be compressed by inserting dense compression gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on opposite side of glazing.

2.6 GLAZING SEALANTS

- A. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that listed and labeled fire-resistant glazing products with which they are used for applications and fire-protection ratings indicated.

2.7 MISCELLANEOUS GLAZING MATERIALS

- A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.
- B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

- D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.
- G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 FABRICATION OF GLAZING UNITS

- A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.
- B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.
- C. Grind smooth and polish exposed glass edges and corners.

2.9 MONOLITHIC-GLASS TYPES

- A. Glass Type GL-1: Clear [float glass] [heat-strengthened float glass] [fully tempered float glass].
 - 1. Thickness: 6.0 mm.
 - 2. Provide safety glazing labeling.

2.10 INSULATING-GLASS TYPES

- A. Glass Type GL-1: Low-e-coated, clear insulating glass.
 - 1. Basis of Design: PPG Solarban R-100
 - 2. Overall Unit Thickness: 1 inch.
 - 3. Thickness of Each Glass Lite: 6.0 mm.
 - 4. Outdoor Lite: Fully tempered float glass.
 - 5. Interspace Content: Argon.
 - 6. Indoor Lite: Float glass .
 - 7. Low-E Coating: Pyrolytic on second Pyrolytic on third Sputtered on second Sputtered on third Pyrolytic or sputtered on second or third surface.
 - 8. Visible Light Transmittance: 70 percent minimum.
 - 9. Winter Nighttime U-Factor: 0.29 maximum.
 - 10. Summer Daytime U-Factor: 0.26 maximum.
 - 11. Solar Heat Gain Coefficient: 0.38 maximum.

2.11 FIRE-PROTECTION-RATED GLAZING TYPES

- A. Glass Type GL-3]: 45-minute fire-rated glazing; .
 - 1. Provide safety glazing labeling.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
 - 1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
 - 2. Presence and functioning of weep systems.
 - 3. Minimum required face and edge clearances.
 - 4. Effective sealing between joints of glass-framing members.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.
- B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

- E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- G. Provide spacers for glass lites where length plus width is larger than 50 inches.
 - 1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
 - 2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.
- H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.
- I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
- J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
- K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.
- L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

- A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.
- B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.
- C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.
- D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

- E. Install gaskets so they protrude past face of glazing stops.

3.5 CLEANING AND PROTECTION

- A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.
- C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.
- D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.
- E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 090560 - MOISTURE MITIGATION FOR FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawing and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes moisture mitigation for flooring.
- B. Related Sections include the following:
 - 1. Division 01 Section "Quality Requirements" for testing procedures.
 - 2. Division 01 Section "Unit Prices" for administrative unit price requirements.
 - 3. Division 03 Section "Cast-in-Place Concrete" for concrete substrates.
 - 4. Division 09 Section "Tiling for ceramic floor tile finish.
 - 5. Division 09 Section "Resilient Tile Flooring" for resilient flooring finish.
 - 6. Division 09 Section "Tile Carpeting" for tile carpeting floor finish.
 - 7. Division 09 Section "Wood Athletic Flooring

1.3 PERFORMANCE REQUIREMENT

- A. General: Provide moisture mitigation measures to ensure that concrete floor substrates meet or exceed the limits below for moisture, relative humidity and alkalinity, unless more stringent limits are required by each flooring manufacturers. Develop the means and methods that will effectively result in acceptable conditions of the substrates for the flooring installation to take place without delays in the project schedule and without additional costs to the Owner.
- B. Moisture Control Plan: Provide a plan describing steps required, if any, in order to achieve acceptable substrates. Provide step by step procedure, in the context of the overall Schedule, for the entire flooring installation from sub-grade preparation, vapor retarder placement, concrete placement, concrete curing, environmental conditions of the spaces, testing for moisture and pH, acceptability of substrates, mitigation required and coordination with each type of flooring installation procedures.
 - 1. Substrates shall be demonstrated by testing to achieve the following:
 - a. Maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Maximum relative humidity of 70%.
 - c. Maximum rH level of 10.
 - d. Maximum % moisture when measured by Tramex – 4%

1.4 ACTION SUBMITTALS

- A. Product Data: For each product required.
 - 1. Product Certificate: Signed by manufacturer certifying that products furnished comply

with performance requirements.

- B. Samples: For each material, at least 3 by 5 inches in size.

1.5 INFORMATION SUBMITTALS

- A. Moisture Control Plan.
- B. Qualification Data: For installer and manufacturer.
- D. Schedule: Provide complete schedule, showing if and how mitigation work affects the overall project schedule.
- F. Product Test Reports: Indicating compliance of products with requirements.
- G. Test Reports: For each moisture and pH test required by flooring manufacturers.
- H. Manufacturer's Certificates: provide written certificates, signed by mitigation products manufacturers certifying that the products are appropriate for applications indicated.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain products through one source from a single manufacturer.
- B. Manufacturer's Qualifications:
 - 1. Company specializing in manufacturing the products specified with minimum 5 years experience in materials of like design and application.
 - 2. Representative Projects: System manufacturer shall have installed specified systems in a minimum of 10 projects of similar scope and complexity over the past five years.
 - a. Provide a list of at least five projects, certifying successful management of moisture vapor emissions rate of a minimum 8lb of water/1000 sq. ft. in 24 hours.
- C. Installer Qualifications: Approved by manufacturer to install specified products.
 - 1. Company specializing in applying specified system with minimum 5 years documented experience.
 - 2. Company approved by system materials manufacturer for specified warranty.
 - 3. Installing Foreman: Individual specializing in applying specified system with minimum 5 years documented experience.
- D. Mockups: Before installing mitigation for flooring products, install mockups of each type of floor system required, to demonstrate qualities of materials and workmanship.
- E. Preinstallation Conference: Conduct conference at Project site.
 - 1. Include at least one representative from each of the following:
 - a. Owner.
 - b. Architect.
 - c. Construction Manager.
 - d. Floor Covering Manufacturer.
 - e. Adhesive Manufacturer.

- f. Flooring Installation Contractor.
- g. Flooring Consultant.
- h. Moisture Mitigation Installer.
- i. Moisture Mitigation Manufacturer.

1.7 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when conditions permit mitigation for flooring to be applied according to manufacturer's written instruction and warranty requirements.

1.8 WARRANTY

- A. Additional Special Warranty: In addition to Manufacturer's standard warranty, provide a Special Flooring Warranty for each type of flooring where a mitigation product was used, executed by the manufacturer, agreeing to replace the entire flooring system, including finish flooring, transition accessories, adhesive, underlayments and mitigation membrane, in case of failure of the flooring due to moisture vapor transmission.
 - 1. Warranty period: Ten (10) years from substantial completion.

PART 2 - PRODUCTS

2.2 MATERIALS

- A. Crack Repair Materials: Manufacturer's standard two-part crack repair material designed to repair cracks in concrete slab prior to installation of finish flooring.
 - 1. Basis of Design Products: Subject to compliance with requirements, provide the following:
 - a. For cracks 10 mils to 60 mils (0.01 to 0.06 inches): Provide "10 Minute Concrete Mender" without sand, by Roadware Inc.
 - b. For cracks 60 mils to 1/4": Provide 'Sikadur 35 H-Mod" by Sika Corporation.
 - c. For cracks less than 10 mils, skim coat with patching compound and grind flush.
- B. Leveling Compounds: Manufacturer's standard hydraulic cement based concrete leveling compounds.
 - 1. Basis of Design Products: Subject to compliance with requirements, provide the following:
 - a. For application after Epoxy Coatings: Provide K15 Self-Leveling Underlayment Concrete by Ardex.
 - b. For application prior to installation of moisture mitigation systems: Provide K301 Exterior Self-Leveling Concrete Topping by Ardex.
 - c. For applications after moisture mitigation: Sikalevel 125.
- C. Moisture Mitigation Systems: Provide manufacturer's standard moisture barrier system, including primers, if required by manufacturer.
 - 1. Basis of Design Products: Subject to compliance with requirements, provide product recommended by flooring manufacturer, or Sikafloor EpoCem 81 MCS, by Sika

Corporation or one of the following:

- a. MC Moisture Control System by Ardex
- b. VAP I-2000 by Koester.
- c. Paniseal EMB by Mapei.

2.3 MIXES

A. General: Mix products, in clean containers, according to manufacturer's written instructions.

1. Do not add water, thinners, or additives unless recommended by manufacturer.
2. When practical, use manufacturer' pre-measured packages to ensure that materials are mixed in proper proportions. When pre-measured packages are not used, measure ingredients using graduated measuring containers; do not estimate quantities or use shovel or trowel as unit of measure.
3. Do not mix more materials than can be used within time limits recommended by manufacturer. Discard materials that have begun to set.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrate and conditions for compliance with requirements for maximum moisture content, installation tolerances and other conditions affecting performance of the work.

1. Prepare written report listing conditions deemed to be detrimental to performance of the work.
2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes and primers.
3. Begin moisture mitigation product application only after unsatisfactory conditions have been corrected.
4. Application of moisture mitigation products indicates acceptance of surfaces and conditions.

3.2 TESTING

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Tests: Perform testing required by each flooring manufacturer and installer including but not limited to the following:

C. Mitigated Concrete Slabs: Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than two tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Perform anhydrous calcium chloride test per ASTM F 1869, as follows:
 - 1) Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

- b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
- c. Perform plastic sheet test, ASTM D 4263. Proceed with installation only after testing indicates absence of moisture in substrates.
 - 1) Proceed with installation only if there is no evidence of condensation or clouding in 24 hours.
2. At Contractor option, in lieu of the anhydrous calcium chloride test, perform moisture test using a Tramex meter. Proceed when moisture percentage is at or below 4%.
3. Proceed with installation only after substrates pass testing.

3.3 PREPARATION

- A. Concrete substrates: Prepare in accordance with ASTM F710.
 1. Verify that substrates are dry and free of curing compounds, sealers and hardeners.
 2. Remove substrate coating and other substances that are incompatible with moisture mitigation materials.

3.4 INSTALLATION

- A. Comply with manufacturer's written instructions for installing moisture mitigation, including crack repair materials, leveling compounds, moisture barriers and patching compounds.

3.5 FIELD QUALITY CONTROL

- A. Provide documentation that moisture mitigation system is installed according with manufacturer's instructions.
- B. Provide written documentation signed by Moisture Mitigation Manufacturer, Moisture Mitigation Installer, Flooring Manufacturer and Flooring Installation Contractor, stating that the Moisture Control Plan has been affected to the satisfaction of all the participants and that the stated moisture conditions have been achieved.
- C. Provide written documentation signed by the Flooring Manufacturer and the Flooring Installation Contractor that the mitigated flooring substrate is acceptable for installation of the flooring. Do not proceed with installation without such an acceptance.

END OF SECTION 090560

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Non-load-bearing steel framing systems for interior gypsum board assemblies.
 - 2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.
- B. Related Requirements:
 - 1. Section 054000 "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing wall studs; floor joists; roof rafters and ceiling joists; and roof trusses.
 - 2. Section 092900 "Gypsum Board".

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.

2.2 FRAMING SYSTEMS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
 - 2. Protective Coating: ASTM A 653/A 653M, G40, hot-dip galvanized unless otherwise indicated.
- C. Studs and Runners: ASTM C 645.

1. Steel Studs and Runners:
 - a. Minimum Base-Metal Thickness: 0.033 inch.
 - b. Depth: As indicated on Drawings .
 - D. Slip-Type Head Joints: Where indicated, provide the following:
 1. Single Long-Leg Runner System: ASTM C 645 top runner with 2-inch- deep flanges in thickness not less than indicated for studs, installed with studs friction fit into top runner and with continuous bridging located within 12 inches of the top of studs to provide lateral bracing.
 - E. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
 1. Minimum Base-Metal Thickness: 0.033 inch.
 - F. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch- wide flanges.
 1. Depth: As indicated on Drawings.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch- thick, galvanized steel.
 - G. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
 1. Minimum Base-Metal Thickness: 0.033 inch.
 2. Depth: As indicated on Drawings.
- 2.3 SUSPENSION SYSTEMS
- A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch- diameter wire, or double strand of 0.048-inch- diameter wire.
 - B. Hanger Attachments to Concrete:
 1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
 - a. Type: Postinstalled, chemical anchor or Postinstalled, expansion anchor.
 2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
 - C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
 - D. Flat Hangers: Steel sheet, in size indicated on Drawings.
 - E. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.053 inch and minimum 1/2-inch- wide flanges.
 1. Depth: As indicated on Drawings.

- F. Furring Channels (Furring Members):
 - 1. Cold-Rolled Channels: 0.053-inch uncoated-steel thickness, with minimum 1/2-inch-wide flanges, 3/4 inch deep.
 - 2. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
 - a. Minimum Base-Metal Thickness: 0.018 inch.

2.4 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 - 1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Isolation Strip at Exterior Walls: Provide the following:
 - 1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
 - 1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C 754.
 - 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 that apply to framing installation.
- B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- C. Install bracing at terminations in assemblies.

- D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.
 - 2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
 - 3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Install studs so flanges within framing system point in same direction.
- D. Direct Furring:
 - 1. Screw to wood framing.
 - 2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
- E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Hangers: 48 inches o.c.
 - 2. Carrying Channels (Main Runners): 48 inches o.c.
 - 3. Furring Channels (Furring Members): 16 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
 - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 - 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 - 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for

- substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 5. Do not attach hangers to steel roof deck.
 6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
 7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
 8. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
- E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
- F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior gypsum board.
 - 2. Tile backing panels.
- B. Related Requirements:
 - 1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For the following products:
 - 1. Trim Accessories: Full-size Sample in 12-inch- long length for each trim accessory indicated.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

- A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. American Gypsum.
 2. CertainTeed Corp.
 3. Georgia-Pacific Gypsum LLC.
 4. Lafarge North America Inc.
 5. National Gypsum Company.
 6. PABCO Gypsum.
 7. Temple-Inland.
 8. USG Corporation.
- B. Gypsum Board, Type X: ASTM C 1396/C 1396M.
 1. Thickness: 5/8 inch.
 2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

2.4 TILE BACKING PANELS

- A. Glass-Mat, Water-Resistant Backing Board: ASTM C 1178/C 1178M, with manufacturer's standard edges.
 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; GlasRoc Tile Backer.
 - b. Georgia-Pacific Gypsum LLC; DensShield Tile Backer.
 2. Core: 5/8 inch, Type X.
 3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
 - 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
 - 2. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. Expansion (control) joint.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
 - 1. Interior Gypsum Board: Paper.
 - 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
 - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
 - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
 - 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound.
- D. Joint Compound for Tile Backing Panels:
 - 1. Glass-Mat, Water-Resistant Backing Panel: As recommended by backing panel manufacturer.

2.7 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
 - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
 - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.
- D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- E. Form control and expansion joints with space between edges of adjoining gypsum panels.
- F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
 1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
 2. Fit gypsum panels around ducts, pipes, and conduits.
 3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.
- G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

- I. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
 1. Wallboard Type: Type X throughout, unless otherwise noted.
 2. Type X: Where required for fire-resistance-rated assembly.
- B. Single-Layer Application:
 1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
 2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
 4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints [at locations indicated on Drawings] [according to ASTM C 840 and in specific locations approved by Architect for visual effect].
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners[unless otherwise indicated].
 2. LC-Bead: Use [at exposed panel edges] <Insert requirements>.
 3. L-Bead: Use [where indicated] <Insert requirements>.

3.5 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
 - 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
 - 2. Level 4: At panel surfaces that will be exposed to view unless otherwise indicated.
 - a. Primer and its application to surfaces are specified in other Section 099123 "Interior Painting." Level 5 is suitable for surfaces receiving gloss and semigloss enamels and other surfaces subject to severe lighting. It is considered a high-quality gypsum board finish.
 - b. Primer and its application to surfaces are specified in other Section 099123 "Interior Painting."
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Glass-Mat Faced Panels: Finish according to manufacturer's written instructions.

3.6 PROTECTION

- A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- C. Remove and replace panels that are wet, moisture damaged, and mold damaged.
 - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
 - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Ceramic tile.
2. Waterproof membrane.
3. Crack isolation membrane.
4. Metal edge strips.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples:

1. Each type and composition of tile and for each color and finish required.
2. Assembled samples, with grouted joints, for each type and composition of tile and for each color and finish required.
3. Stone thresholds in 6-inch (150-mm) lengths.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.
2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

1.4 QUALITY ASSURANCE

A. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Build mockup of each type of floor tile installation.
2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

PART 2 - PRODUCTS

2.1 TILE PRODUCTS

- A. ANSI Ceramic Tile Standard: Provide Standard grade tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.
- B. FloorScore Compliance: Tile for floors shall comply with requirements of FloorScore Standard.
- C. Low-Emitting Materials: Tile flooring systems shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Tile Type: Factory-mounted unglazed ceramic mosaic tile in Toilets A & B.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Sheets A8.0.
 - 2. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base Cove: Cove, module size.
 - b. External Corners: Bead (bullnose).
 - c. Internal Corners: Cove, module size.
 - d. Tapered Transition Tile: Shape designed to effect transition between thickness of tile floor and adjoining floor finishes of different thickness, tapered to provide reduction in thickness from 1/2 to 1/4 inch (12.7 to 6.35 mm) across nominal 4-inch (100-mm) dimension.
 - 3. Face Size: 8 by 8 inches (203 by 203 mm).
 - 4. Thickness: 1/2 inch (12.7 mm).
 - 5. Wearing Surface: Abrasive aggregate embedded in surface.
 - 6. Finish: Bright, opaque glaze.
 - 7. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
 - 8. Grout Color: As selected by Architect from manufacturer's full range.
 - 9. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base: Coved with surface bullnose top edge, face size 8 by 3-7/8 inches (203 by 98 mm).
 - 10.
- E. Tile Type: Unglazed square-edged quarry tile.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following.
 - a. American Olean; Division of Dal-Tile International Inc.
 - b. Atlas Minerals & Chemicals, Inc.
 - c. Daltile; Division of Dal-Tile International Inc.
 - d. Deutsche Steinzeug America, Inc.
 - e. Endicott Tile Ltd.; Endicott Clay Products Co.
 - f. Florida Brick & Clay Company Inc.
 - g. Florida Tile Industries, Inc.

- h. Interceramic.
 - i. Metropolitan Ceramics.
 - j. Portobello America, Inc.
 - k. Quarry Tile Co.
 - l. Seneca Tiles, Inc.
 - m. Summitville Tiles, Inc.
 - n. United States Ceramic Tile Company.
- 2. Face Size: 8 by 8 inches (203 by 203 mm).
 - 3. Thickness: 1/2 inch (12.7 mm).
 - 4. Wearing Surface: Abrasive aggregate embedded in surface.
 - 5. Finish: Bright, opaque glaze.
 - 6. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
 - 7. Grout Color: As selected by Architect from manufacturer's full range.
 - 8. Trim Units: Coordinated with sizes and coursing of adjoining flat tile where applicable and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
 - a. Base: Coved with surface bullnose top edge, face size 8 by 3-7/8 inches (203 by 98 mm).

2.2 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch (1.5 mm) above adjacent floor surface. Finish bevel to match top surface of threshold. Limit height of threshold to 1/2 inch (12.7 mm) or less above adjacent floor surface.

2.3 WATERPROOF MEMBRANE

- A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated.
- B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and continuous fabric reinforcement.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Boiardi Products, a QEP company; Elastiment 344 Reinforced Waterproofing and Anti-Fracture/Crack Suppression Membrane.
 - b. Bonsal American, an Oldcastle company; B 6000 Waterproof Membrane with Glass Fabric.
 - c. Bostik, Inc.; Hydroment Blacktop 90210.
 - d. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - e. Laticrete International, Inc.; Laticrete 9235 Waterproof Membrane.
 - f. MAPEI Corporation; Mapelastick L (PRP M19); Mapelastick HPG with MAPEI Fiberglass Mesh.
 - g. Mer-Kote Products, Inc.; Hydro-Guard 2000.
 - h. Summitville Tiles, Inc.; S-9000.

2.4 CRACK ISOLATION MEMBRANE

- A. General: Manufacturer's standard product that complies with ANSI A118.12 for standard performance and is recommended by the manufacturer for the application indicated.
- B. Fabric-Reinforced, Fluid-Applied Membrane: System consisting of liquid-latex rubber or elastomeric polymer and fabric reinforcement.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Boiardi Products, a QEP company; Elastiment 344 Reinforced Waterproofing and Anti-Fracture/Crack Suppression Membrane.
 - b. Bonsal American, an Oldcastle company; B 6000 Waterproof Membrane with Glass Fabric.
 - c. Bostik, Inc.; Hydroment Blacktop 90210.
 - d. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane.
 - e. Laticrete International, Inc.; Laticrete Blue 92 Anti-Fracture Membrane; 9235 Waterproof Membrane.
 - f. MAPEI Corporation; Mapelastic L (PRP M19); Mapelastic HPG with MAPEI Fiberglass Mesh.
 - g. Mer-Kote Products, Inc.; Hydro-Guard 2000.
 - h. Summitville Tiles, Inc.; S-9000.

2.5 SETTING MATERIALS

- A. Water-Cleanable, Tile-Setting Epoxy: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Atlas Minerals & Chemicals, Inc.
 - b. Bonsal American; an Oldcastle company.
 - c. Bostik, Inc.
 - d. C-Cure.
 - e. Custom Building Products.
 - f. Jamo Inc.
 - g. Laticrete International, Inc.
 - h. MAPEI Corporation.
 - i. Mer-Kote Products, Inc.
 - j. Southern Grouts & Mortars, Inc.
 - k. Summitville Tiles, Inc.
 - l. TEC; a subsidiary of H. B. Fuller Company.

2.6 GROUT MATERIALS

- A. Water-Cleanable Epoxy Grout: ANSI A118.3, with a VOC content of 65 g/L or less when calculated according to 40 CFR 59, Subpart D.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

- a. Atlas Minerals & Chemicals, Inc.
- b. Boiardi Products; a QEP company.
- c. Bonsal American; an Oldcastle company.
- d. Bostik, Inc.
- e. C-Cure.
- f. Custom Building Products.
- g. Jamo Inc.
- h. Laticrete International, Inc.
- i. MAPEI Corporation.
- j. Mer-Kote Products, Inc.
- k. Southern Grouts & Mortars, Inc.
- l. Summitville Tiles, Inc.
- m. TEC; a subsidiary of H. B. Fuller Company.

2.7 ELASTOMERIC SEALANTS

- A. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. DAP Inc.; Titanium Enriched Kitchen and Bath Sealant; 100 percent Silicone Kitchen and Bath Sealant.
 - b. Dow Corning Corporation; Dow Corning 786.
 - c. GE Silicones, a division of GE Specialty Materials; Sanitary 1700.
 - d. Laticrete International, Inc.; Latasil Tile & Stone Sealant.
 - e. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
 - f. Tremco Incorporated; Tremsil 600 White.

2.8 MISCELLANEOUS MATERIALS

- A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.
- B. Metal Edge Strips: Angle or L-shape, stainless steel, ASTM A 666, 300 Series exposed-edge material.
- C. Grout Sealer: Manufacturer's standard silicone product for sealing grout joints and that does not change color or appearance of grout.
 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Bonsal American, an Oldcastle company; Grout Sealer.
 - b. Bostik, Inc.; CeramaSeal Grout & Tile Sealer; Magic Seal; Silox 8; Siloxane 220.
 - c. C-Cure; Penetrating Sealer 978.
 - d. Custom Building Products; Surfaceguard Grout and Tile Sealer.
 - e. Jamo Inc.; Matte Finish; Penetrating Sealer.
 - f. MAPEI Corporation; KER 003, Silicone Spray Sealer for Cementitious Tile Grout; 004, Keraseal Penetrating Sealer for Unglazed Grout and Tile.

- g. Southern Grouts & Mortars, Inc.; Silicone Grout Sealer.
- h. Summitville Tiles, Inc.; SL-15, Invisible Seal Penetrating Grout and Tile Sealer.
- i. TEC, a subsidiary of H. B. Fuller Company; TA-256 Penetrating Silicone; TA-257 Silicone Grout Sealer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.
 - 1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.

3.2 PREPARATION

- A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.
- B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot (1:50) toward drains.
- C. Blending: For tile exhibiting color variations, use factory blended tile or blend tiles at Project site before installing.
- D. Field-Applied Temporary Protective Coating: If indicated under tile type or needed to prevent grout from staining or adhering to exposed tile surfaces, precoat them with continuous film of temporary protective coating, taking care not to coat unexposed tile surfaces.

3.3 INSTALLATION

- A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.
 - 1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:
 - a. Tile floors in wet areas.
 - b. Tile floors composed of tiles 8 by 8 inches (200 by 200 mm) or larger.
- B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

- C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.
- E. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
 - 1. Quarry Tile: 1/4 inch (6.35 mm).
- G. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- H. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
 - 2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- I. Stone Thresholds: Install stone thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
 - 1. At locations where mortar bed (thickset) would otherwise be exposed above adjacent floor finishes, set thresholds in latex-portland cement mortar (thin set).
- J. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.
- K. Grout Sealer: Apply grout sealer to cementitious grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- L. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.
- M. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness and bonded securely to substrate.

END OF SECTION 093000

SECTION 095113 - ACOUSTICAL PANEL CEILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for ceilings.
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, 6 inches in size.
- C. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
 - 1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
 - 2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch- long Samples of each type, finish, and color.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Acoustical Ceiling Panels: Full-size panels equal to 2 percent of quantity installed.
 - 2. Suspension-System Components: Quantity of each exposed component equal to 2 percent of quantity installed.
 - 3. Impact Clips: Equal to 2 percent of quantity installed.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical panels, suspension-system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

1.9 FIELD CONDITIONS

- A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
 - 1. Pressurized Plenums: Operate ventilation system for not less than 48 hours before beginning acoustical panel ceiling installation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: Comply with ASTM E 1264 for Class A materials.
 - 2. Smoke-Developed Index: 450 or less.
- B. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.

2.2 ACOUSTICAL PANELS, GENERAL

- A. Source Limitations:
 - 1. Acoustical Ceiling Panel: Obtain each type from single source from single manufacturer.
 - 2. Suspension System: Obtain each type from single source from single manufacturer.
- B. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system from single source from single manufacturer.
- C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.
- D. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances unless otherwise indicated.
 - 1. Mounting Method for Measuring NRC: Type E-400; plenum mounting in which face of test specimen is 15-3/4 inches away from test surface according to ASTM E 795.
- E. Acoustical Panel Colors and Patterns: Match appearance characteristics indicated for each product type.
 - 1. Where appearance characteristics of acoustical panels are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.

2.3 ACOUSTICAL PANELS, APC-1

- A. Use or Location: Typical Classrooms, Offices, and where indicated.
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corp.
 - 3. USG Interiors, Inc.; Subsidiary of USG Corporation.
- C. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type III, mineral base with painted finish; Form 2, water felted.
 - 2. Pattern: E (lightly textured).
- D. Color: White .
- E. LR: Not less than 0.85.
- F. NRC: Not less than 0.70 .
- G. CAC: Not less than 35.
- H. AC: Not less than 200.

- I. Edge/Joint Detail: Reveal sized to fit flange of exposed suspension-system members.
- J. Thickness: 5/8 inch.
- K. Modular Size: 24 by 24 inches .
- L. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

2.4 ACOUSTICAL PANELS, APC-2

- A. Use of Location: Kitchens, Toilet Rooms and where indicated.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Ceramaguard or comparable product by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. CertainTeed Corp.
 - 3. Chicago Metallic Corporation.
 - 4. USG Interiors, Inc.; Subsidiary of USG Corporation.
- C. Classification: Provide fire-resistance-rated panels complying with ASTM E 1264 for type, form, and pattern as follows:
 - 1. Type and Form: Type XII, glass-fiber base with membrane-faced overlay; Form 1, plastic .
 - 2. Type and Form: <Insert type and form>.
 - 3. Pattern: G (smooth) .
- D. Color: White.
- E. LR: Not less than 0.85.
- F. NRC: Not less than 0.55 .
- G. CAC: Not less than 30.
- H. Edge/Joint Detail: Square .
- I. Thickness: 5/8 inch.
- J. Modular Size: 24 by 24 inches .

2.5 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension-System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635/C 635M.
 - 1. High-Humidity Finish: Comply with ASTM C 635/C 635M requirements for "Coating

Classification for Severe Environment Performance" where high-humidity finishes are indicated.

- B. Impact Clips: Where indicated, provide manufacturer's standard impact-clip system designed to absorb impact forces against acoustical panels.

2.6 METAL SUSPENSION SYSTEM

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Armstrong World Industries, Inc.
 - 2. Chicago Metallic Corporation.
 - 3. USG Interiors, Inc.; Subsidiary of USG Corporation.
- B. Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, G60, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; hot-dip galvanized according to ASTM A 653/A 653M, G60 coating designation; with prefinished, cold-rolled, 15/16-inch-wide aluminum caps on flanges.
 - 1. Structural Classification: Intermediate -duty system.
 - 2. Face Design: Flat, flush.
 - 3. Face Finish: Painted white.
 - 4. Use at: APC-1, APC-2.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.
- B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
 - 1. Fire-Rated Assembly: Install fire-rated ceiling systems according to tested fire-rated design.
- B. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
 - 1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
- C. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- D. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.
 - 1. Arrange directionally patterned acoustical panels as follows:
 - a. As indicated on reflected ceiling plans.
 - b. Install panels with pattern running in one direction parallel to [long] [short] axis of space.
 - 2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.
 - 3. Install impact clips in areas indicated, in areas required by authorities having jurisdiction, and for fire-resistance ratings; space as recommended by panel manufacturer's written instructions unless otherwise indicated.
 - 4. Protect lighting fixtures and air ducts to comply with requirements indicated for fire-resistance-rated assembly.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections and prepare test reports.
- B. Perform the following tests and inspections of completed installations of acoustical panel ceiling hangers and anchors and fasteners in successive stages. Do not proceed with installations of acoustical panel ceiling hangers for the next area until test results for previously completed installations show compliance with requirements.
 - 1. Extent of Each Test Area: When installation of ceiling suspension systems on each floor has reached 20 percent completion but no panels have been installed.
 - a. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.

- b. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
- C. Acoustical panel ceiling hangers and anchors and fasteners will be considered defective if they do not pass tests and inspections.
- D. Prepare test and inspection reports.

3.5 CLEANING

- A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113

SECTION 096466 - WOOD ATHLETIC FLOORING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes wood athletic flooring with underfloor ventilation.
- B. Related Sections:
 - 1. Section 033000 "Concrete".
 - 2. Section 090560 "Moisture Mitigation for Flooring".
 - 3. Div 23 Sections for systems feeding mechanical underfloor ventilation system.
 - 4. Div 26 Sections for electrical feed to underfloor ventilation system.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for wood athletic flooring.
- B. Shop Drawings: For each type of floor assembly and accessory. Include plans, elevations, sections, details, and attachments to other work. Include the following:
 - 1. Expansion provisions and trim details.
 - 2. Layout, colors, widths, and dimensions of game lines and markers.
 - 3. Locations of floor inserts for athletic equipment installed through flooring assembly.
 - 4. Layout of underfloor ventilation.
- C. Samples for Initial Selection: Manufacturer's color charts showing colors and glosses available for the following:
 - 1. Floor finish.
 - 2. Game-line and marker paint.
- D. Samples for Verification: For each type of wood athletic flooring and accessory required; approximately 12 inches long and of same thickness and material indicated for the Work.
 - 1. Include sample sets showing the full range of normal color and texture variations

- expected in wood flooring.
- 2. Include Sample sets showing finishes and game-line and marker paint colors applied to wood flooring.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for wood athletic flooring system.
- C. Sample Warranty.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For wood athletic flooring and finish systems to include in maintenance manuals.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual that has been approved by MFMA as an accredited Installer according to the MFMA Accreditation Program.
 - 1. Flooring Contractor shall be a certified installer of the flooring manufacturer's products.
 - 2. Flooring Contractor shall comply with all of the flooring manufacturer's requirements and documentation including but not limited to concrete inspections, delivery and storage of materials and daily installation reports.
- B. Installer Qualifications: An experienced Installer who has completed wood athletic flooring installations similar in material, design, and extent to that indicated for this Project and whose work has resulted in installations with a record of successful in-service performance.
 - 1. Installer responsibilities include installation and field finishing of wood athletic flooring components and accessories, and application of game lines and markers.
- C. Maple Flooring: Comply with MFMA grading rules for species, grade, and cut.
 - 1. Certification: Provide flooring that carries MFMA mark on each bundle or piece.
- D. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. To set quality standards for installation, install mockup of floor area as shown on Drawings.
 - 2. Prepare finished mockup of floor area as shown on Drawings to set quality standards for sanding and application of field finishes and game lines and markers.

- a. Include mock up of ventilation system.
- 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- 4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver assembly materials in unopened cartons or bundles.
- B. Protect wood from exposure to moisture. Do not deliver wood components until after concrete, masonry, plaster, ceramic tile, and similar wet work is complete and dry.
- C. Store wood components in a dry, warm, well-ventilated, weathertight location and in a horizontal position.
- D. Do not deliver material until all masonry, painting, plastering tile work, marble and terrazzo work are completed. All over head work which includes installation of mechanical work, lighting, backstops, scoreboards are installed.

1.8 FIELD CONDITIONS

- A. Conditioning period begins not less than seven days before wood athletic flooring installation, is continuous through installation, and continues not less than seven days after installation.
 - 1. Environmental Conditioning: Maintain an ambient temperature between 65 and 75 deg F and relative humidity planned for building occupants, but not less than 35 percent or more than 50 percent, in spaces to receive wood athletic flooring during the conditioning period.
 - 2. Wood Conditioning: Move wood components into spaces where they will be installed, no later than beginning of the conditioning period.
 - a. Do not install wood athletic flooring until wood components adjust to relative humidity of, and are at same temperature as, spaces where they are to be installed.
 - b. Open sealed packages to allow wood components to acclimatize immediately on moving wood components into spaces in which they will be installed.
- B. After conditioning period, maintain relative humidity and ambient temperature planned for building occupants.
- C. Install wood athletic flooring after other finishing operations, including painting, have been completed.

1.9 COORDINATION

- A. Coordinate layout and installation of wood athletic flooring systems with floor inserts for gymnasium equipment.

1.10 WARRANTY

- A. Manufacturer Warranty: Manufacturer warrants the flooring materials to be free from manufacturing defects for a period of 5 years from the date of substantial completion. The flooring Contractor warrants the installation to be free from defects for the same period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Aacer Floor Company "Scissor-Loc II with Air Flow System, or comparable product by one of the following:
 - 1. Action Floor Systems, LLC.
 - 2. Connor Floor; Subsidiary of Connor Sport Court International.
 - 3. Robbins Sports Surfaces.

2.2 DESCRIPTION

- A. System Type: Floating, with underfloor ventilation.
- B. Overall System Height: 2-1/4 inches.

2.3 PERFORMANCE REQUIREMENTS

- A. Provide wood athletic flooring systems tested by a qualified testing agency according to DIN V 18032-2 and shown to meet the following requirements:
 - 1. Shock Absorption: Minimum 53 percent.
 - 2. Vertical Deflection: Minimum 0.09 inch.
 - 3. Area of Deflection: Maximum 15 percent.
 - 4. Ball Bounce: Minimum 90 percent.
 - 5. Surface Friction: Not less than 0.5 or more than 0.7.
 - 6. Rolling Loads: No damage when subjected to 337 lbf applied through a single wheel.

2.4 FLOORING MATERIALS

- A. Random-Length Strip Flooring: Northern hard maple (*Acer saccharum*), kiln dried, random length, tongue and groove, and end matched.
 - 1. Grade: MFMA-RL Second and Better.
 - a. Exception: For areas under stacked portion of telescoping bleachers that are normally concealed from view, provide Third and Better Grade.
 - 2. Cut: Flat.
 - 3. Thickness: 25/32 inch.
 - 4. Face Width: 1-1/2 inches.

2.5 SUBFLOOR MATERIALS

- A. Board Underlayment: Nominal 1-by-6-inch graded boards; of Grade #2 (SPF), SPIB No. 2 Southern pine, WCLIB Construction grade (any species), or WWPA No. 3 (any species), or other system specified and certified by the flooring manufacturer, dried to 15 percent moisture content.
- B. Resilient Underlayment: Flexible, multicellular, closed-cell, expanded polyethylene-foam sheet; nominal 2-lb/cu. ft. density.
 - 1. Thickness: 1/4 inch.
- C. Fasteners: Manufacturer's standard 2" barbed cleats for maple.

2.6 FINISHES

- A. Floor-Finish System: System of compatible components recommended in writing by flooring manufacturer, and MFMA approved.
 - 1. Floor-Sealer Formulation: Pliable, penetrating type. MFMA Group 1, Sealers.
 - 2. Finish-Coat Formulation: Formulated for gloss finish indicated and multicoat application.
 - a. Type: MFMA Group 3, Gymnasium-Type Surface Finishes.
 - 3. Game-Line and Marker Paint: Industrial enamel compatible with finish coats and recommended in writing by manufacturers of finish coats, and paint for this use.

2.7 ACCESSORIES

- A. Vapor Retarder: ASTM D 4397, polyethylene sheet not less than 6 mils thick, or other system approved by the flooring manufacturer.

- B. Resilient Wall Base: Molded, vented, rubber or vinyl cove base; 4 by 3 by 48 inches; with premolded outside corners.
 - 1. Color: Black.
- C. Thresholds: 1/4" thick x 6" wide mill finished aluminum ribbed plate, length as indicated.
- D. Ventilation System: Manufacturer's standard or manufacturer's approved underfloor ventilation system with underfloor humidity detector. Detection of humidity under the floor will trigger fan units which will start circulating air through the floor system.
- E. Fasteners: Type and size recommended by manufacturer, but not less than those recommended by MFMA for application indicated.
- F. Trowelable Leveling and Patching Compound: Latex-modified, hydraulic-cement-based formulation approved by wood athletic flooring manufacturer.
- G. Adhesives: Manufacturer's standard for application indicated that has a VOC content of 100 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- H. Adhesives: Manufacturer's standard for application indicated that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, installation tolerances, and other conditions affecting performance of wood athletic flooring.
- B. Proceed with installation only after unsatisfactory conditions, including levelness tolerances, have been corrected.

3.2 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a special inspector to perform field tests and inspections and prepare test reports.
- B. Testing and Inspecting: Engage a qualified testing agency to perform tests and inspections and to submit reports.
- C. Concrete Slabs: Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

1. Moisture Testing: Perform tests so that each test area does not exceed 200 sq. ft., and perform no fewer than two tests in each installation area and with test areas evenly spaced in installation areas.
 - a. Perform anhydrous calcium chloride test per ASTM F 1869, as follows:
 - 1) Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.
 - c. Perform plastic sheet test, ASTM D 4263. Proceed with installation only after testing indicates absence of moisture in substrates.
 - 1) Proceed with installation only if there is no evidence of condensation or clouding in 24 hours.
 - d. Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

3.3 PREPARATION

- A. Grind high spots and fill low spots on concrete substrates to produce a maximum 1/8-inch deviation in any direction when checked with a 10-foot straight edge.
 1. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, and depressions in substrates.
- B. Remove coatings including curing compounds and other substances on substrates that are incompatible with installation adhesives and that contain soap, wax, oil, or silicone; use mechanical methods recommended by manufacturer. Do not use solvents.
- C. Broom and vacuum clean substrates to be covered immediately before product installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust. Proceed with installation only after unsatisfactory conditions have been corrected.
- D. Remediation for concrete slabs that do not meet moisture tests: Provide moisture control system specified or a comparable one approved by flooring manufacturer.

3.4 INSTALLATION

- A. General: Comply with wood athletic flooring manufacturer's written instructions, but not less than written recommendations of MFMA applicable to flooring type indicated.
- B. Pattern: Lay flooring parallel with long dimension of space to be floored unless otherwise indicated.

- C. Expansion Spaces: Provide as indicated, but not less than that required by manufacturer's written instructions and MFMA's written recommendations at walls and other obstructions, and at interruptions and terminations of flooring.
 - 1. Cover expansion spaces with base molding, trim, and saddles, as indicated on Drawings.
- D. Vapor Retarder: Cover entire slab area beneath wood flooring. Install with joints lapped a minimum of 6 inches and sealed.
- E. Underlayment: Install perpendicular to direction of flooring, staggering end joints in adjacent rows.
- F. Strip Flooring: Mechanically fasten perpendicular to supports.
- G. Installation Tolerances: 1/8 inch in 10 feet of variance from level.

3.5 SANDING AND FINISHING

- A. Allow installed flooring to acclimate to ambient conditions before sanding.
- B. Follow applicable recommendations in MFMA's "Industry Recommendations for Sanding, Sealing, Court Lining, Finishing, and Resurfacing of Maple Gym Floors."
- C. Machine sand with coarse, medium, and fine grades of sandpaper to achieve a level, smooth, uniform surface without ridges or cups. Remove sanding dust by tack or vacuum.
- D. Finish: Apply seal and finish coats of finish system according to finish manufacturer's written instructions. Provide no fewer than two coats total and no fewer than two finish coats.
 - 1. Water-Based Finishes: Use finishing methods recommended by finish manufacturer to reduce grain raise and sidebonding effect.
 - 2. Game-Line and Marker Paint: Apply game-line and marker paint between final seal coat and first finish coat according to paint manufacturer's written instructions.
 - a. Mask flooring at game lines and markers, and apply paint to produce lines and markers with sharp edges.
 - b. Where game lines cross, break minor game line at intersection; do not overlap lines.
 - c. Apply game lines and markers in widths and colors according to requirements indicated on Drawings.
 - d. Apply finish coats after game-line and marker paint is fully cured.

3.6 PROTECTION

- A. Protect wood athletic flooring during remainder of construction period to allow finish to cure and to ensure that flooring and finish are without damage or deterioration at time of Substantial Completion.

1. Do not cover flooring after finishing until finish reaches full cure and not before seven days after applying last finish coat.
2. Do not move heavy and sharp objects directly over flooring. Protect fully cured floor finishes and surfaces with plywood or hardboard panels to prevent damage from storing or moving objects over flooring.

END OF SECTION 096466

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Resilient base.
 - 2. Resilient stair accessories.
 - 3. Resilient molding accessories.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.
- C. Samples for Initial Selection: For each type of product indicated.
- D. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches (300 mm) long.

1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Furnish not less than 10 linear feet (3 linear m) for every 100 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Coordinate mockups in this Section with mockups specified in other Sections.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.7 FIELD CONDITIONS

- A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C), in spaces to receive resilient products during the following time periods:
 - 1. 48 hours before installation.
 - 2. During installation.
 - 3. 48 hours after installation.
- B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).
- C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Burke Mercer Flooring Products, Division of Burke Industries Inc.
 - 2. Flexco.
 - 3. Roppe Corporation, USA.
- B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
 - 1. Style and Location:
 - a. Style A, Straight: Provide in areas with carpet.
 - b. Style B, Cove: Provide in areas with resilient flooring.
 - c. Style C, Butt to: Provide in areas indicated.
- C. Thickness: 0.125 inch (3.2 mm).
- D. Height: 6 inches (152 mm).
- E. Lengths: Coils in manufacturer's standard length.
- F. Outside Corners: Job formed.
- G. Inside Corners: Job formed.

- H. Colors: As selected by Architect from full range of industry colors.

2.2 RUBBER STAIR ACCESSORIES

- A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. Manufacturers: Subject to compliance with requirements, provide Mannington-Colorscape, or approved equal product by one of the following:
1. AB; American Biltrite.
 2. Allstate Rubber Corp.
 3. Armstrong World Industries, Inc.
 4. Burke Mercer Flooring Products, Division of Burke Industries Inc.
 5. Flexco.
 6. Johnsonite; A Tarkett Company.
 7. Mondo American Inc.
 8. Musson Rubber Company.
 9. Nora Systems, Inc.
 10. PRF USA, Inc.
 11. R.C.A. Rubber Company (The).
 12. Roppe Corporation, USA.
 13. VPI Corporation.
- C. Stair Treads: ASTM F 2169.
1. Type: TS (rubber, vulcanized thermoset).
 2. Class: 2 (pattern; embossed, grooved, or ribbed).
 3. Nosing Style: Square, adjustable to cover angles between 60 and 90 degrees.
 4. Nosing Height: 1-1/2 inches (38 mm).
 5. Thickness: 1/4 inch (6 mm) and tapered to back edge.
 6. Size: Lengths and depths to fit each stair tread in one piece or, for treads exceeding maximum lengths manufactured, in equal-length units.
 7. Integral Risers: Smooth, flat; in height that fully covers substrate.
- D. Separate Risers: Smooth, flat; in height that fully covers substrate; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
1. Style: Coved toe, 7 inches (178 mm) high by length matching treads.
 2. Thickness: 0.125 inch (3.2 mm).
- E. Landing Tile: Matching treads; produced by same manufacturer as treads and recommended by manufacturer for installation with treads.
- F. Colors and Patterns: As selected by Architect from full range of industry colors.
1. Treads - hammered finish.
 2. Landings - raised disc Manington rubber tile; colorscape.

2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
- C. Stair-Tread Nose Filler: Two-part epoxy compound recommended by resilient stair-tread manufacturer to fill nosing substrates that do not conform to tread contours.
- D. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
 - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
 - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
 - a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.

- b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum 75 percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
 - 1. At least 48 hours in advance of installation, move resilient products and installation materials into spaces where they will be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
 - 1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
 - a. Form without producing discoloration (whitening) at bends.
 - 2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches (76 mm) in length.
 - a. Miter corners to minimize open joints.

3.4 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
 - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.

2. Tightly adhere to substrates throughout length of each piece.
 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Perform the following operations immediately after completing resilient-product installation:
1. Remove adhesive and other blemishes from exposed surfaces.
 2. Sweep and vacuum horizontal surfaces thoroughly.
 3. Damp-mop horizontal surfaces to remove marks and soil.
- C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
- D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.
1. Apply three coats.
- E. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 096519.23 – RESILIENT / VINYL TILE FLOORING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Resilient vinyl tile flooring (MT).

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Manufacturer Certifications:
 - 1. Provide certification that accurately identifies the Original Equipment Manufacturer (OEM) of flooring furnished for this project including manufacturer's name, address and factory location.
 - a. Suppliers of Private-Label flooring for this project must identify themselves as such and fully disclose the OEM information listed above.
 - b. All "manufacturer" requirements in these specifications must be complied with by the OEM, including warranties, certifications, qualifications, product data, test results, environmental requirements, performance data, etc.
 - 2. Provide ISO 9001 certification for the OEM of the specified products.
 - 3. Provide ISO 14001 certification for the OEM of the specified products.
 - 4. Provide OSHAS 18001 certification for the OEM of the specified products.
- C. Shop Drawings: Showing installation details and locations of borders, patterns, locations of any floor inserts and any seams.
- D. Samples:
 - 1. Manufacturer's color chart for selection of available floors
 - 2. Color samples:
 - a. Samples as requested

1.3 INFORMATIONAL SUBMITTALS

- A. Qualification Data:
 - 1. For a qualified resilient flooring Manufacturer.
 - 2. For a qualified resilient flooring Installer.

1.4 CLOSEOUT SUBMITTALS

- A. Submit three copies of the following:
 - 1. Manufacturer maintenance instructions.

2. Manufacturer material warranty.
3. Installer installation warranty.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications:

1. ISO 9001 Certified.
2. ISO 14001 Certified.
3. OHSAS 18001 Certified.
4. At least ten years active experience in the manufacture and marketing of commercial resilient flooring.
5. A provider of authorized installer training.

B. Installer Qualifications:

1. At least five years experience in the installation of resilient flooring.
2. Experience on at least five projects of similar size, type and complexity as this project.
3. Employer of workers for this Project who are competent in techniques required by manufacturer for resilient flooring installation indicated.

C. Fire Test Characteristics: As determined by testing identical products according to ASTM E 648, Class 1, by a qualified testing agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store flooring and installation materials in protected dry spaces, with ambient temperatures maintained within range recommended by manufacturer, but not less than 55 deg F (13 deg C) nor more than 85 deg F (29 deg C).
- B. Store the indoor resilient tiles in an upright position on a smooth flat surface immediately upon delivery to Project.

1.7 FIELD CONDITIONS

A. Product Installation:

1. Maintain temperatures during installation within range recommended by manufacturer, but not less than 65 deg F (18 deg C) in spaces to receive flooring one week before installation, during installation, and one week after installation.
2. After installation, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 85 deg F (29 deg C).
3. Prohibit traffic during flooring installation and for at least 48 hours after flooring installation.

B. Install flooring only after other finishing work, including painting and overhead work, has been completed.

1.8 WARRANTY

- A. Special Limited Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace flooring that fails within specified warranty period.
 - 1. Material warranty must be direct from the product manufacturer.
 - a. Material warranties from separate or third party insurance providers are not valid.
 - b. Material warranties from private label distributors are not valid.
 - 2. Failures include, but are not limited to, the following:
 - a. Material manufacturing defects.
 - b. Surface wear and deterioration to the point of wear-through.
 - c. Failure due to substrate moisture exposure not exceeding 92 percent relative humidity when tested according to ASTM F2170.
 - 3. Warranty Period:
 - a. Contact Gerflor for Attraction Warranty details.
- B. Special Limited Warranty: Installer's standard form in which installer agrees to repair or replace flooring that fails due to poor workmanship or faulty installation within the specified warranty period.
 - 1. Warranty Period: Contact Gerflor for details.

1.9 ENVIRONMENT AND INDOOR AIR QUALITY

- A. Indoor Air Quality Certification:
 - 1. Flooring products must be FloorScore® Certified.
 - a. FloorScore® certification proves compliance with the volatile organic compound emissions criteria of the California Section 01350 standard.
 - b. FloorScore® certification proves compliance with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - c. FloorScore® documentation must include certificate number for specified product.
- B. Manufacturer Certification of Environmental Procedures:
 - 1. Original Equipment Manufacturer's (OEM) ISO 14001 Certification

1.10 COORDINATION

- A. Coordinate layout and installation of flooring with other equipment.

PART 2 - PRODUCTS

2.1 COMMERCIAL RESILIENT / VINYL TILE FLOORING

- A. Basis-of-Design Manufacture: Subject to compliance with requirements, provide Gerflor Attraction (MT) Modular tile flooring a 5mm thick modular tile with dovetail connections or straight seams. Includes a reinforced 1mm thick wearlayer with pressed design, (2) fiberglass grids for extreme dimensional stability and 100% recycled interlayer and base. Protected by the PUR+ surface treatment for No Wax maintenance.
1. All other manufacturers: Submit formal substitution request prior to bid in accordance with Section 012500 - "Substitution Procedures".
 2. Approval by Architect of other manufacturers does not relieve Contractor of responsibility to provide products which comply with all requirements of the specification.
- B. Product Description: Resilient / Vinyl Tile flooring as per ASTM F1700.
1. Overall Thickness: Not less than 0.197 inch (5.0 mm)
 2. Wear-Layer Thickness: Not less than 0.04 inch (1.0 mm)
 3. Adhesive Method: as recommended per Gerflor installation instructions to ensure proper installation and performance.
 4. 100% REACH Compliant.
 5. Applied Finish: Manufacturer's, factory-applied, permanent UV-cured.
 - a. Basis-of-Design Product: Gerflor PUR+
 6. Tile Size: Attraction Connect 25.6'' x 25.6'' (650mm x 650mm)
 - a. Attraction Control 25'' x 25'' (635mm x 635mm)
 7. Color and Pattern:
 - a. FTT-1 (Field):
 - 1) Manufacturer: Gerflor
 - 2) Style: Attraction, 25"x25" Tile
 - 3) Color: Waterlily 0293
 - 4) Install: Interlock, no adhesive
 - b. FTT-2 (Accent):
 - 1) Manufacturer: Gerflor
 - 2) Style: Attraction, 25"x25" Tile
 - 3) Color: Olivia 0287
 - 4) Install: Interlock, no adhesive
 - c. FTT-3 (Accent):
 - 1) Manufacturer: Gerflor
 - 2) Style: Attraction, 25"x25" Tile
 - 3) Color: Aurarae 0291
 - 4) Install: Interlock, no adhesive

C. Performance Criteria:

1. Wear Resistance: EN 660.2: $\leq 2.0\text{mm}^3$
2. Dimensional Stability: EN 434: $\leq 0.25\%$
3. Residual Indentation: EN 433: $\leq 0.10\text{mm}$
4. Chemical & Stain Resistance: EN 423, OK
5. TVOC after 28 days: ISO 16000-6: $< 100\text{ }\mu\text{g/m}^3$
6. Fire Performance: ASTM E 648; Class 1
7. Slab Moisture Design Tolerance:
 - a. Maximum relative humidity of 92 percent when tested according to ASTM F 2170.
 - b. Maximum moisture vapor emission rate of 10 pounds of water per 1000 sq. ft. in 24 hours when tested according to ASTM F1869.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify the Following:

1. The area in which the indoor resilient tile flooring will be installed is dry, weather-tight and in compliance with specified requirements.
2. Permanent heat, lighting and ventilation systems are installed and operable.
3. Other work, including overhead work, that could cause damage, dirt, dust or otherwise interrupt installation has been completed or suspended.
4. No foreign materials or objects are present on the substrate and that it is clean and ready for preparation and installation.
5. Tests to verify that the moisture vapor emission rate or substrate relative humidity is within the specified ranges.
6. The concrete slab surface pH level is within the specified range.
7. The concrete slab surface deviation is no greater than 3/16 inch within 10 feet (4.5 mm within 3 m) as described in AC1117R.
8. The concrete slab complies with ACI 302.2R for concrete design including use of a low-permeance vapor barrier directly beneath the concrete subfloor with sealed penetrations.

3.2 PREPARATION

- A. Prepare substrates according to manufacturer's written recommendations to ensure proper adhesion of resilient flooring system.
- B. Concrete Substrates: Prepare according to ASTM F 710.
 1. Verify that substrates are dry and free of sealers, curing compounds and other additives. Remove coatings and other substances that are incompatible with adhesives using mechanical methods recommended by manufacturer.

2. Alkalinity Testing: Perform pH testing according to ASTM F 710. Proceed with installation only if pH readings are between 7.0 and 8.5.
- C. Moisture Testing: Perform ASTM F 2170 relative humidity test and proceed with installation only after substrates have maximum relative humidity of 92 percent.
- D. Use trowelable concrete based leveling and patching compound with the same moisture vapor tolerance as the adhesive to fill depressions, holes, cracks, grooves or other irregularities in substrate.
- E. Place flooring and installation materials into spaces where they will be installed at least 48 hours before installation. Install flooring materials only after they have reached the same temperature as space where they are to be installed.
- F. Sand the surface of the concrete slab.
- G. Sweep and then vacuum substrates immediately before installation. After cleaning, examine substrate for moisture, alkaline salts, grit, dust or other contamination. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 VINYL TILE FLOORING INSTALLATION

- A. General:
 1. Comply with resilient tile flooring manufacturer's installation instructions.
 2. Take necessary precautions to minimize noise, odors, dust and inconvenience during installation.
 3. Fit flooring neatly and tightly to vertical surfaces, equipment anchors, floor outlets, and other interruptions of floor surface.
 4. Extend flooring into toe spaces, door reveals, closets, and similar openings unless otherwise indicated.
- B. Lay out flooring per manufacturer's recommendations.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations after completing resilient flooring installation:
 1. Remove marks and blemishes from flooring surfaces.
 2. Sweep and then vacuum flooring.
 3. Damp-mop flooring to remove soiling.
- B. Protect flooring from abrasions, indentations, and other damage from subsequent operations and placement of equipment, during remainder of construction period.

END OF SECTION

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes modular, tufted carpet tile.
- B. Related Requirements:
 - 1. Section 096513 "Resilient Base and Accessories" Section 096519 "Resilient Tile Flooring" for resilient wall base and accessories installed with carpet tile.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to carpet tile installation including, but not limited to, the following:
 - a. Review delivery, storage, and handling procedures.
 - b. Review ambient conditions and ventilation procedures.
 - c. Review subfloor preparation procedures.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
 - 2. Include installation recommendations for each type of substrate.
- B. Shop Drawings: Show the following:
 - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
 - 2. Carpet tile type, color, and dye lot.
 - 3. Type of subfloor.
 - 4. Type of installation.
 - 5. Pattern of installation.
 - 6. Pattern type, location, and direction.
 - 7. Pile direction.
 - 8. Type, color, and location of insets and borders.
 - 9. Type, color, and location of edge, transition, and other accessory strips.
 - 10. Transition details to other flooring materials.

- C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

- 1. Carpet Tile: Full-size Sample.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:
 - 1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
 - 2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated, but not less than 10 sq. yd..

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who is certified by the International Certified Floorcovering Installers Association at the Commercial II certification level.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

1.10 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.
- B. Environmental Limitations: Do not deliver or install carpet tiles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and ambient temperature and humidity conditions are maintained at occupancy levels during the remainder of the construction period.
- C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.
- D. Where demountable partitions or other items are indicated for installation on top of carpet tiles, install carpet tiles before installing these items.

1.11 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
 - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
 - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, dimensional stability, loss of face fiber, and delamination.
 - 3. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE (W-CPT)

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Interface "Entry Level Black 7187".

2.2 CARPET TILE (CPT)

- A. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Interface "Detours".

2.3 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.

2. Subfloor finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" for slabs receiving carpet tile.
 3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.
- C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.
- D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

- A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- B. Installation Method: As recommended in writing by carpet tile manufacturer.
- C. Maintain dye lot integrity. Do not mix dye lots in same area.
- D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

- A. Perform the following operations immediately after installing carpet tile:
1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.

2. Remove yarns that protrude from carpet tile surface.
 3. Vacuum carpet tile using commercial machine with face-beater element.
- B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."
- C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 098433 - SOUND-ABSORBING WALL UNITS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes shop-fabricated, panel units tested for acoustical performance, including:
 - 1. Sound-absorbing wall panels.

1.3 DEFINITIONS

- A. NRC: Noise Reduction Coefficient.
- B. SAA: Sound Absorption Average.

1.4 ACTION SUBMITTALS

- A. Shop Drawings: For sound-absorbing wall units. Include mounting devices and details; details at panel head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate panel edge and core materials.
 - 1. Include elevations showing panel sizes and direction of fabric weave and pattern matching.
- B. Samples for Verification: For the following products, prepared on Samples of size indicated below:
 - 1. Assembled Panels: Approximately 48 by 48 inches, including joints and mounting methods.

1.5 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For sound-absorbing wall units to include in maintenance manuals. Include fabric manufacturers' written cleaning and stain-removal recommendations.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials from same production run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Mounting Devices: Full-size units equal to 5 percent of amount installed, but no fewer than five devices, including unopened adhesives.

1.7 QUALITY ASSURANCE

- A. Source Limitations: Obtain sound-absorbing wall units from single source from single manufacturer.
- B. Fire-Test-Response Characteristics: Provide sound-absorbing wall units meeting the following as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
 - 1. Surface-Burning Characteristics: As determined by testing per ASTM E 84.
 - a. Flame-Spread Index: 25 or less.
 - b. Smoke-Developed Index: 450 or less.
 - 2. Fire Growth Contribution: Meeting acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265.
- C. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Comply with fabric and sound-absorbing wall unit manufacturers' written instructions for minimum and maximum temperature and humidity requirements for shipment, storage, and handling.
- B. Deliver materials and units in unopened bundles and store in a temperature-controlled dry place with adequate air circulation.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install sound-absorbing wall units until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
- B. Lighting: Do not install sound-absorbing wall units until a lighting level of not less than 50 fc is provided on surfaces to receive the units.
- C. Air-Quality Limitations: Protect sound-absorbing wall units from exposure to airborne odors, such as tobacco smoke, and install units under conditions free from odor contamination of ambient air.
- D. Field Measurements: Verify locations of sound-absorbing wall units and actual dimensions of openings and penetrations by field measurements before fabrication.

1.10 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of sound-absorbing wall units that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to the following:

- a. Acoustical performance.
 - b. Warping of core.
2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SOUND-ABSORBING WALL UNITS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide Tectum panels or comparable product by one of the following:
 1. Acoustical Solutions, Inc.
 2. Armstrong World Industries.
 3. Conwed Designscape; an Owens Corning company.
- B. General Requirements for Sound-Absorbing Wall Units: Units shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Sound-Absorbing Wall Panel : Manufacturer's standard panel construction consisting of painted core material.
 1. Basis-of-Design Product: Tectum Panels.
 2. Mounting: Back mounted with manufacturer's standard impaling clips, secured to substrate.
 3. Core: Manufacturer's standard or cementitious-fiber board . Provide wood or plywood nailing strips in core where indicated.
 4. Edge Construction: Manufacturer's standard Insert requirement.
 5. Edge Profile: Chamfered (beveled) .
 6. Corner Detail in Elevation: Square with continuous edge profile indicated.
 7. Reveals between Panels: Flush reveals .
 8. Acoustical Performance: Sound absorption NRC of not less than 0.65 according to ASTM C 423 for Type Amounting according to ASTM E 795.
 9. Nominal Overall Panel Thickness: As indicated on Drawings.
 10. Panel Width: As indicated on Drawings.
 11. Panel Height: As indicated on Drawings.

2.2 MATERIALS

- A. Core Materials: Manufacturer's standard.
 1. Cementitious-Fiber Board: Density of not less than 20 lb/cu. ft..
- B. Mounting Devices: Concealed on back of unit, recommended by manufacturer to support weight of unit, and as follows:
 1. Impaling Clips: Manufacturer's standard.

2.3 FABRICATION

- A. General: Use manufacturer's standard construction except as otherwise indicated; with facing material applied to face, edges, and back border of dimensionally stable core; and with rigid edges to reinforce panel perimeter against warpage and damage.
 - 1. and Cores: Chemically harden core edges and areas of core where mounting devices are attached.
- B. Facing Material: Apply fabric facing fully covering visible surfaces of unit; with material stretched straight, on the grain, tight, square, and free from puckers, ripples, wrinkles, sags, blisters, seams, adhesive, or other visible distortions or foreign matter.
 - 1. Square Corners: Tailor corners.
 - 2. Radius and Other Nonsquare Corners: Attach facing material so there are no seams or gathering of material.
- C. Dimensional Tolerances of Finished Units: Plus or minus 1/16 inch for the following:
 - 1. Thickness.
 - 2. Edge straightness.
 - 3. Overall length and width.
 - 4. Squareness from corner to corner.
 - 5. Chords, radii, and diameters.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fabric, fabricated units, substrates, areas, and conditions, for compliance with requirements, installation tolerances, and other conditions affecting performance of sound-absorbing wall units.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install sound-absorbing wall units in locations indicated with vertical surfaces and edges plumb, top edges level and in alignment with other units, faces flush, and scribed to fit adjoining work accurately at borders and at penetrations.
- B. Comply with sound-absorbing wall unit manufacturer's written instructions for installation of units using type of mounting devices indicated. Mount units securely to supporting substrate.
- C. Align and level fabric pattern and grain among adjacent units.

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb and Level: Plus or minus 1/16 inch.
- B. Variation of Panel Joints from Hairline: Not more than 1/16 inch wide.

3.4 CLEANING

- A. Clip loose threads; remove pills and extraneous materials.
- B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 098433

SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Galvanized metal.
- B. Related Requirements:
 - 1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
 - 2. Section 055000 "Metal Fabrications".
 - 3. Section 099600 "High-Performance Coatings" for special-use coatings.
 - 4. Section 099123 "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.

- C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches 200 mm square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal.3.8 L of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.9 sq. m.
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F7 deg C.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F 10 and 35 deg C.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F 3 deg C above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Architectural Finishes, Inc.
 - 3. Sherwin-Williams Company (The).
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: As selected by Architect from manufacturer's full range.

2.3 METAL PRIMERS

- A. Primer, Galvanized, Water Based: MPI #134.
 - 1. Sherwin-Williams; "Pro Industrial, Pro-Cryl Universal Primer".
 - 2. PPG Architectural; "Pitt-Tech Plus, 100% Acrylic DTM Industrial Primer".
 - 3. Benjamin-Moore; "Super Spec HP, Acrylic Metal Primer".

2.4 WATER-BASED PAINTS

- A. Light Industrial Coating, Exterior, Water Based, Semi-Gloss (Gloss Level 5): MPI #153.
 - 1. Sherwin-Williams; Industrial and Marine, DTM Acrylic Coating".
 - 2. PPG Architectural; Pitt-Tech Plus, Int/Ext DTM Industrial Enamel".
 - 3. Benjamin-Moore; Super Spec HP, DTM Acrylic".

2.5 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 4. Paint entire exposed surface of window frames and sashes.
 - 5. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 6. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Galvanized-Metal Substrates:

- 1. Water-Based Light Industrial Coating System:
 - a. Prime Coat: Primer, galvanized, water based, MPI #134.
 - b. Intermediate Coat: Light industrial coating, exterior, water based, matching topcoat.
 - c. Topcoat: Light industrial coating, exterior, water based, semi-gloss (Gloss Level 5), MPI #153.

END OF SECTION 099113

SECTION 099123 - INTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following interior substrates:
 - 1. Concrete.
 - 2. Concrete masonry units (CMU).
 - 3. Steel.
 - 4. Gypsum board.
- B. Related Requirements:
 - 1. Section 034500 "Precast Architectural Concrete".
 - 2. Section 042000 "Unit Masonry".
 - 3. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this Section.
 - 4. Section 052100 "Steel Joist Framing".
 - 5. Section 053100 "Steel Decking".
 - 6. Section 05500 "Metal Fabrication".
 - 7. Section 099600 "High-Performance Coatings" for high-performance and special-use coatings.
 - 8. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 DEFINITIONS

Below is Flat

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.

Below is Flat-Velvet like.

- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

Below is Eggshell.

- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.

Below is Satin.

- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.

Below is Semigloss.

- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.

Below is Gloss.

- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

Below is High Gloss.

- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples for Initial Selection: For each type of topcoat product.
- C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches 200 mm square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- D. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
 - 3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal.3.8 L of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. 9 sq. m.
 - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F 7 deg C.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F 10 and 35 deg C.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F 3 deg C above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Benjamin Moore & Co.
 2. PPG Architectural Finishes, Inc.
 3. Sherwin-Williams Company (The).
 4. Euclid Chemical.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles for the paint category indicated.

2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

- B. Material Compatibility:
 - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Dry-Fog Coatings: 400 g/L.
 - 4. Primers, Sealers, and Undercoaters: 200 g/L.
 - 5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
 - 6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 7. Pretreatment Wash Primers: 420 g/L.
 - 8. Floor Coatings: 100 g/L.
 - 9. Shellacs, Clear: 730 g/L.
 - 10. Shellacs, Pigmented: 550 g/L.
- D. Colors: As selected by Architect from manufacturer's full range.
 - 1. 30 percent of surface area will be painted with deep tones.

2.3 BLOCK FILLERS

- A. Block Filler, Latex, Interior/Exterior: MPI #4.
 - 1. Sherwin-Williams; "Prep-Rite Int/Ext Block Filler".
 - 2. PPG Architectural; "Glidden Professional, Concrete Coatings Block Filler Interior Exterior Primer".
 - 3. Benjamin Moore; Super Spec High Build Interior/Exterior Block Filler".

2.4 PRIMERS/SEALERS

- A. Primer Sealer, Latex, Interior: MPI #50.
 - 1. Sherwin-Williams; "Pro-Mar 200 Zero VOC Interior Latex Primer, White".
 - 2. PPG Architectural; "Speed-Hide Zero VOC Latex Sealer".
 - 3. Benjamin-Moore; "Coronado Super Kote 5000 Latex Primer Sealer".
- B. Primer, Alkali Resistant, Water Based: MPI #3.
 - 1. Sherwin-Williams; "Prep-Rite Pro Block, Interior/Exterior Latex Primer."
 - 2. PPG Architectural; "Perma-Crete Perma-Crete Int/Ext Alkali Resistant Primer".
 - 3. Benjamin-Moore; "Super Spec Interior/Exterior High Build Masonry Primer"..

2.5 METAL PRIMERS

- A. Primer, Rust-Inhibitive, Water Based: MPI #107.
 - 1. Sherwin-Williams; "Pro-Industrial Pro-Cryl Universal Primer".
 - 2. PPG Architectural; "Pitt-Tech Plus, Interior/Exterior DTM Industrial Primer".

3. Benjamin-Moore; "Super Spec HP, Acrylic Metal Primer".

2.6 WATER-BASED PAINTS

- A. Latex, Interior, (Gloss Level 3): MPI #52.
 1. Sherwin-Williams; Pro-Mar 200 Zero VOC Interior Latex.
 2. PPG Speedhide Zero Interior Zero VOC Latex.
 3. Benjamin-Moore; Coronado Super Kote 5000 Zero VOC Interior.
- B. Latex, Interior, High Performance Architectural, Semi-Gloss (Gloss Level 5): MPI #141.
 1. Sherwin-Williams; "Pro-Industrial, Acrylic Coating".
 2. PPG Architectural; "SpeedHide Interior Enamel Latex".
 3. Benjamin-Moore; "Ultra Spec 500, Interior Gloss".
- C. Light Industrial Coating, Interior, Water Based, Semi-Gloss (Gloss Level 5): MPI #153.
 1. PPG Architectural; Pitt-Tech Plus, Int/Ext Semi Gloss DTM. Industrial Enamel".
 2. Sherwin-Williams; "Pro Industrial, PreCatalyzed Water Based Epoxy".
 3. Benjamin-Moore; "Super Spec HP, D.T.M. Acrylic".

2.7 FLOOR COATINGS

- A. Sealer, Water Based, for Concrete Floors: MPI #99.
 1. H & C; Concrete and Masonry Waterproofing Sealer".
 2. PPG Architectural; Perma-Crete Plex-Seal WB Int/ExtClear Sealer".
 3. Euclid Chemical; "Euclid Super Diamond Clear VOX".

2.8 SOURCE QUALITY CONTROL

- A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
 1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 2. Testing agency will perform tests for compliance with product requirements.
 3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMU): 12 percent.
 - 3. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.

- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.
- D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- E. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
 - 1. Paint the following work where exposed in equipment rooms:
 - a. Equipment, including panelboards and switch gear.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.
 - g. Tanks that do not have factory-applied final finishes.
 - h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - 2. Paint the following work where exposed in occupied spaces:
 - a. Equipment, including panelboards.
 - b. Uninsulated metal piping.
 - c. Uninsulated plastic piping.
 - d. Pipe hangers and supports.
 - e. Metal conduit.
 - f. Plastic conduit.

- g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
 - h. Other items as directed by Architect.
- 3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

- A. Concrete Substrates, Nontraffic Surfaces, interior pre-cast concrete walls:
 - 1. High-Performance Architectural Latex System:
 - a. Prime Coat: Primer, alkali resistant, water based, MPI #3.
 - b. Intermediate Coat: Latex, interior, high performance architectural, matching topcoat.
 - c. Topcoat: Latex, interior, high performance architectural, semi-gloss (Gloss Level 5), MPI #141.
- B. Concrete Substrates, Traffic Surfaces:
 - 1. Water-Based Clear Sealer System:
 - a. First Coat: Sealer, water based, for concrete floors, MPI #99.
 - b. Topcoat: Sealer, water based, for concrete floors, MPI #99.
- C. CMU Substrates:
 - 1. Latex System:

- a. Block Filler: Block filler, latex, interior/exterior, MPI #4.
- b. Intermediate Coat: Latex, interior, matching topcoat.
- c. Topcoat: Latex, interior, (Gloss Level 3), MPI #52.

D. Steel Substrates:

1. Water-Based Light Industrial Coating System:

- a. Prime Coat: Primer, rust-inhibitive, water based MPI #107.
- b. Intermediate Coat: Light industrial coating, interior, water based, matching topcoat.
- c. Topcoat: Light industrial coating, interior, water based, semi-gloss (Gloss Level 5), MPI #153.

E. Gypsum Board Substrates:

1. Latex System:

- a. Prime Coat: Primer sealer, latex, interior, MPI #50.
- b. Intermediate Coat: Latex, interior, matching topcoat.
- c. Topcoat: Latex, interior, (Gloss Level 3), MPI #52.

END OF SECTION 099123

SECTION 099600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes surface preparation and application of high-performance coating systems. on the following substrates:
 - 1. Graffiti coating for Clay Masonry.
- B. Related Requirements:
 - 1. Section 099113 "Exterior Painting" for special-use coatings and general field painting.
 - 2. Section 099123 "Interior Painting" for special-use coatings and general field painting.

1.3 DEFINITIONS

- A. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include preparation requirements and application instructions.
- B. Samples for Verification: For each type of coating system and in each color and gloss of top-coat indicated.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Step coats on Samples to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- C. Product List: For each product indicated, include the following:
 - 1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
 - 2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.
 - 3. VOC content.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Coatings: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each coating system specified in Part 3.
 - a. Wall Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
 - 5. Test Area for Graffiti Coatings: Test a minimum 4 ft. by 4 ft. area on each type of masonry. Use the manufacturer's application instructions. Let test area protective treatment cure before inspection. Keep test panels available for comparison throughout the protective treatment project.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
- C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Benjamin Moore & Co.
 - 2. PPG Architectural Finishes, Inc.
 - 3. Sherwin-Williams Company (The).
- B. Basis of Design for Graffiti Coatings: Subject to compliance with requirements, provide products by PROSOCO or equivalent manufacturers. No- or low-gloss finish.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and are listed in "MPI Approved Products List."
- B. Material Compatibility:
 - 1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
 - 3. Provide products of same manufacturer for each coat in a coating system.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
 - 1. Flat Paints and Coatings: 50 g/L.
 - 2. Nonflat Paints and Coatings: 150 g/L.
 - 3. Primers, Sealers, and Undercoaters: 200 g/L.
 - 4. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: 250 g/L.
 - 5. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
 - 6. Pre-Treatment Wash Primers: 420 g/L.
 - 7. Floor Coatings: 100 g/L.
 - 8. Shellacs, Clear: 730 g/L.
 - 9. Shellacs, Pigmented: 550 g/L.
- D. Colors: As selected by Architect from manufacturer's full range.

2.3 ANTI-GRAFFITTI COATINGS

- A. Clear, solvent-based silicone elastomer formulated to weatherproof concrete block and other porous masonry materials and protect treated surfaces from repeated graffiti attacks without altering the natural appearance.
 - 1. Sure Klean® Weather Seal Blok-Guard® & Graffiti Control II

2.4 SOURCE QUALITY CONTROL

- A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
 - 1. Owner will engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
 - 2. Testing agency will perform tests for compliance with product requirements.
 - 3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
 - 1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - a. Masonry (Clay and CMU): 12 percent.
- B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- C. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

- D. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or if alkalinity of mortar joints exceed that permitted in manufacturer's written instructions.
 - 1. Clean surfaces with pressurized water. Use pressure range of 100 to 600 psi (690 to 4140 kPa) at 6 to 12 inches (150 to 300 mm).

3.3 APPLICATION

- A. Apply high-performance coatings according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for coating and substrate indicated.
 - 2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.
 - 3. Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
 - 4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
- B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
- C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
- D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.
- E. Apply graffiti coatings in accordance with manufacturer recommendations using spray, brush or roller.
 - 1. Apply enough in a single saturating application to completely wet the surface without creating drips, puddles or rundown. Brush out or back roll all runs and drips for uniform appearance. Do not over apply. Over application may cause unacceptable color change. One application is normally enough. Always test for application rate.
 - 2. Apply graffiti coatings around entire perimeter of exterior pre-cast walls up to 10 feet above finished grade.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner will engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
 - 1. Contractor shall touch up and restore coated surfaces damaged by testing.
 - 2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

END OF SECTION 099600

SECTION 102213 - WIRE MESH PARTITIONS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Standard-duty wire mesh partitions.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For units with factory-applied color finishes.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. American Woven Wire Corporation.
- B. Central Wire and Iron.
- C. Jesco Industries, Inc.
- D. Standard Wire & Steel Works.
- E. WireCrafters, LLC.

2.2 MATERIALS

- A. Steel Wire: ASTM A 510 (ASTM A 510M).
- B. Steel Plates, Channels, Angles, and Bars: ASTM A 36/A 36M.
- C. Steel Sheet: Cold-rolled steel sheet, ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- D. Steel Pipe: ASTM A 53/A 53M, Schedule 40, unless another weight is indicated or required by structural loads.
- E. Steel Tubing: ASTM A 500/A 500M, cold-formed structural-steel tubing or ASTM A 513, Type 5, mandrel-drawn mechanical tubing.

- F. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer, complying with MPI#79.

2.3 STANDARD-DUTY WIRE MESH PARTITIONS

- A. Mesh: 0.135-inch- (3.5-mm-) diameter, intermediate-crimp steel wire woven into 1-1/2-inch (38-mm) diamond mesh.
- B. Vertical Panel Framing: 1-1/4-by-5/8-by-0.080-inch (32-by-16-by-2.0-mm) cold-rolled, C-shaped steel channels with holes for 1/4-inch- (6-mm-) diameter bolts not more than 12 inches (300 mm) o.c.
- C. Horizontal Panel Framing: 1-by-1/2-by-1/8-inch (25-by-13-by-3.2-mm) cold-rolled steel channels.
- D. Horizontal Panel Stiffeners: Two cold-rolled steel channels, 3/4 by 3/8 by 1/8 inch (19 by 9.5 by 3.2 mm), bolted or riveted toe to toe through mesh or one 1-by-1/2-by-1/8-inch (25-by-13-by-3.2-mm) cold-rolled steel channel with wire mesh woven through channel.
- E. Top Capping Bars: 2-1/4-by-1-inch (57-by-25-mm) cold-rolled steel channels.
- F. Posts for Other-Than-90-Degree Corners: Steel pipe or tubing with holes for 1/4-inch- (6-mm-) diameter bolts aligning with bolt holes in vertical framing; with floor anchor clips.
 - 1. Partitions up to 12 Feet (3.7 m) High: 1-1/4-inch (32-mm) OD by 1/8 inch (3.2 mm).
- G. Floor Shoes: Metal, not less than 2 inches (50 mm) high; sized to suit vertical framing, drilled for attachment to floor, and with set screws for leveling adjustment.
- H. Swinging Doors: Fabricated from same mesh as partitions, with framing fabricated from 1-1/4-by-1/2-by-1/8-inch (32-by-13-by-3.2-mm) steel channels or 1-1/4-by-5/8-by-0.080-inch (32-by-16-by-2.0-mm) cold-rolled, C-shaped steel channels, banded with 1-1/4-by-1/8-inch (32-by-3.2-mm) flat steel bar cover plates on [three] [four] sides, and with 1/8-inch- (3.2-mm-) thick angle strike bar and cover on strike jamb.
 - 1. Hinges: Full-surface type, 3-by-3-inch (76-by-76-mm) steel, three per door; bolted, riveted, or welded to door and jamb framing.
 - 2. Cylinder Lock: Mortise type with manufacturer's standard cylinder; operated by key outside and lever inside.
- I. Accessories:
 - 1. Sheet Metal Base: 0.060-inch- (1.5-mm-) thick steel sheet.
 - 2. Adjustable Filler Panels: 0.060-inch- (1.5-mm-) thick steel sheet, capable of filling openings from 2 to 12 inches (50 to 300 mm).
- J. Finish: Enamel finish unless otherwise indicated.
 - 1. Color: As selected by Architect from manufacturer's full range.

2.4 FABRICATION

- A. General: Fabricate wire mesh items from components of sizes not less than those indicated. Use larger-sized components as recommended by wire mesh item manufacturer. Furnish bolts,

hardware, and accessories required for complete installation with manufacturer's standard finishes.

1. Welding: Weld corner joints of framing and grind smooth, leaving no evidence of joint.
- B. Standard-Duty Wire Mesh Partitions: Fabricate wire mesh partitions with cutouts for pipes, ducts, beams, and other items indicated. Finish edges of cutouts to provide a neat, protective edge.
 1. Mesh: Weld mesh to framing.
 2. Framing: Fabricate framing with mortise and tenon corner construction.
 - a. Provide horizontal stiffeners as indicated or, if not indicated, as required by panel height and as recommended by wire mesh partition manufacturer. Weld horizontal stiffeners to vertical framing.
 3. Fabricate wire mesh partitions with 3 to 4 inches (75 to 100 mm) of clear space between finished floor and bottom horizontal framing.
 4. Fabricate wire mesh partitions with bottom horizontal framing flush with finished floor.
 5. Doors: Align bottom of door with bottom of adjacent panels.
 - a. For doors that do not extend full height of partition, provide transom over door, fabricated from same mesh and framing as partition panels.
 6. Hardware Preparation: Mortise, reinforce, drill, and tap doors and framing as required to install hardware.

PART 3 - EXECUTION

3.1 WIRE MESH PARTITIONS ERECTION

- A. Anchor wire mesh partitions to floor with 3/8-inch- (9.5-mm-) diameter postinstalled expansion anchors at 12 inches (300 mm) o.c. through anchor clips located at each post and corner. Shim anchor clips as required to achieve level and plumb installation.
- B. Anchor wire mesh partitions to floor with 3/8-inch- (9.5-mm-) diameter postinstalled expansion anchors at 12 inches (305 mm) o.c. through floor shoes located at each post and corner. Adjust wire mesh partition posts in floor shoes to achieve level and plumb installation.
- C. Anchor wire mesh partitions to walls at 12 inches (305 mm) o.c. through back corner panel framing.
- D. Secure top capping bars to top framing channels with 1/4-inch- (6-mm-) diameter "U" bolts spaced not more than 28 inches (700 mm) o.c.
- E. Provide seismic supports and bracing as indicated or, if not indicated, as recommended by manufacturer and as required for stability, extending and fastening members to supporting structure.
- F. Where standard-width wire mesh partition panels do not fill entire length of run, provide adjustable filler panels to fill openings.
- G. Install doors complete with door hardware.

3.2 ADJUSTING AND CLEANING

- A. Adjust doors to operate smoothly and easily, without binding or warping. Adjust hardware to function smoothly. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 102213

SECTION 104413 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire protection cabinets for the following:
 - a. Portable fire extinguishers.
- B. Related Sections:
 - 1. Section 099123 "Interior Painting" for field painting fire protection cabinets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
 - 1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.
 - 2. Show location of knockouts for hose valves.
- B. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:
 - 1. Size: 6 by 6 inches square.

1.4 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to fire protection cabinets including, but not limited to, the following:
 - a. Schedules and coordination requirements.

1.5 COORDINATION

- A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire hoses, hose valves, and hose racks indicated are accommodated.
- C. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.6 SEQUENCING

- A. Apply vinyl lettering on field-painted, fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- B. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

2.2 FIRE PROTECTION CABINET -FEC-1

- A. Cabinet Type: Suitable for fire extinguisher.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. J. L. Industries, Inc., a division of Activar Construction Products Group; .
 - b. Kidde Residential and Commercial Division, Subsidiary of Kidde plc; .
 - c. Larsen's Manufacturing Company; .
 - d. Potter Roemer LLC; .
- B. Cabinet Construction: Nonrated.
 - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch- thick, cold-rolled steel sheet lined with minimum 5/8-inch- thick, fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: Steel sheet.
 - 1. Shelf: Same metal and finish as cabinet.
- D. Semirecessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semirecessed cabinet installation.
 - 1. Rolled-Edge Trim: 2-1/2-inch backbend depth.

- E. Cabinet Trim Material: Steel sheet.
- F. Door Material: Steel sheet .
- G. Door Style: Vertical duo panel with frame.
- H. Door Glazing: Tempered float glass (clear).
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
 - 1. Provide continuous hinge, of same material and finish as trim, permitting door to open 180 degrees.
- J. Accessories:
 - 1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
 - 2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
 - 3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
 - 4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated or as directed by Fire Department.
 - a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
 - 1) Location: Applied to cabinet door.
 - 2) Application Process: Silk-screened .
 - 3) Lettering Color: Red.
 - 4) Orientation: Vertical.
- K. Finishes:
 - 1. Manufacturer's standard baked-enamel paint for the following:
 - a. Exterior of cabinet , door, and trim except for those surfaces indicated to receive another finish.
 - b. Interior of cabinet and door.
 - 2. Steel: Factory primed for field painting.

2.3 FABRICATION

- A. Fire Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.
 - 1. Weld joints and grind smooth.
 - 2. Provide factory-drilled mounting holes.
 - 3. Prepare doors and frames to receive locks.
 - 4. Install door locks at factory.
- B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
 - 1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2

- inch thick.
- 2. Miter and weld perimeter door frames.

- C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Protect mechanical finishes on exposed surfaces of fire protection cabinets from damage by applying a strippable, temporary protective covering before shipping.
- C. Finish fire protection cabinets after assembly.
- D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.5 STEEL FINISHES

- A. Surface Preparation: Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning" .
- B. Factory Prime Finish: Apply manufacturer's standard, fast-curing, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine walls and partitions for suitable framing depth and blocking where semirecessed recessed and semirecessed cabinets will be installed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Prepare recesses for semirecessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 INSTALLATION

- A. General: Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.
- B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semirecessed fire protection cabinets.
2. Provide inside latch and lock for break-glass panels.
3. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

C. Identification: Apply vinyl lettering at locations indicated.

3.4 ADJUSTING AND CLEANING

- A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
- B. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
- D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
- E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413

SECTION 107316 - ALUMINUM CANOPY SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Hanger rod supported, pre-engineered metal canopies including fascia channels, decking, tension rods, and attachment hardware.

1.2 RELATED SECTIONS

- A. Section 07 62 00 - Sheet Metal Flashing and Trim.
- B. Section 07 92 00 - Joint Sealants.

1.3 REFERENCES

- A. ASTM B 221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- B. ASTM B 429 - Standard Specification for Aluminum-Alloy Extruded Pipe and Tube.
- C. Aluminum Association AA DAF 45 - Designation System for Aluminum Finishes.

1.4 PERFORMANCE REQUIREMENTS

- A. Canopy must conform to local building codes.
- B. PE Stamped calculations are required and must be signed and sealed by an engineer licensed within the State of Illinois.

1.5 SUBMITTALS

- A. Submit under provisions of Section 013300 - Submittal Procedures.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Indicate system components, dimensions, attachments, and accessories
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 3 inches (76 mm) square, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- G. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic checking and adjustment of cable tension and periodic

cleaning and maintenance of all railing and infill components.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience and approved by manufacturer.
- C. Design structural components, develop shop drawings, and perform shop and site work under direct supervision of Professional Engineer experienced in design of this Work and licensed at Project location.
- D. Welder Qualifications: All welders must be AWS certified welders.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products with labels intact, in manufacturer's unopened packaging until ready for installation.
- B. Handle materials so as to protect materials, coatings, and finishes during transportation and installation to prevent damage or staining.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide products by Mapes Canopies, Lincoln, Nebraska; phone: 888-273-1132; fax: 877-455-6572.
- B. Requests for substitutions will be considered in accordance with the provisions of Section 016000 - Product Requirements.

2.2 EXTERIOR CANOPY SYSTEM

- A. Hanger Rod Supported Metal Canopies: Mapes Canopies: building supported, pre-engineered metal canopy system provided with fascia channels, decking, tension rods, and attachment hardware.
 - 1. Materials:
 - a. Aluminum Extrusions: ASTM B 221 and ASTM B 429 6061-T6 alloy and temper.
 - b. Fasteners: Stainless steel or hot dip galvanized for corrosion resistance.
 - 2. Fascia:
 - a. Standard 8 inch with 8 inch industrial profile.
 - 3. Decking Profiles:
 - a. 1-3/4 inch Roll Formed.
 - 4. Wall Plate Designs:
 - a. 6 inch Contemporary.
 - 5. Framing:
 - a. Type: Extruded aluminum J channels.
 - b. Size: 8 inch by 1/8 inch (203 mm by 3 mm) thick.

6. Canopy Supports:
 - a. 3 inch by 2.5 inch by .25 inch (76 mm by 63.5 mm by 6 mm) Extruded Aluminum Canopy Support "I" Beam.
 - b. Attachment: 1 inch (25 mm) diameter steel hanger rod finished to match canopy
7. Accessories:
 - a. Anchors and Fasteners: Stainless steel or hot dip galvanized and corrosion resistant.
8. Finish:
 - a. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-C12C40R1x (Chemical Finish: cleaned with inhibited chemicals; Chemical Finish: conversion coating; Organic Coating: manufacturer's standard two-coat, thermocured system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride resin by weight). Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2605 and with coating and resin manufacturers' written instructions.
 - 1) Color and Gloss: As selected by Architect from full range of industry colors and color densities.

2.3 FABRICATION

- A. All canopies are shipped in preassembled sections for ease of installation.
- B. All connections shall be mechanically assembled utilizing 3/15 fasteners with a minimum shear stress of 350 lb. Pre-welded or factory-welded connections are not acceptable.
- C. Decking shall be designed with interlocking roll-formed aluminum members.
- D. Concealed drainage: Water shall drain from covered surfaces into intermediate trough and be directed to Front Scupper.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Field verifies dimensions of supporting structure and any openings at site of installation prior to fabrication
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, in proper plane, free from warp and twist.
- C. Anchor system to building components; provide adequate clearance for movement caused by thermal expansion and contraction and wind loads.

3.4 CLEANING

- A. Clean all surfaces and restore any marred or abraded surfaces to original conditions as approved by the Architect.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

3.6 WARRANTY

- A. Warrant the canopy system to be free from defects in workmanship and materials for a period of 10 years from the date of final completion of the canopy.

END OF SECTION

SECTION 114000 – FOODSERVICE EQUIPMENT

PART 1 – GENERAL

1.1 WORK INCLUDES

- A. The work referred to in this section consists of furnishing all labor and material required to provide and deliver all equipment hereinafter specified into the building, uncrate, assemble, hang, set in place, level, and completely install, exclusive of final utility connections.
- B. Coordinate but do not install (unless specifically directed to do so in the technical specifications) Owner and Vendor-supplied equipment noted on the drawings or in the specifications as NIKEC. Show on roughing in plans the sizes, utilities, and other requirements as furnished in the Specifications, by Owner or appropriate supplier in submittals as if the equipment is contractor furnished.
- C. Coordinate and show sizes, utilities, and other requirements as determined by physical inspection for equipment noted as existing to be reused. Include costs for marking, removing, storing, cleaning, redelivering and installing such equipment. All requirements within the project manual apply to reused equipment except warranty as if contractor furnished including but not limited to code compliance and accessories necessary to conform with the new application.

1.2 SUBMITTALS

- A. Upon award of Contract, furnish the Architect with reproducible copies of the following drawings, in accordance with the approved project schedule, which shall be made on sheets equal in size and matching the bid set drawing size. Reproduced copies of bid documents will not be accepted for this purpose in any fashion.
 - 1. Equipment specified for fabrication shall be detailed and fully dimensioned to a minimum scale of $3/4" = 1'-0"$ (1:20) for plan and elevation views and $1-1/2" = 1'-0"$ (1:10) for sections.
 - 2. Prepare separate electrical and mechanical dimensioned rough-in drawings at $1/4" = 1'-0"$ (1:50) showing exact point of penetration of floors, walls, and ceilings for all services required to operate the equipment that the Contractor shall furnish, including the requirements for Contractor supplied and installed refrigerant and beverage piping line runs. These drawings shall also show exact locations of final connections to equipment. Indicate floor drains, floor sinks, receptacles, lights, and other special conditions related to the equipment known to the Contractor but provided under other Sections.
 - 3. Dimensioned drawings shall be submitted showing the location and size of all bases, depressions, grease interceptors, special height walls, openings in walls for equipment or operations, and critical dimensions, etc. Drawings shall be drawn to a scale of not less than $1/4" = 1'-0"$ (1:50).
- B. Manufacturers' Data: Upon award of Contract, submit bound copies of Manufacturers' Illustrations and Technical Data to the Architect for review prior to procurement. Items of Standard Manufacture shall be submitted, including items purchased to be built into fabricated equipment. Each illustration shall be marked to describe accurately the item to be furnished as specified, including voltage, phase, load, accessories, etc.

- C. Manufacturers' List: Submit in writing a list of all manufacturers' representatives of the foodservice equipment, such as convection ovens, ranges, etc., and their authorized service agencies' addresses and telephone numbers.
- D. Foundation Data: Data and drawings shall be submitted for each item, if any, requiring special foundations, structures, or supports. Such foundations, structures, or supports will be provided and installed by other appropriate trades in accordance with the drawings and specifications which shall be provided by the Contractor and reviewed by the Architect.
- E. Operation and Maintenance Manuals: Provide three bound copies of operation, maintenance, and parts manuals for all equipment items of standard manufacture including standard component assemblies built into all custom-fabricated items.
- F. Review by the Architect of the drawings and brochures submitted by the Contractor does not waive the responsibility of the Contractor to furnish each item of equipment in complete compliance with the specifications and contract drawings.
- G. The number of copies of all submittals shall be as determined by the Architect.
- H. Samples: Samples of materials, products, and fabrication methods shall be submitted for review at no additional cost, before proceeding with the work.

1.3 QUALITY ASSURANCE

- A. Standard Products: Materials, products, and equipment furnished under this contract shall be the standard items of manufacturers regularly engaged in the production of such materials, products, and equipment and shall be of the manufacturers' latest design that complies with the specifications.
- B. Manufacturers' Qualifications: Manufacturers shall be regularly engaged in the production of the items furnished and shall have demonstrated the capability to furnish similar equipment that performs the functions specified or indicated herein.
- C. Installation Qualifications: Contractor shall use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work defined in this Section.
- D. Coordination of Work: Coordinate work with the respective trades performing preparatory work for installation of equipment under this Contract, including, but not limited to: construction of pits, trenches, receptors; rough-in of supply, waste and vent piping; electrical connections; and field verification of dimensions.
- E. Product Options: Drawings indicate foodservice equipment based upon equipment specified herein. All substitutions shall be in compliance with the requirements in Division 1 (or Section I if appropriate.).
- F. Conflict: Where written specifications and drawings conflict or appear to conflict, request clarification. Prior to receiving clarification use the greater quality or greater quantity.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver foodservice equipment in containers designed to protect equipment and finish until final installation. Make arrangements to receive equipment at project site at a time and place agreed with the General Contractor. If the site is not ready for delivery, then either delay delivery or arrange to hold in a secure and protected warehouse until delivery can be made to job site.

- B. Store foodservice equipment in original containers and in location to provide adequate protection to equipment while not interfering with other construction operations. Coordinate with other trades so that worktables, serving counters and equipment are not used for scaffolding or as workbenches.
- C. Handle foodservice equipment carefully to avoid damage to components, enclosures, and finish. Do not install damaged foodservice equipment; replace and return damaged components to equipment manufacturer.

1.5 APPLICABLE CODES AND STANDARDS

- A. Except as otherwise indicated, each item of equipment shall comply with the latest current edition of the following standards as applicable to the manufacture, fabrication, and installation of the work in this section. Comply with all Federal, State, and Municipal regulations and notifications which bear on the execution of this work. Call to the attention of the Owner in writing any design conflict with the requirements of the Americans with Disabilities Act (ADA) during Bid Process so resolution can be effected prior to Contract Award.
 - 1. NSF Standards: Comply with applicable National Sanitation Foundation standards and criteria and provide NSF "Seal of Approval" on each manufactured item and on major items of custom-fabricated work.
 - 2. UL / ETL / CSA Standards: For electrical components and assemblies, provide either UL / ETL / CSA listed products or, where no listing service is available, provide a complete index of the components used as selected from the UL / ETL / CSA "Recognized Component Index." For fire extinguishing systems comply with UL 300.
 - 3. ANSI Standards: Comply with applicable ANSI standards for electric-powered and gas-burning equipment; for piping to compressed-gas cylinders; and for plumbing fittings, including vacuum breakers and air gaps, to prevent siphonage in water piping.
 - 4. AGA / CGA: All gas-fired equipment shall be AGA / CGA approved, equipped to operate on the type gas available at the job site, and shall contain 100% automatic safety shut-off devices.
 - 5. NFPA Standards: Comply with NFPA Bulletin 96 for exhaust systems; with NFPA Bulletins 13, 17, 17A and 96 for fire extinguishing systems; and with NFPA 54, National Fuel Gas Code and NFPA 70, National Electrical Code.
 - 6. ASME Code: Comply with ASME boiler code requirements for steam-generating and steam-heated equipment; provide ASME inspection, stamps, and certification of registration with National Board.
 - 7. SMACNA Guidelines: Provide seismic restraints for food service equipment to comply with the Sheet Metal and Air Conditioning Contractors National Association's (SMACNA) "Kitchen Equipment Fabrication Guidelines", appendix 1, "Guidelines for Seismic Restraints of Kitchen Equipment", unless otherwise indicated.
 - 8. ASHRAE: Provide mechanical refrigeration systems complying with the American Society of Heating, Refrigerating and Air Conditioning Engineers' ASHRAE 15, "Safety Code for Mechanical Refrigeration".

1.6 PROJECT CONDITIONS

- A. Visit the job site to field check actual wall dimensions and roughing-in and be responsible for furnishing, fabricating, and installing the equipment in accordance with the available space and utility services as they exist on the job site for an accurate fit.

- B. Check all door openings, passageways, elevators, etc., to be sure that the equipment can be conveyed to its proper location within the building and, if necessary, check with the Contractor regarding the possibility of holding wall erection, placement of doorjamb, windows, etc., for the purpose of moving the equipment to its proper location. Any removal and rebuilding of walls, partitions, doorjamb, etc., necessary to place the equipment or, if caused by incorrect information on the Contractor's drawings, shall be done at the expense of the Contractor.
- C. Physically check the location and utility size of all "rough-ins" at the job site for compatibility with the equipment being installed before finished floors, walls, and/or ceilings are in place.
- D. Check electrical characteristics and water, steam, and gas pressure. Provide pressure-regulating valves where required for proper operation of equipment.

1.7 GUARANTIES AND WARRANTIES

- A. Self-contained or remote refrigeration systems furnished under this Contract shall be provided with start-up and a one-year service contract providing free service, 24 hours per day, seven days per week, including parts and labor. Hermetic or semi-hermetic compressors shall be covered by the manufacturers' factory warranty for an additional four years. Other equipment provided shall include a one-year warranty covering parts and labor, plus any extended warranties as normally provided by individual manufacturers. Equipment including refrigeration systems both self-contained and remote shall be warrantied by the Contractor on the project for one year as indicated in the preceding sentence. The first day of the first year commences upon the issuance of a certificate of occupancy for each area.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The equipment and its component parts shall be new and unused. All items of standard manufactured equipment shall be current models at the time of delivery. Parts subject to wear, breakage, or distortion shall be accessible for adjustment, replacement, and repair.
- B. Means shall be provided to ensure adequate lubrication for moving parts. Oil holes, grease fittings, and filler caps shall be accessible without the use of tools.
- C. The design of the equipment shall be such as to provide for safe and convenient operation. Covers or other safety devices shall be provided for all items of equipment presenting safety hazards. Such guards or safety devices shall not present substantial interference to the operation of the equipment. Guards shall provide easy access to guarded parts.
- D. Trim shall not be an acceptable substitute for accuracy and neatness. When trim is required and accepted by Architect in lieu of rejection of items of equipment, it shall be the Contractor's responsibility to provide same at no additional cost.
- E. Unless otherwise specified herein, no material lighter than #20 gauge shall be incorporated into the work. Gauges for sheet iron and sheet steel shall be U.S. Standard Gauges and finished equipment gauge thickness shall not vary more than 5% plus or minus from the thickness indicated below.

<u>GAUGE</u>	<u>THICKNESS</u>	<u>GAUGE</u>	<u>THICKNESS</u>
#10	0.1406" (3.0mm)	#16	0.0625" (1.6mm)
#12	0.1094" (2.5mm)	#18	0.0500" (1.25mm)
#14	0.0781" (2.0mm)	#20	0.0375" (1.0mm)

- F. Materials or work described in words which have a well-known and accepted technical or trade meaning shall be held to refer to such accepted meanings.

2.2 MATERIALS

- A. Submit a certified copy of the mill analysis of materials if requested by the Architect.
- B. Stainless steel sheets shall conform to American Society for Testing and Materials (ASTM) specification A240, Type 304 Condition A, 18-8, having a No. 4 finish. A No. 2B finish shall be acceptable on surfaces of equipment not exposed to view. Sheets shall be uniform throughout in color, finish, and appearance.
- C. Stainless steel tubing and pipe shall be Type 304, 18-8, having a No. 4 finish, and shall conform to either ASTM A213 if seamless or ASTM A249 if welded.
- D. Rolled shapes shall be of the cold-rolled type conforming to ASTM A36.
- E. Galvanized sheet steel shall conform to ASTM A526; where extensive forming to take place, conform to ASTM A527; conform to ASTM A525, coating designation G115, chemical treatment.
- F. Galvanized steel sheets shall be cold-rolled, stretcher leveled, bonderized, and rerolled to ensure a smooth surface.
- G. Castings shall be corrosion-resisting metal containing not less than 30% nickel. Castings shall be rough ground, polished, and buffed to bright luster and free from pit marks, runs, checks, burrs, and other imperfections. In lieu of corrosion-resisting metal castings, die-stamped or cast 18-8 stainless steel will be acceptable.
- H. Millwork materials shall be free from defects impairing strength, durability, or appearance; straight and free from warpage; and of the best grade for their particular function. Wood shall be well seasoned and kiln dried and shall have an average moisture content of 8%, a maximum of 10%, and a minimum of 5%.
1. Plywood and other woodwork of treatable species, where so required by the code, shall be fire-retardant treated to result in a flame spread rating of 25 or less with no evidence of significant progressive combustion when tested for 30 minutes duration under ASTM E84 and shall bear the testing laboratory mark on a surface to be concealed.
 2. Concealed softwood or hardwood lumber shall be of poplar, Douglas fir, basswood, red oak, birch, maple, beech, or other stable wood and shall be select or better grade, unselected for color and grain, surfaced four sides, square-edged, and straight. Basswood may be used where fire-retardant treated materials are required.
 3. Plywood for transparent finish shall conform to U.S. Product Standard PS-51-71, Type I (fully waterproofed bond), with architectural grade face veneers of species as specified, free of all pin knots, patches, color streaks and spots, sapwood, and other defects. Plywood designated to have plywood cores shall be of either 5 ply or 7 ply construction. Plywood so designated on the drawings and plywood not otherwise shown shall have a particle board core, cross banding of veneers, and face and back veneers. Particle board cores shall have a 45-pound density, except where the fire retardant treatment requires cores of lesser density.
 4. Face veneers shall be matched for color and grain to produce balance and continuity of character. Mineral streaks and other discolorations, worm holes, ruptured grain, loose texture, doze, or shake will not be permitted. Face veneer leaves on each surface shall be full-length, book matched, center matched, and sequence matched. Surfaces shall be sequenced and blueprint matched. Veneers not otherwise indicated shall be plain sliced. Backing veneers for concealed surfaces shall be of a species and thickness to balance the pull of the face veneers.

5. Hardwood plywood for painted surfaces shall conform to U.S. Product Standard PS-51-71, Type I, and shall have sound birch, maple, or other approved close grain hardwood faces suitable for a paint finish.
6. Perforated hardboard shall be a tempered hardboard, 1/4" (6 mm) thick, conforming to Federal Specification LLL-B-810B, Type I, SIS, Finish B (primed), Design B (perforated), with 1/4" (6 mm) diameter holes spaced on 1" (25 mm) centers both ways.
7. Plastic laminate surfaces shall be laminated with thermosetting decorative sheets of the color, pattern, and style as selected by the Architect. Horizontal surfaces shall be laminated with sheets conforming to Federal Specification L-P-508F, Style D, Type I (general purpose), Grade HP, Class 1, 1/16" (2 mm) thick, satin finish, with rough sanded backs. Vertical surfaces shall be laminated with sheets conforming to Federal Specification L-P-598F, Style D, Type II, (vertical surface), Grade HP, Class 1, non-forming, satin finish, 1/32" (1 mm) thick or heavier. Surfacing for curved surfaces shall be laminated from sheets conforming to Federal Specification L-P-508F, Style D, Type III (post-forming), Grade HP, Class 1, satin finish. Balance sheets for backs in concealed locations shall be either reject material of the same type and thickness as the general purpose grade facing or may be .020" (0.5 mm) thick laminate backing sheets conforming to Federal Specification L-P-00508E, Style ND, Type V (backing sheet), Grade HP.
8. Adhesive for application of plastic laminate to wood substrates of counter tops shall be a phenolic, resorcinol, or melamine adhesive conforming to Federal Specification MMM-A-181C and producing a waterproof bond. Adhesive for applying plastic laminate to vertical surfaces shall be either a waterproof type or a water resistant type such as a modified urea-formaldehyde resin liquid glue conforming to Federal Specification MMM-A-188C. Contact adhesive will not be acceptable.
9. Plywood for laminate assemblies shown or specified with plywood core shall be of the 5 or 7 ply construction with sanded close-grain hardwood face and back veneers, laminated with waterproof glue, in thickness shown, conforming to U.S. Product Standard PS-51-71. Particle board for plastic laminate assemblies shown or specified with particle board wood core shall conform to U.S. Products Standard CS-236-66, Type 1 or 2, Grade B (45 pound density), Class 2; except where fire-retardant treatment is required, the density shall conform to the treatment requirements.
- I. Sealant: ASTM C 920; type S, Grade NS, Class 25, use, NT. Provide elastomeric sealant, NSF certified for end use application indicated. Provide sealant that, when cured and washed, meeting requirements of Food and Drug Administration's 21 CFR, Section 177.2600 for use in areas that come in contact with food. Dow-Corning #780 or General Electric "Silastic" or approved equal in either clear or approved color to match surrounding surfaces and applied in accordance with sealant manufacturers' recommendations for smooth, sealed finish.
- J. Tempered Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated surfaces), Type I (transparent), Class 1 (clear), Quality q3 (glazing select). Provide products complying with ANSI Z97.1, manufactured by horizontal (roller hearth) process and 1/4" (6 mm) thick, unless otherwise indicated. Provide exposed safety edges, if any, seamed before tempering.
- K. Sound Dampening: NSF-certified, nonabsorbant, hard-drying, sound deadening coating. Provide coating compounded for permanent adhesion to metal in 1/8" (3 mm) thickness that does not chip, flake, or blister.

2.3 FINISHES

- A. Paint and coatings shall be of an NSF approved type suitable for use in conjunction with foodservice equipment. Such paint or coating shall be durable, non-toxic, non-dusting, non-flaking, and mildew

resistant; shall comply with all governing regulations; and shall be applied in accordance with the recommendations of the manufacturer.

- B. Exterior, galvanized parts, exposed members of framework, and wrought steel pipe where specified to be painted shall be cleaned, properly primed with rust-inhibiting primer, degreased, and finished with two (2) coats of epoxy-based grey hammertone paint, unless otherwise specified.
- C. Stainless steel, where exposed, shall be polished to a #4 commercial finish. Where unexposed, finish shall be #2B. The grain of polishing shall run in the same direction wherever possible. Where surfaces are disturbed by the fabricating process, such surfaces shall be finished to match adjacent undisturbed surfaces.
- D. Galvanized shelving shall not be painted.
- E. Fabricated equipment shall be spray coated with plastic suitable for protecting the equipment during transport and installation. The coating shall be easily removable and shall be removed after the equipment installation is complete at the work site or, alternatively, when directed by the Architect.
- F. Exposed surfaces on brass, bronze, or steel shall be plated with chromium over nickel in accordance with Federal Specifications WW-P-541, Paragraph 9.5 and Table 9.4, unless otherwise specified.

2.4 ELECTRICAL AND MECHANICAL REQUIREMENTS

- A. Standard UL / ETL / CSA listed materials, devices, and components shall be selected and installed in accordance with NEMA Standards and recommendations and as required for safe and efficient use and operation of the foodservice equipment without objectionable noise, vibration, and sanitation problems.
 - 1. Provide recognized commercial grade signals, "on-off" pushbuttons or switches, and other speed and temperature controls as required for operation of each item, complete with pilot lights and permanent engraved, plastic laminate signs and graphics identifying each item. Provide stainless steel cover plates at controls and signals.
 - 2. Each item requiring electrical power shall be equipped with either a terminal box for permanent connection or with cord and plug for interruptible connection, as indicated. Provide NEMA standard grounding type plugs, where used.
 - 3. Furnish foodservice equipment completely wired internally using wire and conduit suitable for a wet location, including a separate grounding wire. Provide electrical outlets and receptacles required to be mounted on or in fabricated equipment and interconnect to a suitable terminal box (subpanel, starter, or disconnect switch if so specified) with all wires neatly tagged showing item number, voltage characteristics, and load information.
 - 4. Receptacles for all wall- and floor-mounted outlets will be provided to be used for plug-in equipment with characteristics as noted on the drawings. Provide Hubbell three-wire or four-wire grounding-type connectors and neoprene cords installed on each item of plug-in equipment to match receptacles provided.
 - 5. Electrically heated equipment shall be internally wired to a thermostatic control and an "on-off" red neon light indicator, which shall be mounted in a terminal box on a removable stainless steel access panel.
 - 6. Only rigid steel zinc-coated conduit shall be used, painted to match adjacent surfaces where exposed. Wiring shall be run concealed wherever possible.
 - 7. Provide on, or for, each motor-driven appliance or electrical heating or control unit, a suitable control switch or starter of the proper type and rating.

8. Appliances shall be furnished complete with motors, driving mechanism, starters, and controllers, including but not limited to, master switches, timers, cut-outs, reversing mechanism, and other electrical equipment if and as applicable. Wiring and connection diagrams shall be furnished with electrically operated machines and for electrically wired fabricated equipment.
 9. Appliances shall be of rigid construction, free from objectionable vibration. Quietness of operation of all foodservice equipment is a requirement. Remove or repair any equipment producing objectionable noise and/or vibration as directed by the Architect.
 10. Motors shall be of the drip-proof, splash-proof, or totally enclosed type, having a continuous duty cycle and ball bearings, except small timing motors which may have sleeve bearings. Motors shall have windings impregnated to resist moisture. Motors located where subject to deposits of dust, lint, or other similar matter from the machine on which installed shall be of the totally enclosed type. Motors shall have ample power to operate the machines for which designated under full load operating conditions without exceeding their nameplate ratings. Horsepower requirements on driven equipment shall be determined by the manufacturer based on normal operation at maximum capacity. The nominal rated motor horsepower shall be not less than the horsepower required for normal operation of the equipment at maximum capacity. Insulation shall be NEMA Class B, or better.
 11. Cover plates shall be furnished and installed for all electrical outlets, receptacles, switches, etc., to match the material and finish of the equipment to which they will be fastened.
 12. Switches, controls, etc., shall be conspicuously labeled as to use with plastic nameplates secured to the adjacent surface as previously specified in Article 2.01-C. Submit a sample for approval if requested by Architect.
 13. Where specified for custom fabricated equipment, provide compartment with electrical sub-panel which shall be pre-wired in conduit concealed in cabinet body construction and connected to all electrical components built into or set upon the counter. Electrical sub-panel shall be UL / ETL / CSA listed, 3-phase, 4-wire circuit breaker type with a ground buss main breaker and individual breakers for each serviced load. Buss shall be copper and the circuit breakers shall be the molded case, bolt-on type with thermomagnetic quick-make, quick-break trip. Multi-pole circuit breakers shall have an internal trip bar. The circuit breakers shall have an interrupting capacity of 10,000 amperes at 120 volts sized for 125% of the connected load and a minimum of two (2) extra, single pole, 20 amp circuit breakers shall be provided. The loads shall be connected through the breakers in a phased sequence to balance the load on each phase.
- B. Water inlets shall be located above the positive water level wherever possible to prevent siphoning of liquids into the water supply system. Wherever conditions shall require a submerged inlet, a suitable type of check valve (except in jurisdictions where check valves are prohibited) and vacuum breaker shall be provided with the fixture to prevent siphoning. Where exposed, piping and fittings shall be chrome-plated. Where vacuum breaker piping is through equipment, provide chrome -plated escutcheon plates to cover holes.
1. Provide and install indirect waste lines from equipment which will discharge into floor drains or safe wastes, chrome-plated where exposed. Extend to a point at least 1" (25 mm) (or as required by local or state code) above the rim of the floor drain, cut bottom on 45-degree angle and secure in position.
 2. Horizontal piping lines shall be run at the highest possible elevation and not less than 6" (150 mm) above the floor, through equipment where possible.
 3. No exposed piping in or around fixtures or in other conspicuous places shall show tool marks or more than one thread at the fitting.

4. Steam operating valves on or in fabricated and purchased foodservice equipment shall be provided with composition hand wheels, which shall remain reasonably cool in service.
 5. Provide suitable gas and liquid pressure-reducing valves for equipment with such components that might reasonably be expected to be affected over a period of time by adverse pressure conditions, including but not limited to dishwashers, booster heaters, coffee urns, ranges, steam boilers, etc.
- C. Provide and install complete refrigeration systems--charged, started, and operating properly--including, but not limited to: compressors, condensers, racks, coils, vibration eliminators, sight glasses (moisture indicating type), expansion valves, filters, oil separators, thermostats, defrost time clocks, all controls and control wiring, liquid line driers, piping, and refrigeration grade copper tubing with all sweat joints using Safety-Silv No. 1200 or approved equal silver solder (with as few joints as possible)
1. Where specifications call for pre-piped lines (i.e., from a fixture to a valve compartment, etc.), provide such work in strict conformance with other sections of the specifications which set forth standards for this type of work or in conformity with the requirements of the ASHRAE Standards or local authorities, whichever is the greater.
 2. Mechanically refrigerated cold pans shall have a normally closed liquid line electric solenoid valve installed before the expansion valve and wired to a silent-type toggle switch complete with an "on-off" red neon light indicator and both mounted in a terminal box on a removable access panel. This switch shall be fed by a separate control circuit and shall not to be wired into the compressor circuit so that it shall stop the flow of refrigerant to the cold pan and not turn off the compressor. The compressor shall then pump down and turn off through the action of the pressure control.
 3. Each refrigeration item specification is written to provide minimum specifications and scope of work. Refrigeration equipment shall be designed and installed to maintain the following general temperatures unless otherwise specified.

a. Walk-In Refrigerators	1.7°C / 35°F
b. Walk-In Freezers	-23.3°C / -10°F
c. Reach-In Refrigerators	1.7°C / 35°F
d. Reach-In Freezers	-23.3°C / -10°F
e. Undercounter Refrigerators	1.7°C / 35°F
f. Undercounter Freezers	-23.3°C / -10°F
g. Cold Pan	-17.8°C / 0°F
h. Work Rooms	10°C / 50°F
 4. Provide electrical and refrigeration components needed by the completed system and complete all refrigeration and control connections of and to said components.
 5. Provide evaporator coil defrost system on all walk-in refrigerator and freezer rooms where the refrigeration systems are designed to operate at room temperature of less than 35°F (1.7°C).
 6. Verify the requirements of and provide any or all additional refrigeration specialty(s) or component(s) required or recommended by the manufacturer for proper operation under the specific operating conditions and location of each system specified.

7. Verify and provide manufacturer's certification (or certification by manufacturer's authorized agent) that the equipment selection hereinafter specified for each refrigeration system is properly sized and shall meet the operating requirements set forth for each system regarding maintaining specified operating temperature, hours of compressor running time, and system pressures and velocities as recommended by the equipment manufacturer(s).
8. During check-out and initial operation, verify that:
 - a. Controls are properly adjusted.
 - b. Condensers are equipped with an overload protector.
 - c. A competent service mechanic is on site during the first eight (8) hours of operation.
 - d. Switches, starters, and controls are identified as to function.
9. Unless otherwise specified, furnish thermometers for walk-in units mounted above the exterior entrance door with suitable length armored capillary tubes to allow the sensing bulbs to be installed in the incoming air stream to the blower coil with runs fastened to the walk-in walls to prevent it from damage. This identical requirement applies to alarm systems when specified.

2.5 PRODUCT SPECIFICATIONS

Refer to Part 4 for complete itemized product specifications.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Begin installing the equipment at the time the building is ready to receive the equipment and in accordance with the schedule.
- B. Provide a competent foreman or supervisor for erection of equipment and to coordinate with other trades regarding connections, installation, and inspection. Coordinate delivery schedule to ensure adequate openings in the building to receive the equipment.
- C. Install refrigeration work in an approved manner, using first quality fittings, controls, valves, etc. Refrigeration items shall be started up, tested, adjusted, and turned over to the Architect in first-class condition and left operating in accordance with the manufacturer's specifications.
- D. Set equipment that rests on masonry bases level onto a bed of silicone rubber sealant.
- E. Seal equipment that butts to a wall or against other equipment with silicone rubber sealant. Set trim strips or other items requiring fasteners in a bed of silicone rubber sealant and fastened with suitable stainless steel fasteners 48" (1200mm) or less on centers. , surfaces shall be thoroughly clean and degrease all surfaces prior to the application of sealant.
- F. Install and interconnect electrical controls, switches, or other units which are separately furnished for field installation in or on equipment provided, unless otherwise specified.
- G. Install and wire refrigeration systems in strict conformance with the manufacturers' instructions and recommendations. Ensure that all refrigeration condensing units are ventilated properly and are accessible for repair, maintenance, and inspection.
- H. Hang evaporator coils per the manufacturer's recommendation at the locations as shown on the drawings. Mount units such that the drain pans are pitched to the drain lines. Hang the coils using nylon or other approved non-conductive, non-corrosive fasteners. Furnish #12 gauge galvanized

steel fish plates of suitable size and shape on the exterior ceiling of the walk-in to spread the weight of the coils adequately. Connect coils to the condensing unit and install to constitute a complete working system capable of maintaining the interior temperatures specified regardless of the heavy usage the walk-in units may receive.

- I. Furnish and install a copper or PVC drainline painted silver from each coil outlet to a point 1" (25mm) above the floor drain. Trap drainlines immediately above the floor drain. Provide continuous electrified heater tape for freezer drainlines, coordinate electrical requirements and wiring with electrical division. Insulate drainline after installation.
- J. Refrigeration tubing shall be the Type L, ACR hard drawn degreased, sealed copper and shall be installed with horizontal runs sloped 1" per 20 feet (1:240) toward the condensing units. Refrigerant piping shall be properly supported by adjustable hangers spaced and adjusted to the drop required. Where vertical runs of more than 5' (1500mm) occur in the suction line, trap the risers at the bottom. Install piping so that refrigerant or oil cannot drain back into the coils from the suction line.
- K. Insulate suction and refrigerant lines with minimum 1/2" (13mm) Armstrong armaflex or equal cellular type insulation. Provide metal pipe sleeves where piping passes through a wall, ceiling, or floor. Fill space around the tubing with mastic insulating compound. Install a permanent suction line filter in each compressor suction line with pressure fitting ahead of the filter to facilitate checking of pressure drop through the filter. Fully insulate and seal penetrations through walk-in cooler or freezer structures to be vapor tight to prevent condensation within any light fixtures, switch boxes, junction boxes, or any other fittings. Fully seal refrigeration and drain lines and provide escutcheon plates.
- L. Furnish and completely install a thermostat to control the refrigeration temperatures for each individual compartment.
- M. Mount the condensing units on a welded steel rack containing all accessories and components necessary to form a complete condensing unit package. Provide each condensing unit with a factory mounted, pre-wired control panel/disconnect switch complete with circuit breakers, contactors, and time clocks as required.
- N. Furnish the refrigeration systems with a one-year refrigeration service contract, covering all parts and labor, with service available seven days per week, 24-hours per day. Provide an option for continuation of the service contract after the first year.. Warrant the refrigeration system for one year and provide the compressors with the manufacturer's extended five-year warranty.
- O. Furnish four (4) copies of complete remote refrigeration system control wiring and piping diagrams. Frame one (1) copy in Plexiglas and mount at compressor location or inside the refrigeration system enclosure as appropriate.
- P. Coordinate the equipment work with the respective work of other Sections so that electrical and mechanical components built into the equipment will conform and/or adapt to the type, materials, and characteristics of the building components.
- Q. Install heated and motor-driven equipment so as to operate efficiently. Provide additional vents, guards, deflectors, and other accessories as needed at no additional cost. Note such additions or modifications on the shop drawings and bring to Architect's attention by special accompanying letter.

3.2 FABRICATION

- A. Items of fabricated equipment shall be fabricated in the same factory and shall be similar in construction details, materials, methods, and appearance to similar types of items so fabricated under this contract.

- B. Each fabricated item of equipment shall include necessary reinforcing, bracing, and welding with the proper number and spacing of uprights and cross members for strength. Wherever standard sheet sizes will permit, the tops of all tables, shelves, exterior panels of cabinet type fixtures, and doors and drainboards shall be constructed of a single sheet of metal. Except where required to be removable, flat surfaces shall be secured to vertical and horizontal bracing members by welding or other approved means to eliminate buckle, warp, rattle, and wobble. Equipment not braced in a rigid manner and which is subject to rattle and wobble shall be unacceptable, and the Contractor shall add additional bracing in an approved manner to achieve acceptance.
- C. Suitable pipe slots shall be provided on fabricated equipment to accommodate service and utility lines and mechanical connections. These slots shall be of proper size and shall be neatly made with turned up edges around to eliminate cutting or defacing of equipment on the job. Cabinet bases shall be provided with an inner panel duct at the ends or rear of the cabinet allowing adequate space to conceal vertical piping. Such work, when performed at the job site, shall be of the same quality as similar work performed in the shop.
- D. Exposed surfaces shall be free from bolt and screw heads. When bolts are required, they shall be of the concealed type and be of similar composition as the metal to which they are applied. Where bolt or screw threads on the interior of fixtures are visible or may come into contact with hands or wiping cloths, they shall be capped with a stainless steel acorn nut and stainless steel lock washer.
- E. Where screw threads are not visible or readily accessible, they shall be assembled with stainless steel lock washers and nuts. Wherever bolts or screws are welded to the underside of trim or tops, the reverse side of the weld shall be finished uniformly with the adjoining surfaces. Depressions at these points shall not be acceptable.
- F. Rivets shall not be permitted in any location.
- G. Welding shall be the heliarc method with welding rod of the same composition as the sheets or parts welded. Welds shall be complete, strong, and ductile with excess metal ground off and joints finished smooth to match adjoining surfaces. Welds shall be free of mechanical imperfections such as gas holes, pits, cracks, etc., and shall be continuously welded so that the fixtures shall appear as one piece construction. Butt welds made by spot solder and finished by grinding shall not be acceptable.
 - 1. Spot welds shall have a maximum spacing of 3" (75mm). Tack welds shall be of at least 1/4" (6mm) length of welding material at a maximum space of 4" (100mm) from center to center. Weld spacing at the ends of the channel battens shall not exceed 2" (50mm) centers.
 - 2. In no case shall soldering be accepted.
 - 3. Fixtures shall be shop fabricated of one piece and shipped to the job completely assembled wherever possible. Equipment too large to transport or enter the building as one piece shall be constructed so that the field joints can be welded at the job site.
 - 4. Exposed joints shall be ground flush with adjoining material and finished to harmonize therewith. Whenever material has been depressed by a welding operation, such depression shall be suitably hammered and peened flush with the adjoining surface and, if necessary, again ground to eliminate low spots. In all cases, the grain of rough grinding shall be removed by successive fine polishing operations.
 - 5. Unexposed welded joints on undershelves of tables or counters in stainless steel construction shall be suitably coated at the factory with an approved metallic-based paint.
 - 6. After galvanized steel members have been welded, welds and areas where galvanizing has been damaged shall have a zinc dust coating applied in conformance with U.S. Government Military Specification Number MIL-P-26915.

- H. Butt joints and contact joints, wherever they occur, shall be close fitting and shall not require filler. Wherever break bends occur, they shall be free of undue extrudence and shall not be flaky, scaly, or cracked in appearance; where such breaks do mar the uniform surface appearance of the material, such marks shall be removed by suitable grinding, polishing, and finishing. Wherever sheared edges occur, they shall be free of burrs, fins, and irregular projections and be finished to obviate danger of cutting or laceration when the hand is drawn over them. In no case shall overlapping materials be acceptable where miters or bullnosed corners occur.
- I. The grain of polishing shall run in the same direction on horizontal and on vertical surfaces of each item of fabricated equipment except in the case where the finish of the horizontal sections of each shall terminate in a mitered edge. Where sinks and adjacent drainboards are equipped with backsplash, the grain of polishing shall be consistent in direction throughout the length of the backsplash and sink compartment.
- J. Component parts, whether fabricated by the Contractor or purchased for building into the fabricated equipment, shall conform to the following.
- K. Bolts, screws, nuts, and washers shall be of steel, except where brass or stainless steel is fastened, in which case they shall be of brass or stainless steel, respectively. Where dissimilar metals are fastened, bolts, screws, nuts, and washers shall be of the higher grade metal. The spacing and extent of bolts and screws shall be such as to ensure suitable fastening and prevent buckling of the metals fastened.

3.3 CLEAN-UP

- A. At completion of the installation, clean up, lubricate, and adjust where necessary items of equipment provided and turn them over in first-class condition.
 - 1. Where stainless steel surfaces are disturbed by the installation or fabricating process, such surface shall be finished to match adjoining undisturbed surfaces.
 - 2. At the completion of the installation work, stainless steel shall be gone over with a portable polishing machine and buffed to perfect surfaces. Painted surfaces shall be carefully gone over and retouched as required.

3.4 START-UP AND TESTING AND COMMISSIONING

- A. Startup Services: Engage factory-authorized service representatives to perform startup services and to demonstrate and train Owner's maintenance personnel as specified below.
 - 1. Coordinate food service equipment startup with service-utility testing, balancing, and adjustments. Do not operate steam lines before they have been cleaned and sanitized.
 - 2. Remove protective coverings and clean and sanitize equipment, both inside and out, and relamp equipment with integral lighting. Where applicable, comply with manufacturer's written cleaning instructions.
 - 3. Test each equipment item for proper operation. Repair or replace equipment that is defective in operation, including units that operate below required capacity or that operate with excessive noise or vibration.
 - 4. Test refrigeration equipment's ability to maintain specified operating temperature under heavy-use conditions. Repair or replace equipment that does not maintain specified operating temperature.

5. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
6. Test motors and rotating equipment for proper rotation and lubricate moving parts according to manufacturer's written instructions.
7. Test water, drain, gas, steam, oil, refrigerant, and liquid-carrying components for leaks. Repair or replace leaking components.
8. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance for each food service equipment item.
9. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Contract Closeout."
10. Review data in the operation and maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
11. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

3.5 SEISMIC RESTRAINTS

- A. Install equipment in these contract documents according to the "SMACNA Guidelines for Seismic Restraint of Kitchen Equipment" in any State, province, or jurisdiction that has legislated this requirement as necessary for acceptance. This shall include:
 1. Identifying these items on his submittal drawings, Plans, Elevations, and Sections.
 2. Showing required SMACNA methods of restraint on his submittal drawings.
 3. Referencing the appropriate detail(s).
 4. Obtain regulatory approval for all seismic engineering details.
- B. If no SMACNA detail exists for a particular situation, prepare and obtain approval for a special attachment detail:
 1. Detail must be prepared by an engineer licensed by the State having jurisdiction over the project and accompanied by the supporting calculations used in the design.
 2. Verify that the restraint design is appropriate to the building's structural conditions and the surfaces to which the equipment will be secured.

PART 4 - ITEMIZED PRODUCT SPECIFICATIONS

The design of the project is based on the following specified equipment. Furnish all equipment in compliance with these specifications. Substitutions, deviations, alternates and owner approved equals must be approved prior to submission for review. All costs associated with re-design, re-engineering and changes to the work shall be paid by the equipment supplier.

<u>ITEM #01</u>	<u>PLASTIC SHELVING UNIT</u>
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Manufacturer:	Cambro or equal by ISS or Metro
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Model:	CSU
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Camshelving® Starter Unit, width and length x 64"H, 4 shelf, includes: solid bottom shelf, four

posts, 2 sets of post connectors, traverses & vented shelf plates, speckled gray, NSF

ITEM #02 DUNNAGE RACK

Manufacturer: Cambro or equal by ISS or Metro

Model: DRS

S-Series Dunnage Rack, slotted top, 3000 lb. load capacity, 21"W x length per plan x 12"H, polypropylene, one-piece, seamless double wall construction, 4" square legs, speckled gray, NSF

ITEM #03 & 04 WALK-IN COOLER/FREEZER COMBINATION

Manufacturer: ThermoKool, Imperial, Thermalrite

Model: Custom

16'-2"W X 7'-9"D x 8'-6"H (Overall includes freezer)

Interior dimensions for cooler-9"W x 7'1"D

4" urethane insulation, minimum value R-25.

NSF & UL approved construction

Interior vertical panels finished with stucco embossed .040 aluminum

Interior ceiling panels to be smooth white aluminum finish

Unexposed exterior vertical and ceiling panels to be stucco embossed galvanized

Exposed exterior vertical stucco aluminum panels with 1/8" thick aluminum tread plate for 48" high wainscoting exposed exterior.

Doors- 36"W x 76" high; three hinges; 48"H 1/8" thick aluminum tread plate inside and out; 14" x 24" observation window. Provide inside safety release.

Heated relief port in freezer

Provide Modularm 75LC door for light and alarm control, shipped to factory to recess into panels.

Conduit for wiring shall penetrate top of box and be exposed 6" high.

Automatic door closer

1/8" thick aluminum tread plate for 48" high wainscoting exposed exterior.

(1) Extra LED light fixtures per compartment Lights shall have an efficacy of no less than 40 lumens per watt.

Heat tape for freezer drain line

Depressed floor shall be provided and installed by general contractor prior to installation of cold room. Depressed area to be level and smooth.

See FS101SC for floor details.

Matching trim strips and enclosure panels as required to adjacent walls and ceiling.

Provide roof mounted, complete refrigeration system. (verify location of system, air-cooled)

Unit shall meet or exceed all 2009 Federal mandates.

Provide and install complete refrigeration systems--charged, started, and operating properly--including, but not limited to:

compressors, condensers, racks, coils, vibration eliminators, sight glasses (moisture indicating type), expansion valves, filters, oil separators, thermostats, defrost time clocks, all controls and control wiring, liquid line driers, piping, and refrigeration grade copper tubing with all sweat joints using Safety-Silv No. 1200 or approved equal silver solder (with as few joints as possible)

Where specifications call for pre-piped lines (i.e., from a fixture to a valve compartment, etc.), provide such work in strict conformance with other sections of the specifications which set forth standards for this type of work or in conformity with the requirements of the ASHRAE Standards or local authorities, whichever is the greater.

Refrigeration equipment shall be designed and installed to maintain the following general temperatures unless otherwise specified.

- | | |
|--------------------------|-----------------|
| a. Walk-In Refrigerators | 1.7°C / 35°F |
| b. Walk-In Freezers | -23.3°C / -10°F |

Provide electrical and refrigeration components needed by the completed system and complete all refrigeration and control connections of and to said components.

Provide evaporator coil defrost system on all walk-in refrigerator and freezer rooms where the refrigeration systems are designed to operate at room temperature of less than 35°F (1.7°C).

Verify the requirements of and provide any or all additional refrigeration specialty(s) or component(s) required or recommended by the manufacturer for proper operation under the specific operating conditions and location of each system specified.

Orbus controller with variable speed EC motor(s) to be factory mounted and tested, located on condensing unit.

Verify the requirements of and provide any or all additional refrigeration specialty(s) or component(s) required or recommended by the manufacturer for proper operation under the specific operating conditions and location of each system specified.

Verify and provide manufacturer's certification (or certification by manufacturer's authorized agent) that the equipment selection hereinafter specified for each refrigeration system is properly sized and shall meet the operating requirements set forth for each system regarding maintaining specified operating temperature, hours of compressor running time, and system pressures and velocities as recommended by the equipment manufacturer(s).

During check-out and initial operation, verify that:

- a. Controls are properly adjusted.
- b. Condensers are equipped with an overload protector.
- c. A competent service mechanic is on site during the first eight (8) hours of operation.
- d. Switches, starters, and controls are identified as to function.

Unless otherwise specified, furnish thermometers for walk-in units mounted above the exterior entrance door with suitable length armored capillary tubes to allow the sensing bulbs to be installed in the incoming air stream to the blower coil with runs fastened to the walk-in walls to prevent it from damage. This identical requirement applies to alarm systems when specified.

ITEM #03.1 EVAPORATOR COIL-COOLER

Included in item # 03

ITEM #03.2 COMPRESSOR-COOLER-OUTDOOR ROOF MOUNT

Included with item # 03

ITEM #04.1 EVAPORATOR COIL -FREEZER

Included in item # 04

ITEM #04.2 COMPRESSOR - FREEZER-OUTDOOR ROOF MOUNT

Included in item # 04

ITEM #05 DESK

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided

ITEM #06 FILE CABINET

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided

ITEM #07 HAND SINK

Manufacturer: Eagle Group or equal by Advance Tabco, Nationwide, or Universal Stainless or IEI
Model: HSA-10-1FK

Hand Sink, wall mount, 13-1/2" Wide x 9-3/4" front-to-back x 6-3/4" deep bowl, 304 stainless steel construction, splash mounted faucet, single knee pedal, skirt, basket drain, deep-drawn seamless design-positive drain, inverted "V" edge, NSF

Right and Left end splash

Faucet/Drain – shipped loose to plumber to install on site.

Soap & paper towel dispensers provided by Owner to be installed by KEC

ITEM #08 PREP REFRIGERATOR

Manufacturer: Continental or equal by Beverage-Air or Delfield
Model: SW27-BS

Work Top Refrigerator, 27" wide, one-section, stainless steel top with 6" backsplash, (1) field rehingable door, stainless steel front, aluminum sides & interior, 5" casters, rear mounted self-contained refrigeration, 1/5 hp

ITEM #09 SOILED DISHTABLE

Manufacturer: Eagle Group or equal by Advance Tabco, Nationwide, or Universal Stainless or IEI
Model: SDTL-48-14/3

Soiled Dishtable, straight design, 48"W x 30"D x 43-1/2"H, left-to-right operation, 14/304 stainless steel top, 8"H backsplash, stainless steel hat channels, 20" x 20" x 5" deep pre-rinse sink with basket drain, (1) set of splash mounted faucet holes for pre-rinse, includes scrap block, raised rolled edges on front & side, stainless steel legs & side bracing, adjustable feet, NSF

All welded construction

ITEM #10 WALL SHELF

Manufacturer: Eagle Group or equal by Advance Tabco, Nationwide, Universal Stainless or IEI
Model: WS1224-14/3

Wall Shelf, 12" x 24" 14/304 stainless steel, 1-1/2" roll on front, 1-1/2" upturn on rear & ends, stainless steel mounting brackets stud welded to shelf, NSF

ITEM #11 DISPOSER

Manufacturer: InSinkErator or equal by Salvajor

Model: SS-300- 7- MRS

SS-300™ Complete Disposer Package, sink mount system, 6-5/8" diameter inlet, with #7 collar adaptor for sink installation, 3 HP motor, stainless steel construction, includes syphon breaker, solenoid valve, flow control valve, removable splash baffle, stainless steel sink stopper, manual reverse switch

ITEM #12 PRE-RINSE-SPLASH/WALL MOUNT

Manufacturer: Fisher or equal by T&S or Chicago Faucet

Model: 2210-WB

Pre-Rinse Assembly, 8" adjustable centers, wall-mounted mixing valve, with spring action flexible gooseneck, with spray head (1.15 gallons per minute @ 60 PSI), with wall bracket.
Shipped loose to plumber to install on site

ITEM #13 DISHWASHER, DOOR TYPE-CORNER

Manufacturer: Hobart or equal by Insinger or Champion

Model: AM15VLT-2

Ventless Door Type Dishwasher, Energy Recovery, tall chamber, hot water sanitize, internal condensing system, 40 racks/hr, corner, solid-state controls with digital status, booster heater, electric tank heat, auto-fill, stainless steel tank, doors & feet, ENERGY STAR®

Single point electrical connect AM15 kit (field installation required) (3 phase booster

Two extra (2) Combination rack

Two extra (2) 6 pan rack

ITEM #14 CLEAN DISHTABLE

Manufacturer: Eagle Group or equal by Advance Tabco, Nationwide, or Universal Stainless or IEI

Model: CDTR-48-14/3

Clean Dishtable, straight design, 48"W x 30"D x 43-1/2"H, left-to-right operation, 14/304 stainless steel top, 8"H backsplash, stainless steel hat channels, raised rolled edges on front & side, stainless steel legs & crossbracing, adjustable metal feet, NSF

All welded construction

ITEM #15 SHELVING, WALL-MOUNTED

Manufacturer: Eagle Group or equal by Advance Tabco, Nationwide, or Universal Stainless or IEI

Model: WS1236-14/3

Wall Shelf, 12" x 36" 14/304 stainless steel, 1 1/2" roll on front, 1 1/2" upturn on rear & ends, stainless steel mounting brackets stud welded to shelf, NSF

ITEM #16 THREE (3) COMPARTMENT SINK

This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided.

Verify replacement faucet (Item 17) and drain levers (item 18) coordinate with existing three compartment sink

ITEM #17 FAUCET

Manufacturer: Fisher or equal by T&S or Chicago Faucet

Model: 13277

Faucet, wall/backsplash mount, 8" C.C., 14" long swing spout, 1/2" inlets

Shipped loose to plumber to install on site

ITEM #18 LEVER WASTE

Manufacturer: Fisher or equal by T&S or Chicago Faucet

Model: 22322

DrainKing Waste Valve, flat strainer, overflow body, 14 x 16 tube & elbow, 12 GPM drain rate, cast red brass body

Shipped loose to plumber to install on site

ITEM #19 SPARE NUMBER

ITEM #20 SHELVING, WALL-MOUNTED

Manufacturer: Eagle Group or equal by Advance Tabco, Nationwide, or Universal Stainless or IEI

Model: WS12114-14/3

Wall Shelf, 12" x 114" 14/304 stainless steel, 1 1/2" roll on front, 1 1/2" upturn on rear & ends, stainless steel mounting brackets stud welded to shelf, NSF

ITEM #21 TABLE, PREP /SINK

Manufacturer: Eagle Group or equal by Advance Tabco, Nationwide, or Universal Stainless or IEI

Model: SMPT3090

Marine Prep Table, 90"W x 30"D, 14/304 stainless steel top with box marine edge, (2) 24" x 18" x 12" sink bowls, splash mount T&S faucet on 8" centers, 10" high backsplash, 1/2" thick poly cutting board with set of slides welded to outside of unit, NSF approved drawer, gusset with Uni-Lok® design, heavy gauge 304 undershelf, 1-5/8" dia. stainless steel feet with flanged adjustable feet, NSF

All welded construction

Right side splash

ITEM #22 SHELVING, WALL-MOUNTED

Manufacturer: Eagle Group or equal by Advance Tabco, Nationwide, or Universal Stainless or IEI

Model: WS1290-14/3

Wall Shelf, 12" x 90" 14/304 stainless steel, 1 1/2" roll on front, 1 1/2" upturn on rear & ends, stainless steel mounting brackets stud welded to shelf, NSF

Two Tier, Mount first shelf 54" AFF, second shelf 12" above first.

ITEM #23-25 SPARE NUMBER

ITEM #26 **EXHAUST HOOD**

Manufacturer: Captive Air, Streivor, Halton, Avtec, Gaylord
Model: EXHAUST HOOD

12'-0"L x 60"D plus fire cabinet on end per plan

See plans for location and placement of item with reference to adjoining equipment. Furnish and install per Manufacturer's standard specifications and the following:

Install in the location as shown on drawings. It is the responsibility of the Installer to verify all clearances and stand offs from the hood to limited combustibles and/or combustibles. Hood must be installed in accordance with the Manufacturer's specifications. Canopy Hoods to be installed a minimum of 78in. off finished floor and level. ADA requires 80in. minimum off above the finished floor.

Hood to be U.L. listed #710, N.S.F. approved and built in compliance to the prevailing NFPA Standard #96.

The Hood assembly to be size and shape per the drawings with 3in standoff in the back. The hood (exposed and unexposed) shall be fabricated from Type 201 18 gauge stainless steel or heavier. All exposed surfaces to be fabricated from Type 201 stainless steel with a #4 finish. All exposed welds to be ground smooth and polished to a #4 finish.

Exhaust airflow volume and static pressure at the duct collar(s) shall not exceed those shown on the drawings.

Stainless steel matching enclosure panels from the top of the Hood to the finished ceiling to be furnished by KEC. (Verify ceiling height with plan.)

KEC shall provide 20 gauge stainless steel wall sheathing to extend from the top of the floor base to the bottom of the rear edge of the hood, the full length of the hood and extending to the side walls where so installed. Sheathing shall be maximum practical size and trimmed with Component Hardware joining and end strips. Pre-cut holes for utilities to minimize field cutting. All holes to be trimmed with chrome-plated escutcheon plates. Finish to match exhaust hood.

See FS101H for additional details

ITEM #27 **FIRE SUPPRESSION SYSTEM**

Manufacturer: Ansul Fire Protection
Model: R102

Furnish and install a complete, fully operational wet chemical automatic fire extinguishing system to provide surface, duct and plenum protection in conformance with NFPA-96 and local code requirements. All exposed components shall be chrome plated. Field installation of system shall done by a trained and authorized distributor. No exposed piping is acceptable with the exception of appliance drops (if applicable). Appliance drops shall be chrome-plated or stainless steel. Furnish mechanical gas shut-off valves (verify size) and provide to Plumber on site for installation. Located in cabinet on right of exhaust hood, Item #26.

System shall be complete in all respects, including remote manual activation device, mechanical gas solenoid valve, and provision for connection to a remote notification device.

ITEM #29 **COMBI OVEN**

Manufacturer: Alto-Shaam or equal by Cleveland or Rational
Model: CTP7-20G

Combitherm® CT PROformance™ Combi Oven/Steamer, gas, boiler-free, countertop, (7) 18" x 26" full size sheet or (14) 12" x 20" full size hotel pan (1/1 GN) capacity, PROtouch control with steam/convection/combi and retherm cooking modes, programmable cool-down, SafeVent™ steam venting, single point removable probe, CombiClean PLUS™ with (5) cleaning levels, (2) side racks with (7) non-tilt support rails, CoolTouch3™ glass window, door hinged right, high efficiency LED lighting, stainless steel construction, adjustable stainless steel legs, 98,000 BTU, EcoSmart®, cULus, CE, UL ANSI/NSF 4, IP X5, Gastec, ENERGY STAR®

Dormont Quick Disconnect Kit, for all gas ovens

Dormont Quick Disconnect kit for water connection

Mobile stand for single unit

ITEM 29.1 **WATER FILTER**

Manufacturer: Dormont Manufacturing or equal by 3M or Everpure
Model: QTSTMMA-2S-1M

Watts Hydro-Safe® QT Steam Max Filtration System, three-stage filtration system, 1.5 gpm, 1 micron carbon block filter, 5 micron sediment pre-filter reduces scale, sand, silt, sediment, rust, chlorine taste and odor, with remote filter housing, 15,000 gallons, (2) 1/2" NPT brass ball valves, flush kit, polypropylene filter housing mounted on powder coated steel bracket, inlet and outlet pressure gauges

For use w/ item #29

ITEM #30 **TILTING SKILLET, GAS**

Manufacturer: Cleveland Range or equal by Market Forge
Model: SGL30TR

DuraPan™ Tilting Skillet, gas, 30-gallon capacity, modular open base, standard with electric tilt mechanism, stainless steel construction, includes spring-assisted cover, gallon markings and electronic spark ignition, food strainer, stainless steel level adjustable feet, CE, NSF

Double Pantry Faucet with, 3/4" swing spout & bracket

48" flexible gas hose, with quick disconnect & restraining device

ITEM #31 **CONVECTION OVEN**

Manufacturer: Blodgett Oven or equal by Vulcan or Garland
Model: DFG100XCEL SINGLE

Xcel Convection Oven, gas, single-deck, standard depth, capacity (5) 18" x 26" pans per compartment, 2-speed fan, porcelain interior liner with coved corners, EZ slide rack, porcelain crumb tray, interior lights, stainless steel front, sides & top, glass doors with removable interior glass windows, flue connector, 80,000 BTU, cETL, NSF

Mobile stand for single unit

48" flexible gas hose, with quick disconnect & restraining device

ITEM #32 **FLOOR TROUGH**

Manufacturer: IMC/Teddy or equal by Eagle Group or Advance Tabco
Model: ASFT-2436-SG

ASFT Anti-Spill Floor Trough, 24" wide x 36" long x 6" deep, with drain & (SG) subway grating

ITEM #33 **MOBILE WORK TABLE**

Manufacturer: Eagle Group or equal by Advance Tabco, Nationwide, or Universal Stainless or IEI

Model: T3060SE

Work Table, 30"W x 60"D, 14/304 stainless steel top with square turndown ends, Uni-Lok® gusset system, 18 gauge stainless steel undershelf, (4) 1-5/8" diameter heavy gauge stainless steel legs, NSF

Square edge table, front and/or rear, per table

All welded construction

Table Casters, 5" diameter, set of (4), (2) swivel & (2) braked, 250 lb weight capacity per caster, poly cart washable with polymer tread

ITEM #34 **HEATED CABINET, MOBILE**

Manufacturer: Food Warming Equip or equal by Cres Cor, Carter Hoffman or Winston

Model: PHTT-12

Clymate IQ™ Heated Cabinet, mobile, insulated, humidified holding system, oversized water reservoir, top mounted circulating heat system with recessed controls, (12) pair universal stainless steel tray slides 4.5" OC, (12) 18x26x4-1/2 in. pans, stainless steel construction, push-pull air distribution system

5" Caster standard: EZ Roll Heavy Duty Poly, (2) rigid, (2) swivel with brakes

ITEM #35 **FRONT COUNTER**

Manufacturer: Custom

Model: Stainless steel

Length per plan x 42"D. Top 14 gauge, 304 stainless steel. 16 ga, Type 304. s/s legs with bullet feet. Constructed in accordance with the front end specifications and drawings. Provide cut-outs for drop-in equipment per plan, food shield and POS cords/cables. Provide hat channel support for drop-in equipment. Provide apron on kitchen side and mount controls. Provide 11" clearance in front of food shield posts. Coordinate overhead door location so it does not interfere with food shield and drop in equipment.

See FS101SC for details

ITEM #35.1 **FOOD SHIELD**

Manufacturer: BSI

Model: DECO-250-N

Overall length 8'-7" - Two (2) segments per plan

Overall Height 14"

Through counter mount.

1/2" tempered glass front and top and side panels, 1-" stainless steel square tubing uprights, narrow mounting flange, NSF, ETL-Brushed stainless

Post placement- First set to second set- 50" o.c. Second set to third set- 50" O.C.

Coordinate with counter manufacturer for correct placement of post holes.

It is the responsibility of the KEC to verify all codes (NSF) are met when placing and installing the food shield.

See FS101F for details

ITEM #36 DROP-IN HOT WELLS

Manufacturer: Vollrath

Model: 36404

3-well hot modular drop-in with infinite controls & standard drains, 18/8 stainless steel, drip-free flange, ind drain shutoffs, 6-3/8" deep wells operate moist or dry, dial controls, 625W per well, 120v/60/1-ph, 15.6 amps, NEMA 5-20P, OA 41-1/2"x26", cutout 40-3/4"x25-1/4", 7/8" corner radius

Manifold drain lines in field, separate drain shut-off per well

Cord/Plug- no hard wire connection

ITEM #37 DROP-IN HOT/COLD WELLS

Manufacturer: Vollrath

Model: 3667201

Hot/Cold Drop-In Unit, top mount, (2) pan, remote mountable panel with on-off switch, hot/cold toggle with indicator lights for hot or cold, thermostatic temperature rotary knob control in hot mode, preset cold control, automatic manifold drain, 300 series stainless well & flange, galvanized wrapper, 625watts per well, 12amp, 120v, 5-20P, cULus, NSF, NSF7, Made in U.S.A.

Cord/Plug- no hard wire connection

Wells work independent hot/cold

Manifold drain lines in field; separate drain shut offs per well

ITEM #38 MILK COOLER-EXISTING/PROVIDED BY VENDOR

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided

ITEM #39 POS

NIKEC - This is not in the kitchen equipment contract and is shown here for informational purposes only. General Contractor to confirm all required utilities are provided

ITEM #40 MOBILE WORK TABLE

Manufacturer: Eagle Group or equal by Advance Tabco, Nationwide, or Universal Stainless or IEI

Model: T2436SE

Work Table, 36"W x 24"D, 14/304 stainless steel top with square turndown ends, Uni-Lok® gusset system, 18 gauge stainless steel undershelf, (4) 1-5/8" diameter heavy gauge stainless steel legs, NSF

Square edge table, front and/or rear, per table

All welded construction

Table Casters, 5" diameter, set of (4), (2) swivel & (2) braked, 250 lb weight capacity per caster, poly cart washable with polymer tread

ITEM #41 REFRIGERATED SELF-SERVE CASE

Manufacturer: Structural Concepts or equal by Federal

Model: CO35R

Oasis® Self-Service Refrigerated Open Air Screen Case, 36-1/4"L, 61-5/8"H, Breeze-E (Type II) with EnergyWise self-contained refrigeration system, (2) non-lit adjustable metal shelves, top light, black interior, (2) full end panels, 4"D removable wall spacer brackets. 6' Power cord, exit at base, standard

Left and Right end panels: Full with mirrored interior, vinyl edging, standard

Base Support: Seismic Levelers

Back Panel: Solid rear swinging doors with lock

Exterior: Stainless steel

Roll-down security cover, locking

Coordinate wall opening to ensure fit. Wall opening should be within 1"-2" of overall size necessary on top and sides.

END OF SPECIFICATIONS



S2O

S2O Consultants Inc.

Brookview Elementary - Rockford Schools Cut Sheet Book

Table of Contents

GENERAL INFORMATION FOR ARCHITECTS - CUSTOM GENERAL INFORMATION FOR ARCHITECTS (ITEM 00.1)	1
ELECTRIC LOAD SCHEDULE - CUSTOM ELECTRIC LOAD SCHEDULE (ITEM 00.2)	12
MECHANICAL LOAD SCHEDULE - CUSTOM MECHANICAL LOAD SCHEDULE (ITEM 00.3)	13
PLASTIC SHELVING UNIT - CAMBRO CSU41486480 (ITEM 01)	14
DUNNAGE RACK - CAMBRO DRS480480 (ITEM 02)	16
WALK-IN COOLER - CUSTOM WALK-IN COOLER (ITEM 03)	18
EVAPORATOR COIL - CUSTOM EVAPORATOR COIL (ITEM 03.1)	19
COMPRESSOR - CUSTOM COMPRESSOR (ITEM 03.2)	20
WALK-IN FREEZER - CUSTOM WALK-IN FREEZER (ITEM 04)	21
EVAPORATOR COIL - WALK-IN FREEZER - CUSTOM EVAPORATOR COIL - WALK-IN FREEZER (ITEM 04.1)	22
COMPRESSOR - WALK-IN FREEZER - CUSTOM COMPRESSOR - WALK-IN FREEZER (ITEM 04.2)	23
DESK - NIKEC DESK (ITEM 05)	24
FILE CABINET - NIKEC FILE CABINET (ITEM 06)	25
HAND SINK - EAGLE GROUP HSA-10-1FK (ITEM 07)	26
REACH-IN UNDERCOUNTER REFRIGERATOR - CONTINENTAL REFRIGERATOR UC27 (ITEM 08)	28
SOILED DISHTABLE - EAGLE GROUP SDTL-48-14/3 (ITEM 09)	30
SHELVING, WALL-MOUNTED - EAGLE GROUP WS1224-14/3 (ITEM 10)	32
DISPOSER - INSINKERATOR SS-300-7-MRS (ITEM 11)	34
PRE-RINSE - FISHER 2210-WB (ITEM 12)	36
DISHWASHER, DOOR TYPE - HOBART AM15VLT-2 (ITEM 13)	37
CLEAN DISHTABLE - EAGLE GROUP CDTR-48-14/3 (ITEM 14)	45
SHELVING, WALL-MOUNTED - EAGLE GROUP WS1236-14/3 (ITEM 15)	47
THREE (3) COMPARTMENT SINK - EXISTING (ITEM 16)	49
FAUCET - FISHER 13277 (ITEM 17)	51
LEVER WASTE - FISHER 22322 (ITEM 18)	52
SHELVING, WALL-MOUNTED - EAGLE GROUP WS12120-14/3 (ITEM 20)	53
WORK COUNTER - EAGLE GROUP SMPT3096 (ITEM 21)	55
SHELVING, WALL-MOUNTED - EAGLE GROUP WS1290-14/3 (ITEM 22)	57
SPARE NUMBER - CUSTOM SPARE NUMBER (ITEM 23-25)	59
EXHAUST HOOD - CUSTOM EXHAUST HOOD (ITEM 26)	60
FIRE SUPPRESSION SYSTEM - ANSUL FIRE PROTECTION R102 (ITEM 27)	61
SPARE NUMBER - CUSTOM SPARE NUMBER (ITEM 28)	65
COMBI OVEN - ALTO-SHAAM CTP7-20G (ITEM 29)	66
WATER FILTER ASSEMBLY - DORMONT MANUFACTURING QTSTM MAX-2S-1M (ITEM 29.1)	74
TILTING SKILLET, GAS - CLEVELAND RANGE SGL30TR (ITEM 30)	78
CONVECTION OVEN - BLODGETT OVEN DFG-100 XCEL SGL (ITEM 31)	80
FLOOR TROUGH - IMC/TEDDY ASFT-2436-SG (ITEM 32)	82

WORK TABLE - EAGLE GROUP T3060SE (ITEM 33)	84
HEATED CABINET, MOBILE - FOOD WARMING EQUIP PHTT-12 (ITEM 34)	86
HOT FOOD COUNTER - CUSTOM HOT FOOD COUNTER (ITEM 35)	88
DROP-IN HOT WELL - VOLLRATH 36404 (ITEM 36)	89
DUAL TEMP FOOD WELL, DROP-IN - VOLLRATH 3667201D (ITEM 37)	91
MILK COOLER - NIKEC SM58N-S (ITEM 38)	93
POS - CUSTOM POS (ITEM 39)	95
WORK TABLE - EAGLE GROUP T2436SE (ITEM 40)	96
SELF-SERVICE REFRIGERATED OPEN AIR SCREEN CASE - STRUCTURAL CONCEPTS CO35R	98
(ITEM 41)	

GENERAL INFORMATION AND REQUIREMENTS FOR ARCHITECTS AND ENGINEERS REGARDING FOODSERVICE EQUIPMENT

The following information is provided to the Architect and Consulting Engineers for inclusion in their documents as necessary. Please review all information provided below and address questions and issues raised.

GENERAL

The paragraphs below are intended to provide the design team with an outline of the general trade relationships assumed in the design process and detailed in our standard specifications.

Unless advised otherwise by the Owner or Architect it is assumed that the foodservice equipment will be designed and specified as a separate, distinct package (Section 11400) or subcontract to be provided by a Kitchen Equipment Contractor (KEC) to the General Contractor; **the Owner or Architect to specify if this situation will not prevail.**

The work of the KEC consists of providing all labor, equipment, appliances, and materials and of performing all operations required for execution of the work as shown or reasonably inferred by the foodservice drawings and specifications. This work includes equipment procurement and fabrication, freight, delivery, unloading, uncrating, storage as required, handling, assembly, setting in place, and leveling, all in accordance with the project schedule. Also included is the removal, alteration, relocation, and reinstallation of existing equipment (if specified), but not the disconnection of equipment from utility services.

Not included in the work of the KEC is the construction and/or installation of concrete or masonry pads, piers, stub walls, depressions, and any ceramic or quarry tile unless specified to be supplied by the KEC as a portion of an item; i.e. a countertop. Also not included are electrical and mechanical utility rough-ins and final connections. Should the foodservice equipment and/or relocation of that equipment require any cutting or patching of other facility fixtures or finishes, the KEC will notify the Architect and General Contractor to obtain their approval prior to the initiation of such work. It shall be the responsibility of the KEC to ensure that such work is accomplished by trades skilled in same, resulting in a finished product meeting with the approvals of the Owner and the Architect.

Plumbing and electrical requirements indicated for individual items of equipment on the documents prepared by us are for the use of the mechanical and electrical engineers. The location of the actual roughing in of these services will be shown on a dimensioned roughing in plan which will be furnished by the KEC.

Combining utility lines for simplification and/or relocation due to conditions on job site shall be effected at the discretion of the plumber, steam fitter, or electrician only after obtaining approval from the Project Engineers and Architect. Notice of any change in rough-in locations or requirements must be given to the KEC so that any required changes can be made to fabricated equipment construction, if necessary. KEC will not be responsible if written notification of change had not been made by the project architect or manager.

The KEC shall be responsible for the cost of storing the foodservice equipment prior to the time of installation. Should the Owner or General Contractor require the delivery of any foodservice equipment to the building prior to the time it can be installed therein, the General Contractor must provide safe and protected space for storage thereof (within, and only within, the building unless approval is obtained from the KEC) and be responsible for the care thereof from the time of delivery until such time as it can be moved from its storage location and installed by the KEC.

AREAS OF RESPONSIBILITY

Coordination

ARCHITECTURAL SECTION

A1. DOORS AND OPENINGS

1. Door openings of a minimum 3'-0" X 7'-0" (914 X 2133 mm) with flush sills are required from building delivery through to kitchen and all accesses required for foodservices.
2. Exterior delivery access doors must be protected with fly fans or insect screen protection.
3. All doors in traffic aisles should have vision panels.
 - a) one-way doors excepted;
 - b) office doors in the kitchen usually have large windows;
 - c) door to dining areas must be sight line protected and acoustically treated.
4. Doors require 4'-0" (1219mm) kickplates (from bottom up).
5. Wall openings as required for recessed or pass-through equipment.
6. Will the kitchen have a fire separation and where will it occur?
7. We recommend that kitchen and servery be able to be secured from access after operating hours.

A2. FLOORS

1. We recommend as our preferred solution a finished floor in kitchen of 15% abrasive, non-slip quarry tile (100% homogeneous) with black epoxy grout to avoid discoloration of grout from food acids.

- a) Alternate finishes that may be considered are:
 - i. A poured and troweled cupric oxychloride flooring such as Hubbellite
 - ii. For a resilient floor use a sheet vinyl material with "welded" impervious joints such as Altro Safety Flooring series K35. Non-slip tile is recommended for serverly floors and similar high traffic areas.
2. The floors in kitchens, serveries and all other food service areas must be made water proof if area below is to be occupied.
3. Kitchen floor finish to extend into walk-in and roll-in refrigerators and freezers, unless a pre-fab floor is provided as part of the walk-in.
4. An 8" (200 mm) minimum depression for walk-in refrigerators and freezers; for sump pans/floor troughs see special conditions plan.
5. Cart washing areas must be pitched a minimum of 1/4" per foot (1:50) to a floor drain at the rear of the work area. The high point of the cart washing area should be approximately 1/2" (13mm) lower than the adjacent floor areas.

A3. WALLS

1. Coved bases are required to be a minimum of 4" (100 mm) high unless otherwise noted.
2. Walls should be a smooth, easily cleaned, non-absorbent hard surface.
 - a) Ceramic tile with acid proof grout is preferred.
 - b) glazed concrete masonry units.
 - c) water resistant gypsum wallboard on structural 16-gauge studs clad with fiberglass reinforced panels and battens
 - d) painted dry wall partitions in kitchen are not recommended.
 - e) Wet areas require a water proof wall finish such as ceramic tile, FRP, or smooth, epoxy painted, skim coated CMU block
3. 42" (1066 mm) high corner guards mounted 6" (150 mm) above finished floor at exposed column and wall edges are advised.
4. Bumper guards mounted at 10" (250mm) and 34" (865 mm) to center of bumper above finished floor are required for heavy cart traffic areas.
5. Where control panels are to be recessed, walls should be a minimum of 8" (200 mm) thick.
6. All equipment will be placed tight against all walls or a minimum of 3" off walls to meet NSF requirements and all mechanical and electrical connections are to be roughed out of the walls with access for connections.
7. All kitchen and serverly walls are to be non-combustible.
8. Walls between dining rooms and kitchen/warewashing areas must be sound attenuated.
9. When stud walls are used, all walls intended to support wall shelving, wall cabinets, utensil racks, exhaust ventilators, hand sinks, etc. must be provided with blocking consisting of a 6" (150mm) headers at 4'0" (1200mm) and 5'0" (1500mm) above the floor. Construction must support 50 (25kg) pounds per lineal foot.

A4. CEILINGS

1. Finished ceilings should be a minimum of 9'-0" (2745 mm) above the finished floor. Please advise of exact height.
2. Finished ceiling should be a smooth, acoustically rated, non-absorbent, washable surface which will require approval by local health authorities.

3. Walk-in refrigerators, freezers and exhaust ventilators will be closed to the ceiling with enclosure panels provided by the KEC unless otherwise advised.
4. Verify requirement for fire rated enclosures around exhaust ventilators that penetrate finished ceilings.
5. Here is a link to a company that makes interesting ceiling tiles.
<http://www.ceilume.com/restaurant-ceiling-tiles.cfm>

A5. LIGHTING

1. Warm, white deluxe fluorescent lights or LED should be used in the kitchen complete with non-breakable diffusers or tubular bulb guards.
2. All lighting fixtures used in foodservice areas must be equipped with lens protectors or shatter shielded bulbs.
3. Ceiling fixtures should be recessed.

A6. WINDOWS

1. Minimum sill height suggested to be 48" (1220mm) to allow for equipment against wall under window.
2. Advise where heating or ventilation units directly relate to windows..

A7. WASTE

1. Advise if solid waste and recycling program is required or separation of waste materials is needed to meet local requirements.
2. A central grease trap outside the building in a vehicle accessible location is recommended.
 - a) Where impractical, localized grease traps shall be installed flush with floor, have non-skid cover, and be easily accessible, not impeded by equipment.
 - b) The size of the grease trap is based on applicable plumbing codes and is to be sized by the project engineers.
3. Food waste disposers (garbage grinders) are an integral part of most kitchen facilities. Please advise if they are not permitted by local code.

A8. MISCELLANEOUS

1. Space for the installation of remote refrigeration condensing units may be needed. An exterior location is preferred. Advise location.
2. Space must be available for kitchen exhaust air pollution control unit when required. Advise location when required.
3. Provide large windows in kitchen office for control purposes.
4. The use of color is beneficial to employee morale and productivity and is suggested in work areas
5. Separate toilet and changing rooms and locker facilities should be provided for male and female foodservice employees. These areas are not to open directly into food preparation or storage areas.
6. Are there any local codes affecting our work under this section of which we should be advised?

ENGINEERING SECTION

B1. WATER AND DRAINS

1. Advise us of ambient cold water temperature and recirculated hot water temperature.
2. Water temperature at hand basins shall not exceed 110°F (43°C). Dishwashing machines and water wash exhaust ventilators require a minimum of 110°F (60°C). Advise if different.
3. Advise if 180°F (82°C) water is available for the warewasher. If available is it recirculating? If not, advise the incoming HW temperature to dishmachines so booster heater may be sized accordingly.
4. What is domestic cold water pressure?
5. Are either chilled or cooling tower water available for refrigeration system use? If so, please provide available temperatures, flow rate, pressure and year-round availability. When water-cooled refrigeration compressor/condenser units are utilized, they will require approximately 1.5 gallons of 70°F (21°C) cooling tower water per minute per horsepower.
6. If water hardness is over 6 GPG provide water softener and soft water lines to all equipment requiring a water connection. If below 2GPG advise as some equipment functions can be adversely affected.
7. Low volume exhaust ventilators are preferred.
8. Food waste disposers (garbage grinders) are an integral part of most kitchen facilities. Please advise if they are not permitted by local code.
9. Are there any local codes affecting our work under this section of which we should be advised?
10. For funnel floor drains (FFD), many use Josam 30000-E2 or E3 series (combination drain) or equal. All floor drains are to be flush mounted.
11. For floor sinks (FS), many use Josam 49000 series with partial floor grate or without grate as appropriate; size dependent upon requirements.
12. For air gap drains (at water wash exhaust ventilators), many use Josam 88900 series or equal.

B2. GAS

1. Advise type and calorific value of the gas available at the site..
2. What is the gas pressure available at the foodservice area?
 - a) Individual pressure requirements for specific equipment varies.
 - b) Line pressure should be approximately 8" (200mm) water column.

B3. STEAM

1. Advise if steam is available in the building.
 - a) Advise if this is non-toxic, "clean" steam suitable for food contact.
 - b) Advise available steam pressure at the foodservice area.
2. For foodservice equipment steam traps many use Anderson Super Silvertop inverted bucket traps or equal, with built-in thermal air eliminator. Provide and install bleeders and/or vents with brass petcocks on all shock stops and equipment connections requiring same.

B4. VENTILATION

1. 20 to 30 air changes per hour in the kitchen are required.
 - a) The air supply into the kitchen should be tempered.
2. Spot cooling is required in cold food preparation and plating areas
3. Negative air pressure must be maintained in the kitchen to control odor transfer.
4. Separate fans and duct systems are required for:
 - a) cooking exhaust,
 - b) wood fired equipment
 - c) dishwashing exhaust
5. Exhaust hood control panels will require 24 hour uninterrupted power.
6. Air cooled refrigeration equipment requires adequate ventilation of not less than 1,000 cfm (472 L/S) per horsepower [250 cfm (118 L/S) for watercooled].
7. When tabulating the rejected heat load of the equipment in foodservice areas, the Mechanical Engineer shall take into account all sources of heat, including small, self-contained refrigeration compressors operating simultaneously at peak service periods.

B5. FIRE CONTROL

1. Wet chemical fire extinguishing systems will be specified by us.
2. Exhaust vent ducts are not included in foodservice fire extinguishing system
3. Advise if sprinkler heads will be specified by the Mechanical Engineer for walk-in refrigerators and freezers.
4. Advise if dampers are to remain open with fans "on" for smoke exhaust in fire condition.

B6. ELECTRICAL

1. Advise if there is a limited electrical capacity for the foodservice facility.
2. Where available, emergency power is required for:
 - a) Exhaust hood control panel;
 - b) Walk-in freezer;
 - c) Walk-in refrigerators;
 - d) Other equipment required for emergency service.
3. Connect exhaust ventilators and/or fire protection systems to central enunciator panels - dry switch contacts are provided with the systems.
4. Advise of building electrical characteristics available.

B7. STRUCTURAL

1. Advise of site seismic zone and specific requirements.
2. Advise of any unusual requirements related to isolation of equipment.
3. All foodservice storage and preparation area floor slabs should be designed for 150 psf (10.55 Kg/cm²).
4. Advise of structural systems/conditions which limit floor slab depressions, penetrations, loads, etc.
5. Expansion joints cannot be located within prefabricated walk-in refrigerators and freezers, floor depressions or equipment raised bases, advise of locations if conflict with kitchen equipment exists.

AREAS OF RESPONSIBILITY For Construction Documents

C1. ARCHITECT (Responsibility of contracts other than the KEC, the Mechanical and Electrical sections)

Include the following in the general contractor responsibilities:

1. Floor depressions, stub walls, wall blocking and insulation.
2. Sloped floors to all floor drains where required.
3. Finished floor in walk-in and roll-in refrigerators and freezers, unless a pre-fab floor is specified as part of the walk-in unit.
4. Wall openings or recesses for Foodservice Equipment.
5. Bases or curbs upon which FS equipment is mounted.
6. Sleeves and chases for services concealed in floors and walls.
7. Corner guards on columns or walls.
8. Clean and seal floor prior to placement of Foodservice Equipment.
9. Hand fire extinguishers and fire blankets. Locate according to local codes.
10. Fire shutters required in wall openings, on non-fire rated areas.
11. Floor sleeves and conduit for soft drink or beer lines.
12. Installation of items supplied by KEC to be built into walls, floors, ceilings, etc.
13. Sound and vibration pads or structural separations.
14. Locate clocks, intercoms, phones, time clocks, and other specialty items and areas.

C2. FOOD SERVICE CONSULTANT (Responsibility of Kitchen Equipment Contractor)

Included as responsibility of the Kitchen Equipment Contractor (KEC):

1. Supply and set into place all equipment specified.
2. Dimensioned roughing-in drawings, dimensioned drawings of recesses, bases and wall openings, soda/beer line runs, shop drawings and catalogue "cuts" for all Foodservice Equipment.
3. Prefabricated walk-in refrigerators and freezers.
4. Compressors and coils for Foodservice Equipment complete with all lines, valves, controls, and other parts to ensure a fully operating system.
5. Surface Fire Extinguishing system to meet all applicable and/or local fire regulations for exhaust ventilators and related equipment.
6. Relocate and set into place any existing equipment to be reused.
7. Supply of items shown or specified as Foodservice Equipment to be built into walls, floors, ceilings, etc. by other contractors.
8. Securing to the floor, by means of SS pins (or other means where seismic conditions require), all stationary equipment with mechanical or electrical services.
9. Supply alarms and/or recording devices on all walk-in refrigerators and freezers.

10. Internal electrical load centers and all internal wiring within Foodservice Equipment.
11. Exhaust ventilators with duct collars terminated six inches (150mm) above finished ceiling.
12. Indirect drain line connections from blower coils and condensers operating prefabricated walk-in refrigerators and freezers. Run condensate lines on exterior of walk-ins where possible. Ensure that piping is installed with adequate slope and proper trap in line to allow for adequate drainage while preventing the entrance of vermin.
13. Supply and install heater cable on all walk-in freezer drain lines from evaporator coil to drain.

C3. PLUMBING (MECHANICAL CONTRACTOR. Division 15)

Include:

1. Rough-ins complete with individual service valves for all foodservice equipment and the clearing of debris from lines prior to final connection. Conceal all pipes in walls and/or chases for cleanliness.
2. Grease traps where required; set flush with floor, where possible. Access must not be impeded by any equipment.
3. Supply and install strainers or approved type filters on cooking gas supply lines at all equipment having thermostatic controls.
4. Provide floor drains where shown on drawings as well as any deemed necessary for housekeeping purposes.
5. All exposed piping to be chrome plated.
6. Supply where required and install **all** shut off valves, check valves, condensate traps, traps, pressure reducing valves, strainers, vacuum breakers including those noted on Service Requirements List as supplied by KEC.
7. Install gas solenoid valve(s) as required for the fire extinguishing system provided by the KEC.
8. Supply and install drinking fountains, and janitors' sinks in the kitchen area.
9. Provide final connections from all required rough-ins to equipment under this section including any required interconnections on equipment.
10. Install and connect all trim and other devices (custom fabricated floor grates, control panels, and the like) provided by the KEC.
11. General water pressure in kitchen area not to exceed 50 psi. (3.52 Kg/cm²). Water pressure for dishwasher and/or glass washer at 20 psi (1.45 Kg/cm²) maximum. Minimum water pressure to be 15 psi (1.06 Kg/cm²).
12. Seal all floor openings water tight by means of sleeves. Extend sleeve collars 2" (50mm) above the finished floor. Piping through walls or floors and openings between collar and passing pipe shall be sealed vermin proof and watertight.
13. Horizontal piping lines connected to equipment to run at a minimum of 8" (200 mm) above floor to provide clearance for cleaning. At wall or column locations, all piping to be stubbed out of walls, if possible.
14. Exposed piping to run parallel to equipment or framed in a neat, unobtrusive manner wherever possible.
15. Conceal vent piping for waste lines wherever possible.

16. Size gas service lines to provide the necessary BTU's (watts) indicated for equipment. Shut off valve at the equipment to be readily accessible.
17. Size service lines for water and gas to provide full volume for all items supplied and future items on respective mains and branches. For extended length gas fired cooking batteries, provide gas supplies at both ends for even distribution of gas. Gas fueled service equipment generally operates at a pressure of 4" to 10" (100 to 250mm) W.G. Identify all lines and the service they provide with appropriate labels.
18. Sprinkler head temperature settings in kitchen shall be 250°F (121°C).
19. Provide a 6" (150mm) diameter (minimum) PVC, EMT, pneumatic tubing or clay pipe (depending on local code) conduit with minimum 24" (600mm) radius sweep bends and required tubing pull boxes where indicated on drawings for routing of beverage system syrup, water, and soda lines.
→ **NOTE:** Beverage system installer shall pull beverage tubing and make final outlet connections and be responsible for a completely sealed installation.
20. Provide dry type sprinkler heads in all walk-in refrigerators and freezers as required by code and seal same to prevent condensation.
21. Trench drains not custom fabricated to exhibit a minimum 50% open area.

C4. STEAM (Responsibility of Mechanical Contract - Division 15)

Include:

1. Rough-ins for all foodservice equipment concealed in walls and chases for cleanliness.
2. Supply and install strainers on steam supply lines at all equipment having thermostatic controls. Supply where required and install **all** shut off valves, check valves, condensate traps, traps, pressure reducing valves, strainers, vacuum breakers including those noted on Service Requirements List as supplied by KEC.
3. Supply and install C/P control valves with heat resistant handles; readily accessible at reasonable work height and otherwise located to prevent dangerous operating conditions.
4. Supply and install blow off extensions to floor and directed away from front or end of cooking bank.
5. Provide final connections from all required rough-ins to equipment under this section including any required interconnections on equipment.
6. Provide unions on both sides of valves and traps and to the service side of the steam supply and steam return service valves.
7. Minimum steam pressure to be 15 psi (1.76 Kg/cm²) or as noted on our Mechanical And Electrical Schedule. Higher pressure preferred when available.
8. Seal all floor openings water tight by means of sleeves or otherwise. Extend sleeve collars 2" (50mm) above the finished floor. Piping through walls or floors and openings between collar and passing pipe shall be sealed vermin proof and watertight.
9. Provide back pressure valves on each individual condensate return line to prevent steam from entering the unit through the condensate line.

C5. VENTILATION (Responsibility of Mechanical Contract - Division 15)

Include:

1. Provide fan and ducts systems to rough-in points 6" (152 mm) above finished ceiling or as otherwise defined.
2. Supply and install make-up air systems, as required.
3. Make final connection to exhaust hood duct collars.
4. Size of duct collar connection and air volumes are shown on our Mechanical and Electrical Utility Schedule.
5. Design exhaust for Foodservice Equipment as separate systems.
6. Duct work to have welded grease proof joints. Horizontal ducts to be pitched or graded back to ventilators.
7. Ventilate all areas containing refrigeration compressors. Room ambient temperature not to exceed 90°F (32°C).
8. All kitchen exhaust systems to be controlled from the kitchen.
9. Disconnect and connect existing equipment to be relocated, dismantled or removed.
10. Ensure that the air flow is balanced to create a negative pressure in the kitchen and to ensure that there are no currents established which will interfere with the exhaust ventilators' capabilities to capture the cooking smoke, odors and heat.

C6. ELECTRICAL (Responsibility of Electrical Contract - Division 16)

Include:

1. Design and specify electrical systems, including size, type and location of electrical service entrance panels, dedicated electrical panels, main distribution panels and transformers, with all visible components to be stainless steel.
2. Rough-ins for all Foodservice Equipment; conceal in walls, chases, and floors for cleanliness. Flush mount in wall, all disconnect switches, control panels, and similar devices when not provided by KEC mounted on equipment.
3. Provide final connections from all required rough-ins to equipment under this section including any required interconnections on equipment.
4. Supply and install all receptacles noted in Mechanical and Electrical List as well as any deemed necessary for appliances.
5. Conceal all electrical conduit rough-ins wherever possible. Advise if surface mounted.
6. Supply and wire from main electrical panels to supply side of load center on custom fabricated foodservice equipment.
7. Supply and wire from main electrical panel through disconnect switches, junction boxes, and control panels to all equipment systems.
8. Supply, install and make final connections to shunt trips as required for the fire protection system.
9. Supply and wire from main electrical panel to refrigeration compressors and interwire through all components such as time clocks, alarm, defrost, multiple internal light fixtures and switches to walk-in refrigerator or freezer rooms. **NOTE: Do not run conduit exposed inside walk-in refrigerator/freezer rooms.**

1. Field wiring between sections of equipment such as factory wired exhaust ventilators and Utility Distribution Systems.
2. Seal all floor openings water tight by means of sleeves. Extend sleeve collars 2" (50mm) above the finished floor. Conduit passing through walls or floors and openings between collar and passing conduit shall be sealed vermin proof and watertight.
3. Provide computer grade, isolated ground service for electronic cash registers. Provide empty conduit between cash register locations and phone system punchblock to allow communication wiring to be installed by system manufacturer or installer.
4. Exposed conduit to be chrome plated.
5. Disconnect and reconnect existing equipment to be relocated, dismantled or removed.

C7. OWNERS

Include:

1. Detergent dispensing equipment for dishwashers and pot washers.
2. Service information for all equipment noted "By Owner" on Mechanical and Electrical List.
3. Employee time clocks.
4. Staff lockers.
5. Kitchen and cafeteria smallwares including all food pans unless otherwise noted.
6. All china, cutlery, glassware, trays and linen unless otherwise noted.
7. Samples of all china, trays, utensils, disposables, etc.
8. POS and other computer equipment.
9. Menu boards and signage.
10. Enzyme injection system for drain line maintenance.

ELECTRIC LOAD SCHEDULE														
Item No	Qty	Equipment Category	Equipment Remarks	Amps	KW	HP	Volts	Phase	Direct	Plug	NEMA	Electrical AFF (in)	Elec Remarks	Item No
01	13	Shelving Unit												01
02	2	Rack, Dunnage												02
03	1	Walk-in Cooler		16.0			120	1	X			48	lights/alarm	03
03.1	1	Evaporator Coil		16.0			208	1	X			96		03.1
03.2	1	Compressor				2.0	208	3	X			96		03.2
04	1	Walk-in Freezer		16.0			120	1	X			48	lights/alarm	04
04.1	1	Evaporator Coil - Walk-in Freezer		16.0			208	1	X			96		04.1
04.2	1	Compressor - Walk-in Freezer				1.5	208	3	X			96		04.2
05	1	Desk	NIKEC	16.0			120	1		X	5-20P	48	Data req'd	05
06	1	File Cabinet	NIKEC											06
07	3	Sink, Hand, Wall Mount												07
08	1	Prep Refrigerator		6.0		0.2	120	1		X	5-20P	12		08
09	1	Soiled Dishtable												09
10	1	Shelf, Wall Mount												10
11	1	Disposer, Garbage		6.0		3.0	208	3	X			4		11
12	1	Pre-Rinse Faucet, Wall Mount												12
13	1	Warewasher, Door Type, High Temp		24.9			208	3	X			12.75		13
14	1	Clean Dishtable												14
15	1	Shelf, Wall Mount												15
16	1	Three Compartment Sink	Existing-To remain											16
17	3	Faucet, Backsplash Mount												17
18	5	Drain, Lever Handle, w/ Overflow												18
19	1	Spare Number												19
20	1	Shelf, Wall Mount												20
21	1	Table, Prep w/ Sink		(2)16			120	1		X	5-20P	36	DR Convenience outlets on wall	21
22	2	Shelf, Wall Mount	Two Tier											22
23-25	1	Spare Number												23-25
26	1	Exhaust Hood		16.0			120	1	X			86	lights/fan	26
27	1	Fire Supression System		10.0			120	1	X			96		27
28	1	Spare Number												28
29	1	Oven-Steamer, Combination, Boilerless, Gas		6.8	0.8		120	1	X					29
29.1	1	Water Filtration System												29.1
30	1	Tilt Skillet		1.8			120	1		X	5-20P	21.25		30
31	1	Oven, Convection, Gas		10.0		0.75	120	1		X	5-15P	46		31
32	1	Floor Trough												32
33	2	Mobile Worktable		16.0			120	1		X	5-20P	ceiling	pendant receptacle	33
34	1	Holding Cabinet, Humidified Heated		19.8			120	1		X	5-20P	48		34
35	1	Front Counter		(2)16			120	1		X	5-20P	18	DR-on wall below counter	35
35.1	1	Foodshield		16.0			120	1	X			34		35.1
36	1	Drop-In, Hot Wells		15.6	1.9		120	1		X	5-20P	16		36
37	1	Drop-In, Hot/Cold Unit		11.2			120	1		X	5-20P	18		37
38	1	Milk Cooler	NIKEC- By Vendor	6.3		0.33	115	1		X	5-20P	12		38
39	1	POS	NIKEC	16.0			120	1		X	5-20P	34	Data req'd	39
40	1	Mobile Worktable												40
41	1	Refrigerated Self-Service Case		14.0			120	1		X	5-20P	18		41

MECHANICAL LOAD SCHEDULE																							
Item No	Qty	Equipment Category	Equipment Remarks	Cold Water Size (in)	Cold Water AFF (in)	Hot Water Size (in)	Hot Water AFF (in)	Direct Drain Size (in)	Direct Drain AFF (in)	Indir Drain Size (in)	Gas Size (in)	MBTUH	Gas AFF (in)	Plumbing Remarks	HVAC Exhaust Duct Size (in)	HVAC Exhaust CFM	HVAC Exhaust SPWG	HVAC Exhaust AFF (in)	HVAC Make-Up Duct Size (in)	HVAC Make-Up CFM	HVAC Make-Up SPWG	Refrigeration Remarks	Item No
01	13	Shelving Unit																					01
02	2	Rack, Dunnage																					02
03	1	Walk-in Cooler																					03
03.1	1	Evaporator Coil								1				FS req'd									03.1
03.2	1	Compressor																					03.2
04	1	Walk-in Freezer																					04
04.1	1	Evaporator Coil - Walk-in Freezer								1				FS req'd									04.1
04.2	1	Compressor - Walk-in Freezer																					04.2
05	1	Desk	NIKEC																				05
06	1	File Cabinet	NIKEC																				06
07	3	Sink, Hand, Wall Mount		0.5	34	0.5	34	1	24														07
08	1	Prep Refrigerator																					08
09	1	Soiled Dishtable																					09
10	1	Shelf, Wall Mount																					10
11	1	Disposer, Garbage		0.5	20			3	12														11
12	1	Pre-Rinse Faucet, Wall Mount		0.5	40	0.5	40																12
13	1	Warewasher, Door Type, High Temp		0.5	73.25	0.5	42.25			1.5				FS req'd									13
14	1	Clean Dishtable																					14
15	1	Shelf, Wall Mount																					15
16	1	Three Compartment Sink	Existing-To remain																				16
17	3	Faucet, Backsplash Mount		0.5	40	0.5	40																17
18	5	Drain, Lever Handle, w/ Overflow								2				FS req'd									18
19	1	Spare Number																					19
20	1	Shelf, Wall Mount																					20
21	1	Table, Prep w/ Sink																					21
22	2	Shelf, Wall Mount	Two Tier																				22
23-25	1	Spare Number																					23-25
26	1	Exhaust Hood														3000		96					26
27	1	Fire Supression System																					27
28	1	Spare Number																					28
29	1	Oven-Steamer, Combination, Boilerless, Gas		0.75						1.5	0.75	98		FS req'd									29
				0.75																			
29.1	1	Water Filtration System		0.5	36									For use w/ item #29									29.1
30	1	Tilt Skillet		0.5	26.5	0.5	26.5				0.75	91	12.25										30
31	1	Oven, Convection, Gas									0.75	80	23										31
32	1	Floor Trough						4	-1														32
33	2	Mobile Worktable																					33
34	1	Holding Cabinet, Humidified Heated																					34
35	1	Front Counter																					35
35.1	1	Foodshield																					35.1
36	1	Drop-In, Hot Wells								1				FS req'd									36
37	1	Drop-In, Hot/Cold Unit								0.5				FS req'd									37
38	1	Milk Cooler	NIKEC- By Vendor																				38
39	1	POS	NIKEC																				39
40	1	Mobile Worktable																					40
41	1	Refrigerated Self-Service Case																					41

CAMBRO

Camshelving®

Stationary - Starter Units

4 Shelf Units, Vented Shelf Plates only with Camguard™ antimicrobial

2 Post Heights

64" (162,6 cm) and 72" (182,9 cm)

3 Shelf Widths

18" (45,7 cm), 21" (53,3) and 24" (61 cm)

5 Shelf Lengths

36", 42", 48", 54", 60" (91,4 cm, 106,7 cm, 121,9 cm, 137,2cm, 152,4 cm)

• Starter Unit includes:

- Two Post Kits.
- Four Vented Shelf Kits.



Features & Benefits

Versatile Storage

For use in any environment, indoors or outdoors, including walk-in coolers and freezers, dry storage, wet areas or front of the house display. Works in temperatures down to -36°F (-30°C) or warm environments up to 190°F (88°C). Weldless and rust free.

Fits in Any Space

Units combine together in straight lines by sharing posts of existing units. Corner Connectors, made of reinforced nylon, connect units together in a 90° angle. Unique design maximizes valuable space and offers strength and stability. Simplify assembly and reduce costs by sharing posts of existing unit without the use of add-on clips or "S" hooks.

Easy to Clean

Camshelving shelf plates contain Camguard™ antimicrobial, a silver-ion technology that inhibits the growth of mold, fungus and bacteria that may cause odors, stains and product degradation. Camguard is incorporated throughout the shelf plate material so that it will never wash off or wear out. The shelf plates remove easily and can be placed in an open end Camrack® (OETR314) for washing. The traverses and post kits are smooth polypropylene so they can be wiped or steam cleaned. The traverses can be easily removed and washed in a conveyor dishwasher.

Easy to Assemble

Assembles in minutes with the use of a rubber mallet. Requires no bolts or nuts, clips or stainless steel connectors. Molded in dovetails on Posts ensure that Traverses set easily into place.

Strong as Steel

Posts and Traverses are made of a steel core coated with polypropylene. Uniquely engineered Post Connectors offer exceptional cross stabilization. Shelves up to 48" (121,9 cm) long hold up to 800 lbs. (363 kg) evenly distributed static weight. Shelves 54" - 72" (137,2 - 182,9 cm) long hold up to 600 lbs. (272 kg) each. Shelves connected by Corner Connectors hold 400 lbs. (182 kg) for any length traverse.

Easy to Adjust

Requires use of rubber mallet. Shelves can be adjusted at 4" (10,2 cm) increments. Add a shelf to an existing unit by simply ordering the appropriate Shelf Kit. Sturdy reinforced nylon foot on bottom of each stationary Post adjusts easily for floor irregularities.

Optional Accessories

Includes Wall Fastener and Seismic Foot. Each are packed 4 per case. Identification Tags clip easily onto traverses. Dunnage stand recommended for heavy usage with shelves 54" (137,2 cm) or longer. Increases capacity of bottom shelf to 1,000 lbs. (450 kg).

Item No. _____

Specifier Identification No. _____

Code No. _____

Quantity _____



Four Shelf Starter Unit consists of two Post Kits and four Vented Shelf Kits.



Dunnage Stand



Set of Left and Right Corner Connectors (1 set required per shelf).

Approvals



Components

* Does not include 6" (15 cm) Shelf Plate, Wall Fastener and Seismic Foot.

CAMBRO
MANUFACTURING COMPANY
www.cambro.com

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Telephone 714 848 1555 Toll Free 800 854 7631 Customer Service Hot Line 800 833 3003 680
LIT CS-0505-2CS(REV)

2CS

Camshelving®

Stationary - Starter Units

4 Shelf Units, Vented Shelf Plates only

Item No. _____

Specifier Identification No. _____

Code No. _____

Quantity _____

Four shelf Starter Unit includes two Post Kits and four Vented Shelf Kits

64" (162,6 cm) Height
18" (45,7 cm) Width

Code	traverse in. cm	case lbs. (cube)	case kg. (cube m³)
CSU48366	36" 91,4	77.36 (5.90)	35.09 (0,1671)
CSU48426	42" 106,7	86.08 (5.90)	39.04 (0,1671)
CSU48486	48" 121,9	91.36 (5.90)	41.44 (0,1671)
CSU48546	54" 137,2	100.08 (5.90)	46.00 (0,1671)
CSU48606	60" 152,4	106.80 (5.90)	48.44 (0,1671)

64" (162,6 cm) Height
21" (53,3 cm) Width

Code	traverse in. cm	case lbs. (cube)	case kg. (cube m³)
CSU41366	36" 91,4	82.92 (7.17)	37.61 (0,2030)
CSU41426	42" 106,7	93.12 (7.17)	42.24 (0,2030)
CSU41486	48" 121,9	98.96 (7.17)	44.89 (0,2030)
CSU41546	54" 137,2	109.20 (7.17)	49.53 (0,2030)
CSU41606	60" 152,4	117.24 (7.17)	53.18 (0,2030)

64" (162,6 cm) Height
24" (61 cm) Width

Code	traverse in. cm	case lbs. (cube)	case kg. (cube m³)
CSU44366	36" 91,4	85.44 (8.50)	38.75 (0,2407)
CSU44426	42" 106,7	94.24 (8.50)	42.75 (0,2407)
CSU44486	48" 121,9	103.00 (8.50)	46.72 (0,2407)
CSU44546	54" 137,2	111.80 (8.50)	51.00 (0,2407)
CSU44606	60" 152,4	118.28 (8.50)	53.65 (0,2407)

72" (182,9 cm) Height
18" (45,7 cm) Width

Code	traverse in. cm	case lbs. (cube)	case kg. (cube m³)
CSU48367	36" 91,4	79.46 (5.90)	36.04 (0,1671)
CSU48427	42" 106,7	88.18 (5.90)	40.00 (0,1671)
CSU48487	48" 121,9	93.46 (5.90)	42.39 (0,1671)
CSU48547	54" 137,2	103.58 (5.90)	47.00 (0,1671)
CSU48607	60" 152,4	108.90 (5.90)	49.40 (0,1671)

72" (182,9 cm) Height
21" (53,3 cm) Width

Code	traverse in. cm	case lbs. (cube)	case kg. (cube m³)
CSU41367	36" 91,4	86.42 (7.17)	39.20 (0,2030)
CSU41427	42" 106,7	96.62 (7.17)	43.83 (0,2030)
CSU41487	48" 121,9	102.46 (7.17)	46.48 (0,2030)
CSU41547	54" 137,2	112.70 (7.17)	51.12 (0,2030)
CSU41607	60" 152,4	120.74 (7.17)	54.77 (0,2030)

72" (182,9 cm) Height
24" (61 cm) Width

Code	traverse in. cm	case lbs. (cube)	case kg. (cube m³)
CSU44367	36" 91,4	88.94 (8.50)	40.34 (0,2407)
CSU44427	42" 106,7	97.74 (8.50)	44.33 (0,2407)
CSU44487	48" 121,9	106.50 (8.50)	48.31 (0,2407)
CSU44547	54" 137,2	115.30 (8.50)	52.50 (0,2407)
CSU44607	60" 152,4	121.78 (8.50)	55.24 (0,2407)

Corner Connector Set

code	description	case lbs. (cube)	case kg. (cube m³)
CSCC	Right and Left	0.38 (0.05)	0.02 (0,0014)

Case Pack: 1 set

Architect Specs

Posts:	Internal steel core, reinforced polypropylene exterior.
Post Connectors:	Reinforced polypropylene.
Traverses:	Internal steel core, reinforced polypropylene exterior.
Vented/Solid Shelf Plates:	Reinforced polypropylene with Camguard™ antimicrobial.
Corner Connectors:	Reinforced nylon.
Adjustable Foot:	Reinforced nylon.
Seismic Foot:	Stainless steel post and wide foot plate, 3 holes for bolts. (Bolts not provided)
Wall Fastener:	Stainless steel.

6 1/2" (16,5 cm) Height

code	width	case lbs. (cube)	case kg. (cube m³)
CSDS18	18"	2.90 (0.22)	1.30 (0,0062)
CSDS21	21"	3.10 (0.26)	1.40 (0,0074)
CSDS24	24"	3.30 (0.30)	1.50 (0,0085)

Optional Accessories

Seismic Foot (Bolts not provided)	<input type="checkbox"/> CSEQ3	Color: Silver	Case pack: 4 each
Wall Fastener	<input type="checkbox"/> CSWF	Color: Silver	Case pack: 4 each
Identification Tag 6"	<input type="checkbox"/> CSID	Color: White/Clear	Case pack: 12 each
Identification Tag 3"	<input type="checkbox"/> CSID3	Color: White/Clear	Case pack: 12 each

Standard Colors

☐ Speckled Gray (480)

Approvals



Components

* Does not include 6" (15 cm) Shelf Plate,
Wall Fastener and Seismic Foot.

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Telephone 714 848 1555 Toll Free 800 854 7631 Customer Service Hot Line 800 833 3003 681

Printed in USA.

CAMBRO**S-Series Dunnage Racks****Solid Top**

Models DRS30, DRS36, DRS48, DRS60

Slotted Top

Models DRS300, DRS360, DRS480, DRS600

Features & Benefits**StoreSafe**

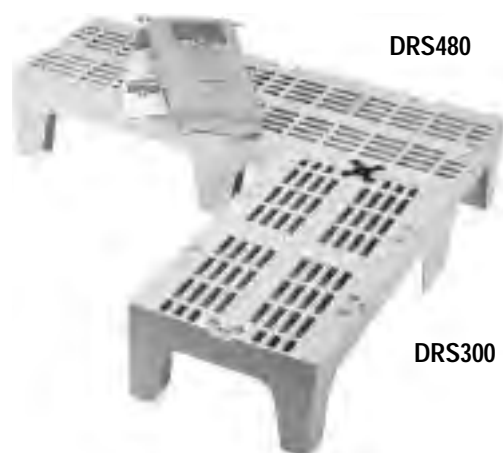
- Conveniently and safely store heavy bulk foods, liquids, dairy products, dry goods, paper products, or clean equipment 12" (30 cm) off the floor.
- Storage height is double the required 6" (15 cm) enforced by most regional food safety and/or HACCP programs.
- Use in receiving dock area to keep clean food storage boxes safely off the ground while transferring bulk produce and other food products out of cartons and into storage boxes.
- New Speckled Gray (480) color matches perfectly with Camshelving™ for a clean, consistent look from the freezer to the cooler to dry storage area.
- Load capacity:
 - Models DRS30, DRS36, DRS300, DRS360 - 1500 lbs. (680 kg.)
 - Models DRS48, DRS60, DRS480, DRS600 - 3000 lbs. (1,360 kg.)
- One piece, seamless, heavy-duty polypropylene ensures long lasting durability and superior equipment performance. Single wall structure provides added strength and stability.
- Smooth surface is easy to clean and will not rust, chip, dent or corrode. Open ends and sides provide easy access for cleaning floor areas underneath.
- Available with solid ribbed tops or slotted tops.
- Slotted tops recommended for use in coolers and freezers to ensure extra cold air circulation around perishable products for optimum freshness and quality.
- One Camlink® connector is included to securely lock racks together for a more stable storage system.
- No assembly required.
- Available in 2 colors.

Item No. _____

Specifier Identification No. _____

Model No. _____

Quantity _____

**S-Series Solid Top Dunnage Racks****S-Series Slotted Top Dunnage Racks**

Camlink®
Securely connects S-Series
Dunnage Racks together.

Approvals

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LIT FCST-0102-17

S-Series Dunnage Racks

Solid Top

Models DRS30, DRS36, DRS48, DRS60

Slotted Top

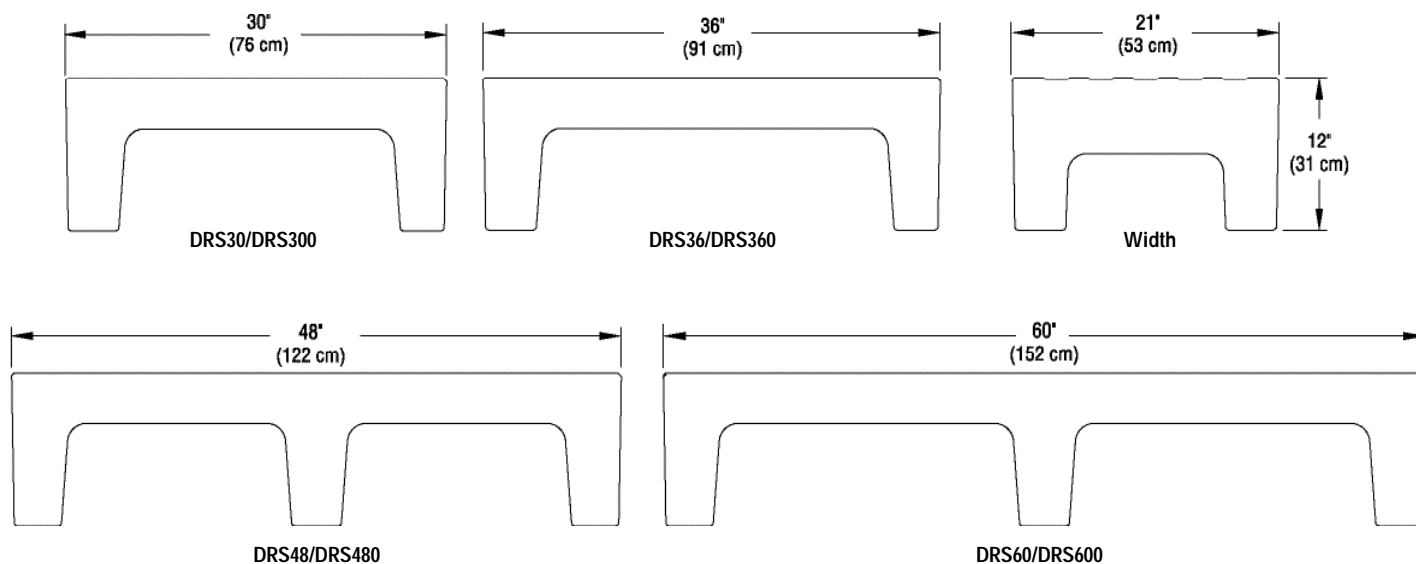
Models DRS300, DRS360, DRS480, DRS600

Item No. _____

Specifier Identification No. _____

Model No. _____

Quantity _____



Specifications

Dimension Tolerance: +/- 1/4" (0,64 cm)

Code	Load Capacity	Dimensions L x W x H	Case lbs./cube Kg/m ³
Solid Top			
DRS30	1500 lbs. (680 Kg.)	30" x 21" x 12" (76 x 53 x 31 cm)	19 (4.78) 9 (0,13)
DRS36	1500 lbs. (680 Kg.)	36" x 21" x 12" (91 x 53 x 31 cm)	21 (5.72) 9,5 (0,16)
DRS48	3000 lbs. (1,360 Kg.)	48" x 21" x 12" (122 x 53 x 31 cm)	28 (7.77) 13 (0,22)
DRS60	3000 lbs. (1,360 Kg.)	60" x 21" x 12" (152 x 53 x 31 cm)	35 (9.72) 16 (0,27)

Code	Load Capacity	Dimensions L x W x H	Case lbs./cube Kg/m ³
Slotted Top			
DRS300	1500 lbs. (680 Kg.)	30" x 21" x 12" (76 x 53 x 31 cm)	19 (4.78) 9 (0,13)
DRS360	1500 lbs. (680 Kg.)	36" x 21" x 12" (91 x 53 x 31 cm)	20 (5.72) 9 (0,16)
DRS480	3000 lbs. (1,360 Kg.)	48" x 21" x 12" (122 x 53 x 31 cm)	26.5 (7.77) 12 (0,22)
DRS600	3000 lbs. (1,360 Kg.)	60" x 21" x 12" (152 x 53 x 31 cm)	34 (9.72) 15,5 (0,27)

Optional Accessories

Camlink® Connector ☐ DRLNK Black (110)
(1 included with each S-Series Dunnage Rack)

Standard Colors

☐ Dark Brown (131) ☐ Speckled Gray (480)

Architect Specs

The S-Series Dunnage Racks shall be Cambro Models..., manufactured by Cambro Mfg. Co., Huntington Beach, CA 92648 U.S.A. Each unit shall be constructed of one-piece, seamless, heavy-duty molded polypropylene and shall be available with solid ribbed tops or slotted tops. Unit load capacity shall range from 1500 - 3000 lbs. (680 -1,360 Kg.). The top of each unit shall be 12" (30 cm) from the floor. Units will not rust or corrode. Each unit shall come with one Camlink® connector to securely lock racks together. It shall require no assembly and shall be available in 2 colors.

Approvals



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Telephone (1)714 848 1555 Toll Free 800 854 7631 Customer Service Hot Line 800 833 3003 683

Printed in USA

CUSTOM FABRICATED ☒

SPARE NUMBER ☐

MILLWORK ☐

EXISTING ☐

NOT IN KITCHEN
EQUIP. CONTRACT
(NIKEC) ☐

FURNISHED BY:

OWNER ☐

OPERATOR ☐

SUPPLIER/
VENDOR ☐

DIV. 15, PLUMB ☐

DIV. 16, ELEC. ☐

ARCHITECT ☐

OTHER ☐

NOTES:

CUSTOM FABRICATED ☒

SPARE NUMBER ☐

MILLWORK ☐

EXISTING ☐

NOT IN KITCHEN
EQUIP. CONTRACT
(NIKEC) ☐

FURNISHED BY:

OWNER ☐

OPERATOR ☐

SUPPLIER/
VENDOR ☐

DIV. 15, PLUMB ☐

DIV. 16, ELEC. ☐

ARCHITECT ☐

OTHER ☐

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DIV. 15, PLUMB ☐

DIV. 16, ELEC. ☐

ARCHITECT ☐

OTHER ☐

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DIV. 16, ELEC. ☐

ARCHITECT ☐

OTHER ☐

NOTES:

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DIV. 16, ELEC. ☐

ARCHITECT ☐

OTHER ☐

NOTES:

CUSTOM FABRICATED ☒

SPARE NUMBER ☐

MILLWORK ☐

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EQUIP. CONTRACT
(NIKEC) ☐

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VENDOR ☐

DIV. 15, PLUMB ☐

DIV. 16, ELEC. ☐

ARCHITECT ☐

OTHER ☐

NOTES:

CUSTOM FABRICATED	—
SPARE NUMBER	—
MILLWORK	—
EXISTING	—
NOT IN KITCHEN EQUIP. CONTRACT (NIKEC)	_X_
FURNISHED BY:	
OWNER	_X_
OPERATOR	—
SUPPLIER/ VENDOR	—
DIV. 15, PLUMB	—
DIV. 16, ELEC.	—
ARCHITECT	—
OTHER	—

NOTES:

CUSTOM FABRICATED ☐

SPARE NUMBER ☐

MILLWORK ☐

EXISTING ☐

NOT IN KITCHEN
EQUIP. CONTRACT ☒
(NIKEC)

FURNISHED BY:

OWNER ☒

OPERATOR ☐

SUPPLIER/
VENDOR ☐

DIV. 15, PLUMB ☐

DIV. 16, ELEC. ☐

ARCHITECT ☐

OTHER ☐

NOTES:



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Hand Sink, model _____. Constructed of all-welded type 304 stainless steel, with deep-drawn positive drain sink bowl, basket drain, inverted "V" edge to prevent spillage, and splash mounted gooseneck spout. Offered are the following hand sinks:

- Eagle Pedestal Style Hand Sink, model HSA-10-FA-P. Includes stainless steel pedestal base with front access panel, foot valves, p-trap and tail piece.
- Eagle Single Foot Valve Pedestal Style Hand Sink, model HSA-10-FA-1P. Includes stainless steel pedestal base with front access panel, single foot valve, P-trap and tail piece.
- Eagle Knee Pedal Hand Sink, model HSA-10-FK. Includes knee pedals and stainless steel skirt.
- Eagle Knee Pedal Hand Sink, model HSA-10-FKP. Includes single pedal knee valve and stainless steel skirt.
- Eagle Single Knee Pedal Hand Sink, model HSA-10-1FK. Includes single knee pedal and stainless steel skirt.
- Eagle Knee Pedal Hand Sink, model HSA-10-FDPK. Includes knee pedals, towel dispenser and soap dispenser.



HSA-10-FA-P
foot valve-operated
hand sink



HSA-10-FK
knee valve-operated hand sink



HSA-10-FKP

EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

Phone: 302-653-3000 • Fax: 302-653-2065

www.eaglegrp.com

Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our SpecFAB® Division.

Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

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Item No.: _____
Project No.: _____
S.I.S. No.: _____

Knee/Foot Valve Operated Hand Sinks

MODELS:

- | | |
|-------------------------------------|---------------------------------------|
| <input type="checkbox"/> HSA-10-FK | <input type="checkbox"/> HSA-10-FDPK |
| <input type="checkbox"/> HSA-10-FKP | <input type="checkbox"/> HSA-10-FA-P |
| <input type="checkbox"/> HSA-10-1FK | <input type="checkbox"/> HSA-10-FA-1P |

Design and Construction Features on all sinks

- Type 304 stainless steel all-welded construction.
- Splash mount lead-free gooseneck spout.
- 1½" basket drain.
- Inverted "V" edge rim retards spillage.
- Deep-drawn bowl with positive drainage.

Knee Valve-Operated Hand Sinks

- Model #HSA-10-FK includes individual hot & cold knee pedals.
- Model #HSA-10-FKP includes single pedal knee valve.
- Model #HSA-10-1FK comes with single knee pedal.
- Model #HSA-10-FDPK includes knee pedals, c-fold towel dispenser and soap dispenser.
- Stainless steel "skirt" on all knee valve operated hand sinks.
- Knee valve requires piping from valve to gooseneck.

Foot Valve-Operated Hand Sinks

- Stainless steel pedestal, complete with removable front access panel, mounts to floor and wall.
- Includes splash-mount lead-free gooseneck spout, foot pedal valves, p-trap, and tailpiece.
- Model #HSA-10-FA-1P comes with single foot pedal.
- Foot valve requires piping from valve to gooseneck.

Options / Accessories

- ☐ P-trap*
- ☐ Tail piece*
- ☐ MICROGARD® antimicrobial protection**

* For knee valve-operated handsinks

** See the Price List for more details about MICROGARD® for handsinks.

All Eagle Group hand sinks use lead-free faucets to meet California law #AB1953.

Certifications / Approvals



AUTOQUOTES



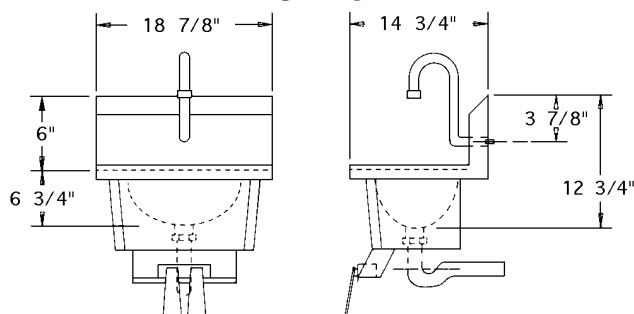


Profit from the Eagle Advantage®

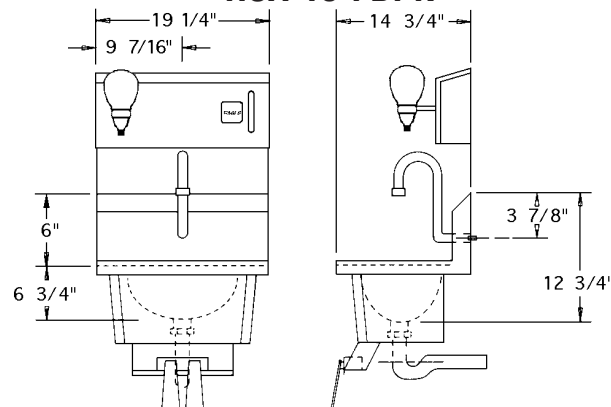
Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Knee-Operated Wall-Mounted Units

#HSA-10-FK



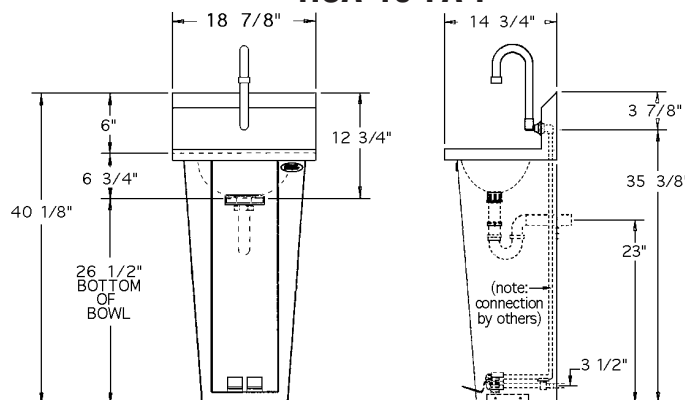
HSA-10-FDPK



model #	includes	<u>bowl size</u>		<u>overall size</u>		<u>weight</u>	
		width x length x depth	in. mm	width x length x height	in. mm	lbs.	kg
HSA-10-FK	spout, knee pedals, skirt, basket drain	9 3/4" x 13 1/2" x 6 3/4"	248 x 343 x 173	14 3/4" x 18 7/8" x 17 1/2"	376 x 480 x 445	27	12.2
HSA-10-FKP	spout, single pedal knee valve, skirt, basket drain	9 3/4" x 13 1/2" x 6 3/4"	248 x 343 x 173	14 3/4" x 18 7/8" x 17 1/2"	376 x 480 x 445	26	11.8
HSA-10-1FK	spout, single knee pedal, skirt, basket drain	9 3/4" x 13 1/2" x 6 3/4"	248 x 343 x 173	14 3/4" x 18 7/8" x 17 1/2"	376 x 480 x 445	27	12.2
HSA-10-FDPK	spout, knee pedals, skirt, soap disp., towel disp., basket drain	9 3/4" x 13 1/2" x 6 3/4"	248 x 343 x 173	14 3/4" x 19 1/4" x 33"	376 x 489 x 838	44	20.0

Foot-Operated Pedestal Units

HSA-10-FA-P



model #	includes	<u>bowl size</u>		<u>overall size</u>		<u>weight</u>	
		width x length x depth	in. mm	width x length x height	in. mm	lbs.	kg
HSA-10-FA-P	spout, foot pedals, p-trap, tail piece, basket drain	9 3/4" x 13 1/2" x 6 3/4"	248 x 343 x 173	14 3/4" x 18 7/8" x 39 1/4"	376 x 480 x 997	32	14.5
HSA-10-FA-1P	spout, single foot pedal, p-trap, tail piece, basket drain	9 3/4" x 13 1/2" x 6 3/4"	248 x 343 x 173	14 3/4" x 18 7/8" x 39 1/4"	376 x 480 x 997	32	14.5

EAGLE GROUP

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Rev. 09/14

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UNDERCOUNTER REFRIGERATOR

Model: UC27

27" Undercounter Refrigerator with Solid Door

Stainless steel front, aluminum subtop, end panels, case back and interior.

Designed to maintain NSF-7 temperatures in 100°F ambient.



Options and Accessories

(upcharge and lead times may apply)

Stainless steel exterior and interior - SS models	Stainless steel shelves
Stainless steel subtop	Expansion valve system
Glass door in lieu of solid door - GD models	Remote models
Drawers in lieu of door	Door lock
Additional epoxy-coated steel shelves	Special electrical requirements (consult factory)
Automatic electric condensate evaporator	

Project Name:

Model Specified:

Location:

Item No:

Quantity:

AIA #:

SIS #:

Standard Model Features

REFRIGERATION SYSTEM

Performance-rated refrigeration system
Environmentally-safe R-134a refrigerant
Automatic, energy-saving, non-electric condensate evaporator
Non-corrosive, plasticized fin evaporator coil
Easily serviceable back mounted compressor

CABINET ARCHITECTURE

2" non-CFC polyurethane foam insulation
Spring loaded, self closing door
Magnetic snap-in door gasket
Heavy-duty, epoxy-coated steel shelf
Completely enclosed, vented and removable case back
3 5/8" casters

MODEL FEATURES

Interior hanging thermometer
Front breathing
Field rehingeable door
Meets ADA height requirements

Front breathers are a unique, field assembled, bottom mounted ventilation system designed to allow cabinets to be flush against a wall or built into a counter to conserve space.

Continental
Refrigerator

Toll-Free: 800-523-7138
Phone: 215-244-1400
Fax: 215-244-9579

539 Dunksferry Road
Bensalem, PA 19020
www.continentalrefrigerator.com

APPROVAL:

694

Model Specifications

DIMENSIONAL DATA

Net Capacity (cu. ft.)	7.4 (210 cu l)
Width, Overall (in.)	27 11/16 (703 mm)
Depth, Overall (in.) (incl. handle)	30 9/16 (776 mm)
Depth, Body Only (less door) (in.)	27 1/2 (699 mm)
Height, Overall (in.) (incl. 3 5/8" casters)	31 61/64 (812 mm)
Shelf Area (sq. ft.)	3.5 (.3 sq m)
No. of Shelves	1
No. of Doors	1
Interior Depth (in.)	See Drawing
Interior Height (in.)	23 5/8 (600 mm)
Interior Width (in.)	24 1/2 (622 mm)

REFRIGERANT DATA

Condensing Unit Size (H.P.)	1/5
Capacity (BTU/Hr)*	1620

ELECTRICAL DATA

Voltage (int'l)	115/60/1 (220/50/1)
Fans	1
Total Amps (int'l)	6.3 (3.7)
10 ft. Cord/Plug [attached] (int'l)	Yes (No)

SHIPPING DATA

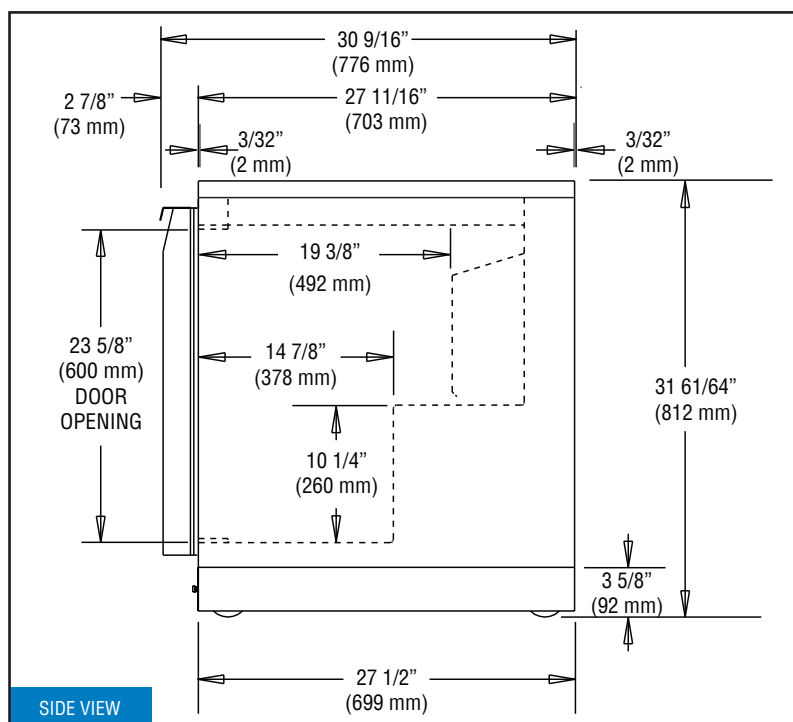
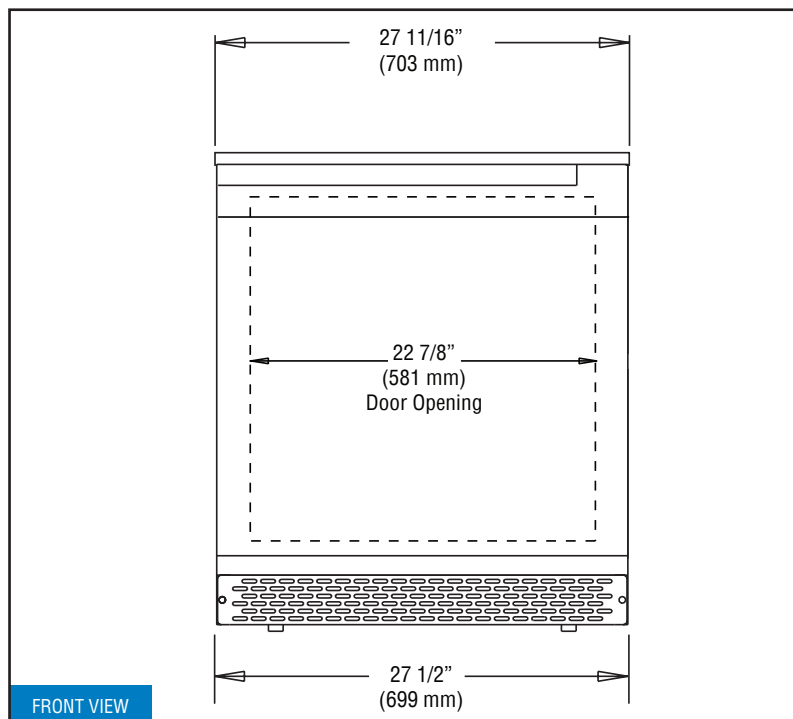
Weight (lbs.)	165 (75 kg)
Height - Crated (in.)	43 1/4 (1099 mm)
Width - Crated (in.)	35 3/4 (908 mm)
Depth - Crated (in.)	37 1/4 (946 mm)

* Rating @ +25°F evaporator, 90°F ambient
Figures in parentheses reflect metric equivalents rounded to the nearest whole unit.



Equipped with one NEMA-5-15P Plug
(varies by country)

Model Plan Views



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Bensalem, PA 19020
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Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Soiled Dishtables, model _____. Top to be 16/430, 16/304, or 14/304 stainless steel with all seams welded, ground smooth, and polished. Front and ends to have 3"-high upturn with a 1½"-diameter rolled edge. Galvanized hat channels welded to underside. Backsplash is 8"-high. 20½" opening for dishwasher. 20" x 20" x 5" deep stainless steel prerinse sink with basket drain, hole for deck mounted prerinse spray, and rubber scrap block provided. Legs to be 1½" O.D. galvanized tubing with 1" diameter crossbracing and adjustable bullet feet (14/304 models come standard with stainless steel hat channels welded to underside of table, stainless steel crossbraced legs, and adjustable metal feet).



left-hand model shown with optional deck-mount prerinse unit (dishwasher not included)

Options / Accessories

- | | |
|--|--|
| <input type="checkbox"/> Rack slides | <input type="checkbox"/> Faucets |
| <input type="checkbox"/> Scrap basket | <input type="checkbox"/> Undershelf |
| <input type="checkbox"/> Scrap basket/
rack slide combo | <input type="checkbox"/> Stainless steel legs |
| <input type="checkbox"/> Prerinse unit | <input type="checkbox"/> Stainless steel gussets |
| | <input type="checkbox"/> Stainless steel feet |

EAGLE GROUP

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Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our **SpecFAB®** Division.

Phone: 302-653-3000 • Fax: 302-653-3091 • e-mail: specfab@eaglegrp.com

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Soiled Dishtables— Straight Design

MODELS:

- | | | |
|---------------------------------------|---------------------------------------|--|
| <input type="checkbox"/> SDTL-30-16/4 | <input type="checkbox"/> SDTR-48-16/3 | <input type="checkbox"/> SDTL-84-14/3 |
| <input type="checkbox"/> SDTL-30-16/3 | <input type="checkbox"/> SDTR-48-14/3 | <input type="checkbox"/> SDTR-84-16/4 |
| <input type="checkbox"/> SDTL-30-14/3 | <input type="checkbox"/> SDTL-60-16/4 | <input type="checkbox"/> SDTR-84-16/3 |
| <input type="checkbox"/> SDTR-30-16/4 | <input type="checkbox"/> SDTL-60-16/3 | <input type="checkbox"/> SDTR-84-14/3 |
| <input type="checkbox"/> SDTR-30-16/3 | <input type="checkbox"/> SDTL-60-14/3 | <input type="checkbox"/> SDTL-96-16/4 |
| <input type="checkbox"/> SDTR-30-14/3 | <input type="checkbox"/> SDTR-60-16/4 | <input type="checkbox"/> SDTL-96-16/3 |
| <input type="checkbox"/> SDTL-36-16/4 | <input type="checkbox"/> SDTR-60-16/3 | <input type="checkbox"/> SDTL-96-14/3 |
| <input type="checkbox"/> SDTL-36-16/3 | <input type="checkbox"/> SDTR-60-14/3 | <input type="checkbox"/> SDTR-96-16/4 |
| <input type="checkbox"/> SDTL-36-14/3 | <input type="checkbox"/> SDTL-72-16/4 | <input type="checkbox"/> SDTR-96-16/3 |
| <input type="checkbox"/> SDTR-36-16/4 | <input type="checkbox"/> SDTL-72-16/3 | <input type="checkbox"/> SDTR-96-14/3 |
| <input type="checkbox"/> SDTR-36-16/3 | <input type="checkbox"/> SDTL-72-14/3 | <input type="checkbox"/> SDTL-120-16/4 |
| <input type="checkbox"/> SDTR-36-14/3 | <input type="checkbox"/> SDTR-72-16/4 | <input type="checkbox"/> SDTL-120-16/3 |
| <input type="checkbox"/> SDTL-48-16/4 | <input type="checkbox"/> SDTR-72-16/3 | <input type="checkbox"/> SDTL-120-14/3 |
| <input type="checkbox"/> SDTL-48-16/3 | <input type="checkbox"/> SDTR-72-14/3 | <input type="checkbox"/> SDTR-120-16/4 |
| <input type="checkbox"/> SDTL-48-14/3 | <input type="checkbox"/> SDTL-84-16/4 | <input type="checkbox"/> SDTR-120-16/3 |
| <input type="checkbox"/> SDTR-48-16/4 | <input type="checkbox"/> SDTL-84-16/3 | <input type="checkbox"/> SDTR-120-14/3 |

Design and Construction Features

- 16 or 14 gauge stainless steel.
- 30" (762mm)-wide table with choice of eight lengths.
- Left or right hand operation.
- 20" x 20" x 5" (508 x 508 x 127mm) prerinse sink punched for standard basket drain.
- Hole supplied for deck-mount prerinse.
- Adjustable non-marking feet with up to 1" (25mm) adjustment.
- 1½" (41mm)-diameter galvanized legs with welded 1" (25mm)-diameter crossbrace.
- All Spec-Master® 14 gauge type 304 dishtables come standard with stainless steel crossbraced legs and gussets, complete with stainless steel feet.
- Scrap block automatically provided on left-hand models 48" (1219mm) and longer, and right-hand models 60" (1524mm) and longer. To specify no scrap block desired, add suffix "-NSB" to model number.
Example: SDTL-48-16/4-NSB

Certifications / Approvals



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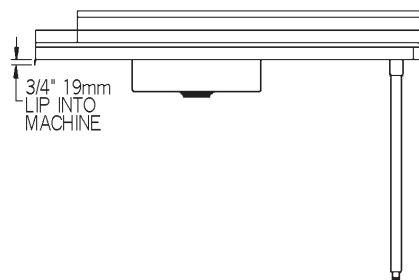
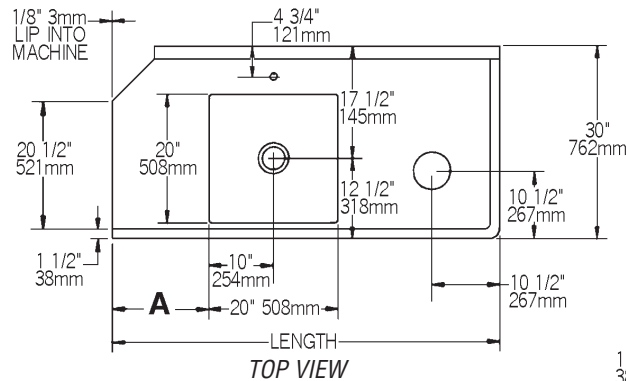
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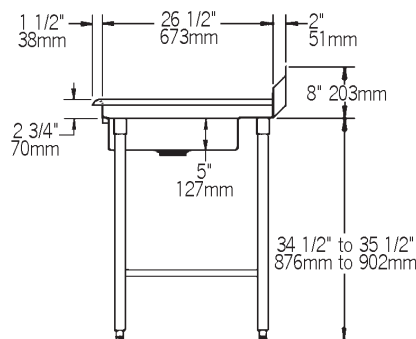
Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Soiled Dishtables—Straight Design



FRONT VIEW

(right-hand model shown)



SIDE VIEW

Dimension A

- **3 1/2"** – for 30" & 36" tables L or R, and 48" left only.
 - **15"** – for 48" right and 60" & 72" both L or R.
 - **23 1/2"** – for 84" & 96" tables.
- Please review dishwasher for size and location of control box.**

16 gauge type 430 model #	16 gauge type 304 model #	Spec-Master® 14 gauge type 304 model #	description	length		weight	
				in.	mm	lbs.	kg
SDTL-30-16/4	SDTL-30-16/3	SDTL-30-14/3	left-hand model	30"	762	42	19.1
SDTR-30-16/4	SDTR-30-16/3	SDTR-30-14/3	right-hand model	30"	762	42	19.1
SDTL-36-16/4	SDTL-36-16/3	SDTL-36-14/3	left-hand model	36"	914	49	22.2
SDTR-36-16/4	SDTR-36-16/3	SDTR-36-14/3	right-hand model	36"	914	49	22.2
SDTL-48-16/4*	SDTL-48-16/3*	SDTL-48-14/3*	left-hand model	48"	1219	63	29.6
SDTR-48-16/4	SDTR-48-16/3	SDTR-48-14/3	right-hand model	48"	1219	63	29.6
SDTL-60-16/4*	SDTL-60-16/3*	SDTL-60-14/3*	left-hand model	60"	1524	77	34.9
SDTR-60-16/4*	SDTR-60-16/3*	SDTR-60-14/3*	right-hand model	60"	1524	77	34.9
SDTL-72-16/4*	SDTL-72-16/3*	SDTL-72-14/3*	left-hand model	72"	1829	91	41.3
SDTR-72-16/4*	SDTR-72-16/3*	SDTR-72-14/3*	right-hand model	72"	1829	91	41.3
SDTL-84-16/4*	SDTL-84-16/3*	SDTL-84-14/3*	left-hand model	84"	2134	105	47.6
SDTR-84-16/4*	SDTR-84-16/3*	SDTR-84-14/3*	right-hand model	84"	2134	105	47.6
SDTL-96-16/4*	SDTL-96-16/3*	SDTL-96-14/3*	left-hand model	96"	2438	119	54.0
SDTR-96-16/4*	SDTR-96-16/3*	SDTR-96-14/3*	right-hand model	96"	2438	119	54.0
SDTL-120-16/4*	SDTL-120-16/3*	SDTL-120-14/3*	left-hand model	120"	3048	147	66.7
SDTR-120-16/4*	SDTR-120-16/3*	SDTR-120-14/3*	right-hand model	120"	3048	147	66.7

* Scrap block provided with these models. To order one of these models with no scrap block, add suffix "-NSB" on end of model number. Example: SDTL-60-14/3-NSB

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697



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Wall Shelf, model _____. Constructed of 16 gauge type 430, 16 gauge type 304, or 14 gauge type 304 stainless steel. 1½" roll on front, with 1½" upturn on rear and ends. Stainless steel mounting brackets are stud welded to shelf.



#WS1236-16/3 wall shelf

Wall Shelves

MODELS:

- | | |
|---|---|
| <input type="checkbox"/> WS1024-* | <input type="checkbox"/> WS1224-* |
| <input type="checkbox"/> WS1036-* | <input type="checkbox"/> WS1236-* |
| <input type="checkbox"/> WS1048-* | <input type="checkbox"/> WS1248-* |
| <input type="checkbox"/> WS1060-* | <input type="checkbox"/> WS1260-* |
| <input type="checkbox"/> WS1072-* | <input type="checkbox"/> WS1272-* |
| <input type="checkbox"/> WS1084-* | <input type="checkbox"/> WS1284-* |
| <input type="checkbox"/> WS1096-* | <input type="checkbox"/> WS1296-* |
| <input type="checkbox"/> WS10108-* | <input type="checkbox"/> WS12108-* |
| <input type="checkbox"/> WS10120-* | <input type="checkbox"/> WS12120-* |

* See chart on back page for complete model numbers.

Wall Mounted Shelves

- 1½" (38mm) roll on front.
- 1½" (38mm) upturn on rear and ends.
- Die-formed stainless steel mounting brackets are stud-welded to shelf.
- All stainless steel polished to #4 finish.
- Available in 16 gauge type 430, 16 gauge type 304, and 14 gauge type 304 stainless steel.
- Wide selection of sizes.

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Certifications / Approvals



AUTOQUOTES



EG02.05 Rev. 09/13

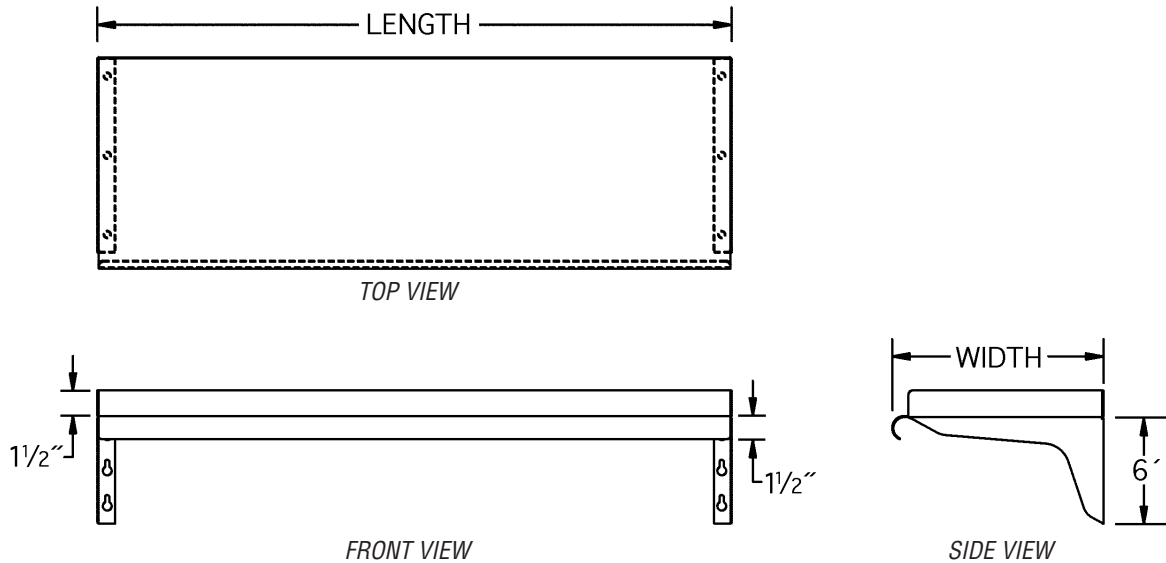
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Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Wall Mounted Shelves



16 gauge type 430 model #	16 gauge type 304 model #	14 gauge type 304 model #	width*		length		weight	
			in.	mm	in.	mm	lbs.	kg
WS1024-16/4	WS1024-16/3	WS1024-14/3	10"	254	24"	610	10	4.5
WS1036-16/4	WS1036-16/3	WS1036-14/3	10"	254	36"	914	12	5.4
WS1048-16/4	WS1048-16/3	WS1048-14/3	10"	254	48"	1219	15	6.8
WS1060-16/4	WS1060-16/3	WS1060-14/3	10"	254	60"	1524	20	9.0
WS1072-16/4	WS1072-16/3	WS1072-14/3	10"	254	72"	1829	22	10.0
WS1084-16/4	WS1084-16/3	WS1084-14/3	10"	254	84"	2134	24	10.9
WS1096-16/4	WS1096-16/3	WS1096-14/3	10"	254	96"	2438	29	13.2
WS10108-16/4	WS10108-16/3	WS10108-14/3	10"	254	108"	2743	32	14.5
WS10120-16/4	WS10120-16/3	WS10120-14/3	10"	254	120"	3048	34	15.4
WS1224-16/4	WS1224-16/3	WS1224-14/3	12"	305	24"	610	12	5.4
WS1236-16/4	WS1236-16/3	WS1236-14/3	12"	305	36"	914	14	6.4
WS1248-16/4	WS1248-16/3	WS1248-14/3	12"	305	48"	1219	17	7.7
WS1260-16/4	WS1260-16/3	WS1260-14/3	12"	305	60"	1524	23	10.4
WS1272-16/4	WS1272-16/3	WS1272-14/3	12"	305	72"	1829	25	11.3
WS1284-16/4	WS1284-16/3	WS1284-14/3	12"	305	84"	2134	28	12.7
WS1296-16/4	WS1296-16/3	WS1296-14/3	12"	305	96"	2438	31	14.1
WS12108-16/4	WS12108-16/3	WS12108-14/3	12"	305	108"	2743	36	16.3
WS12120-16/4	WS12120-16/3	WS12120-14/3	12"	305	120"	3048	39	17.6

* 15" and 18" (381 and 457mm)-wide shelves available. To order, replace "12" in model number with a "15" or "18" indicating shelf width. Example: WS1536-16/3

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PROJECT: _____ ITEM NO.: _____



3-10 H.P. DISPOSER MODELS

Heavy-duty disposer designed for continuous operation in restaurants, hotels, hospitals and cafeterias. Food waste including steak bones is quickly and efficiently removed with this labor-saving, self-cleaning, environmentally sound disposer.

SPECIFICATIONS

- **Grind Chamber:** Corrosion Resistant Stainless Steel
- **Mounting:** 3/4" (19.1 mm) rubber mounting above grinding chamber isolates sound and eliminates vibration. Mounting is enclosed in chrome plated covers for sanitation and appearance.
- **Motor:** 3 – 10 HP Induction Motor, 1725 RPM, totally enclosed to provide protection against outside moisture. Controlled power air flow cools motor for efficiency and longer life. Built-in thermal overload protection.
- **Cutting Elements:** Stationary and rotating shredding elements made from cast nickel chrome alloy for long life and corrosion resistance, designed for reverse action grinding.
- **Main Bearings:** Double-tapered Timken roller bearings provide a shock absorbing cushion.
- **Motor Seals:** Triple lip seal protects motor from water damage. Secondary spring-loaded oil seal provides double protection against water and loss of grease.
- **Finish:** All Stainless Steel and Chrome plated. Paint-free for lasting sanitation.
- **Warranty:** 1 year full warranty from date of installation.
- **A Disposer Package Includes:** 1 Mounting/Bowl Assembly, 1 Electrical Control, 1 Syphon Breaker, 1 Solenoid Valve, and 1 Flow Control Valve. The standard Flow Control Valve will be sent with the unit unless the optional valve is specified.



MODEL & HORSEPOWER/ELECTRICAL REQUIREMENTS

<input type="checkbox"/> SS-300 3 H.P.	<input type="checkbox"/> 208-230/460V, 60 Hz, 3 Ph, 6.0/7.4/3.7 amps, UL <input type="checkbox"/> 208-230/460V, 60 Hz, 3 Ph, 6.0/7.4/3.7 amps, UL, short body <input type="checkbox"/> 208-230/460V, 60 Hz, 3 Ph, 7.0/8.6/3.7 amps, NOM	<input type="checkbox"/> 415V, 50 Hz, 3 Ph, 4.9 amps <input type="checkbox"/> 220V, 50 Hz, 3 Ph, 7.2 amps <input type="checkbox"/> 380V, 50/60 Hz, 3 Ph, 4.1/3.0 amps
<input type="checkbox"/> SS-500 5 H.P.	<input type="checkbox"/> 208-230/460V, 60 Hz, 3 Ph, 8.6/8.8/4.4 amps, UL <input type="checkbox"/> 208-230/460V, 60 Hz, 3 Ph, 8.6/8.8/4.4 amps, UL, short body <input type="checkbox"/> 230/460V, 50 Hz, 3 Ph, 9.0/4.5 amps	<input type="checkbox"/> 415V, 50 Hz, 3 Ph, 6.0 amps <input type="checkbox"/> 380V, 50 Hz, 3 Ph, 8.9 amps
<input type="checkbox"/> SS-750 7-1/2 H.P.	<input type="checkbox"/> 208-230/460V, 60 Hz, 3 Ph, 9.7/12.4/6.2 amps, UL	<input type="checkbox"/> 208-230/460V, 60 Hz, 3 Ph, 9.7/12.4/6.2 amps, UL, short body
<input type="checkbox"/> SS-1000 10 H.P.	<input type="checkbox"/> 208-230/460V, 60 Hz, 3 Ph, 11.0/13.0/6.5 amps, UL	<input type="checkbox"/> 208-230/460V, 60 Hz, 3 Ph, 11.0/13.0/6.5 amps, UL, short body

NOTE: All amp ratings denote amp draw during a grind load.

ELECTRICAL CONTROLS



- ☐ AS-101 Control Center AquaSaver® (Auto-Reversing)



- ☐ CC-101 Control Center (Auto-Reversing)



- ☐ CC-202 Control Center (Auto-Reversing)



- ☐ Manual Reverse Switch (Dual Direction)



- ☐ Manual Switch (Single Direction)

A complete collection of our product drawings is available for download at the InSinkErator Revit/CAD Library, which can be found at www.insinkerator.com/foodservice. Product information is also accessible on **The KCL CADalog**. More information is available from KCL at www.kclcad.com.



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RACINE, WI 53406
TEL: 800-845-8345
FAX: 262 554-3620

www.insinkerator.com/foodservice



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DISPOSER MOUNTING ASSEMBLIES (choose one)

Bowl Mounts



- ☐ Type A Sink Bowl Assembly: Includes bowl, water nozzle(s), bowl cover, splash baffle



- ☐ Type B Sink Bowl Assembly: Includes bowl, water nozzle(s), silver guard, splash baffle



- ☐ Type C Sink Bowl Assembly: Includes bowl, water nozzle(s), splash baffle

Sink Bowl Assembly Size

- ☐ 12" (304.8 mm) with one adjustable water nozzle
- ☐ 15" (381.0 mm) with one adjustable water nozzle
- ☐ 18" (457.2 mm) with two adjustable water nozzles

Collar Mounts



- ☐ #6 Collar Adaptor for welding into trough, provides 6-5/8" (168.3 mm) opening, includes splash baffle



- ☐ #7 Collar Adaptor for welding into sink, provides 6-5/8" (168.3 mm) opening, includes splash baffle and stopper

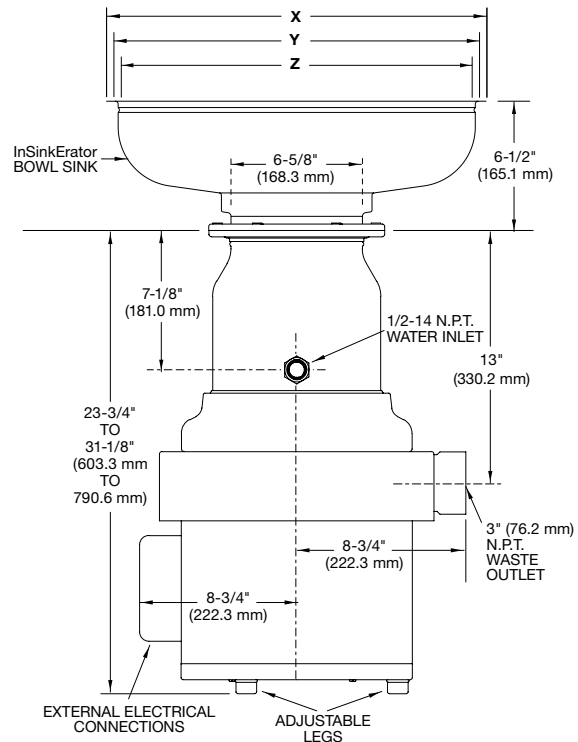
DIMENSIONS

IMPORTANT: Use dimension chart below for adaptor height in place of InSinkErator bowl sink height when mounting directly to a sink.

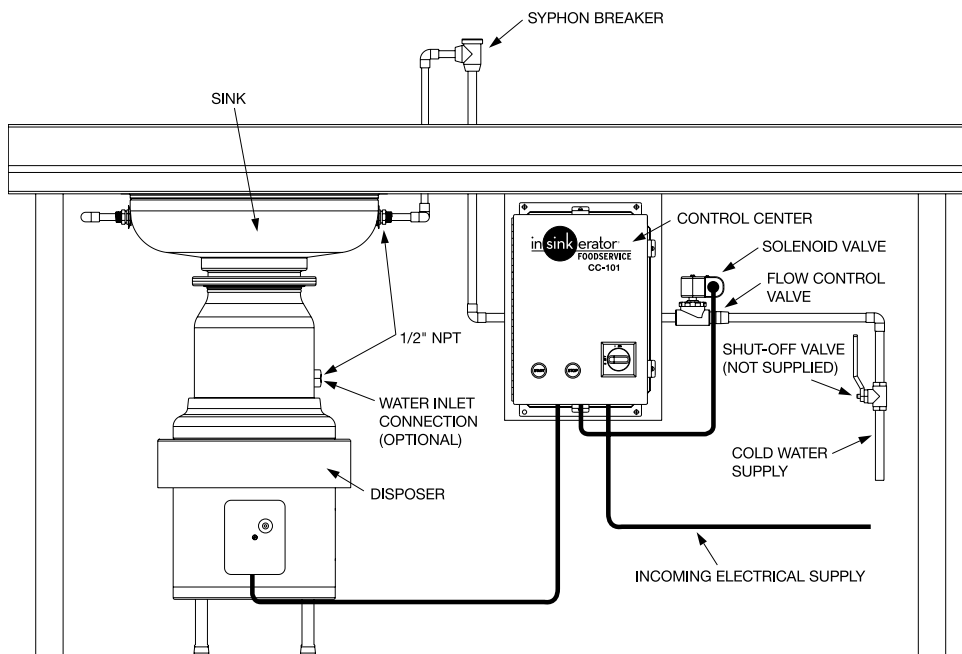
Bowl Sinks	Flange O.D. X	Work Table Hole Y	Flange I.D. Z	Height
12" (304.8 mm)	13-1/2" (342.9 mm)	12-1/4" (311.2 mm)	12" (304.8 mm)	6-1/2" (165.1 mm)
15" (381 mm)	16-1/2" (419.1 mm)	15-1/4" (387.4 mm)	15" (381.0 mm)	6-1/2" (165.1 mm)
18" (457.2 mm)	19-1/2" (495.3 mm)	18-1/4" (463.6 mm)	18" (457.2 mm)	6-1/2" (165.1 mm)
Adaptors	X	Y	Z	Height
No. 6	7-13/16" (198.4 mm)	6-7/8" (174.6 mm)	6-5/8" (168.3 mm)	1-3/16" (30.2 mm)
No. 7	9-1/8" (231.8 mm)	7-7/8" (200.0 mm)	7-5/8" (193.7 mm)	2-1/16" (52.4 mm)

NOTE:

- Adaptors are available upon request for all competitor sink bowls or cones.
- Please have sink bowl/cone type with the necessary dimensions when ordering adaptors.
- Also available as a **short body** model. Reduces overall height of disposer by 3" (76.2 mm).




RECOMMENDED INSTALLATION



RECOMMENDED WATER USAGE

	Standard	Optional
SS-300	8 GPM (30.3 LPM)	7 GPM (26.5 LPM)
SS-500	8 GPM (30.3 LPM)	7 GPM (26.5 LPM)
SS-750	10 GPM (37.9 LPM)	N/A
SS-1000	10 GPM (37.9 LPM)	N/A

For additional information, see Foodservice Product Information Binder.

APPLICATION:		PRODUCT NAME: PRE-RINSE SPRING STYLE WALL MOUNT	
JOB NAME:		<input type="checkbox"/> SPECIAL CONFIGURATION <input type="checkbox"/> CHECK BASE MODEL AND OPTIONS	
QUANTITY:	ITEM NO.	MODEL: <input type="checkbox"/> 2210 ULTRA SPRAY VALVE, NO WALL BRACKET <input type="checkbox"/> 2210-WB ULTRA SPRAY VALVE, WALL BRACKET	
		OPTIONS OR MODIFICATIONS: <input type="checkbox"/> SUPPLY LINES (24" OR 36") CIRCLE LENGTH <input type="checkbox"/> ADD-ON FAUCET (6", 8", 10", 12", 14", 16") CIRCLE <input type="checkbox"/> IN-LINE DUAL CHECK VALVE <input type="checkbox"/> BRUSH <input type="checkbox"/> NIPPLES <input type="checkbox"/> ELBOWS <input type="checkbox"/> VANDAL RESISTANT KIT <input type="checkbox"/> HANDLES (CROSS OR WRIST) CIRCLE STYLE <input type="checkbox"/> OTHER _____	
		FEATURES CONTROL VALVE * ECCENTRICS ADJUST FROM 7-3/4" TO 8-1/4" * INTERNAL SPRING LOADED CHECK VALVES * SWIVELLING SEAT DISKS * HOT SIDE STEM - RIGHT HAND * COLD SIDE STEM - LEFT HAND * STAINLESS STEEL SEATS * STAINLESS STEEL SEAT SCREWS * STAINLESS STEEL HANDLE SCREWS HOSE * 36" LENGTH * STAINLESS STEEL END FITTINGS * STAINLESS STEEL EXTERNAL JACKET * 3 PLY FIBER REINFORCED INTERNAL RUBBER HOSE * REPAIRABLE IN FIELD WITH SIMPLE TOOLS ULTRA SPRAY VALVE * LOWEST ENERGY USER - 1.15 GPM @ 60 PSI * CLEANS FASTER - TEST PROVEN * ENGINEERED TO LAST - NO 'O' RINGS TO LEAK * INTERCHANGEABLE - FITS ALL BRANDS WALL BRACKET * ADJUSTS FROM 2" TO 12" SYSTEM LIMITS * TEMP: 40°F MIN. TO 140°F MAX. * PRESSURE: 200 PSI MAX. STATIC SHIPPING WEIGHT * 12.0 LBS	
ROUGH-IN: 			
EPAct 2005 Compliant		 ANSI/A112.18.1M	



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1-888-4HOBART • www.hobartcorp.com

advansys VENTLESS TALL DISHWASHER



STANDARD FEATURES

- Internal condensing system minimizes water vapor
- Does not require a vent hood
- Energy recovery
- Sense-A-Temp™ 70°F rise electric booster heater
- .74 gallons per rack final rinse water
- 40 racks per hour – hot water sanitizing
- NSF pot and pan listed for 2-, 4- & 6- minute cycles plus condense time
- Timed wash cycles for 1, 2, 4 or 6 minutes plus condense time
- 27" door opening for 18" x 26" sheet pans or 60 quart mixing bowl
- Solid state, integrated controls with digital status indicators
- Self-draining, high efficiency stainless steel pump and stainless steel impeller
- Stainless steel drawn tank, tank shelf, chamber, trim panels, frame and feet
- Spring counterbalanced chamber with UHMW polyethylene guides
- Revolving, interchangeable upper and lower anti-clogging wash arms
- Revolving, interchangeable upper and lower rinse arms
- Slanted, self-locating, one-piece scrap screen and basket system
- Pumped rinse for constant rinse pressure
- Cycle light
- End of cycle audible alarm (field activated)
- Automatic fill
- Door actuated start
- Automatic drain closure
- Delime cycle with notification (field activated)
- Service diagnostics
- NAFEM Data Protocol capable
- Hot water sanitation

VOLTAGE

- ☐ 208-240/60/1
- ☐ 208-240/60/3
- ☐ 480/60/3

MODEL

- ☐ AM15VLT

OPTIONS AT EXTRA COST

- ☐ Single point electrical connection (3 phase only)

ACCESSORIES

- ☐ Peg rack
- ☐ Combination rack
- ☐ Sheet pan rack
- ☐ Flanged and seismic feet
- ☐ End of cycle audible alarm (field activated)
- ☐ Drain water tempering kit

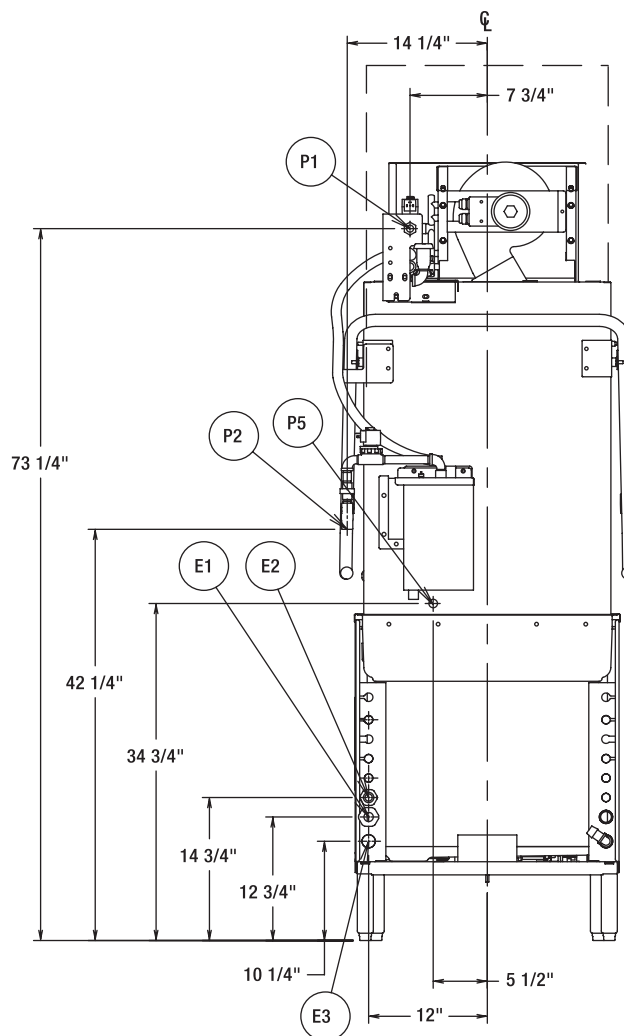
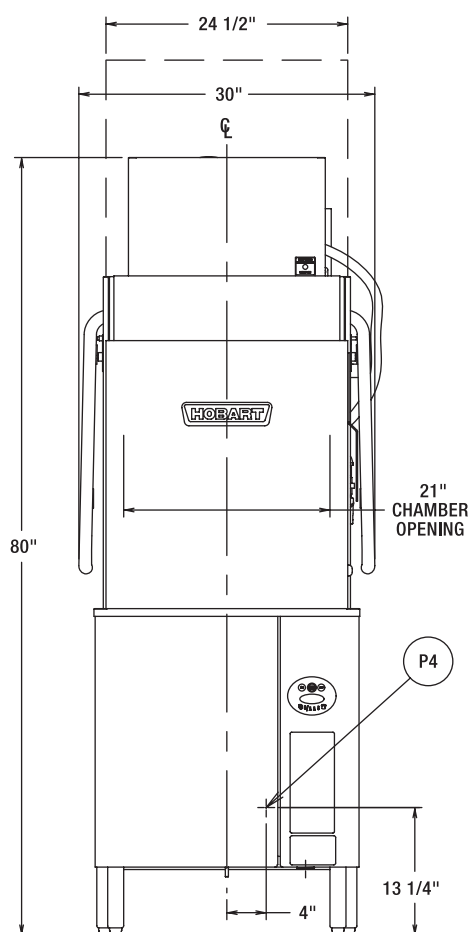
Specifications, Details and Dimensions on Inside and Back.



advansys VENTLESS TALL DISHWASHER

advansys VENTLESS TALL DISHWASHER

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MACHINE ELECTRICAL SPECIFICATIONS

 208-240/60/1
 208-240/60/3
 480/60/3

 MODEL:
 AM-15VLT
 E-941177
 REV B

AM-15VLT WITH ELECTRIC HEAT			
ELEC. SPECS	RATED AMPS	MINIMUM SUPPLY CIRCUIT CONDUCTOR AMPACITY	MAXIMUM OVERCURRENT PROTECTIVE DEVICE
208-240/60/1	43.0	50	50
208-240/60/3	24.9	30	30
480/60/3	13.4	15	15

WARNING

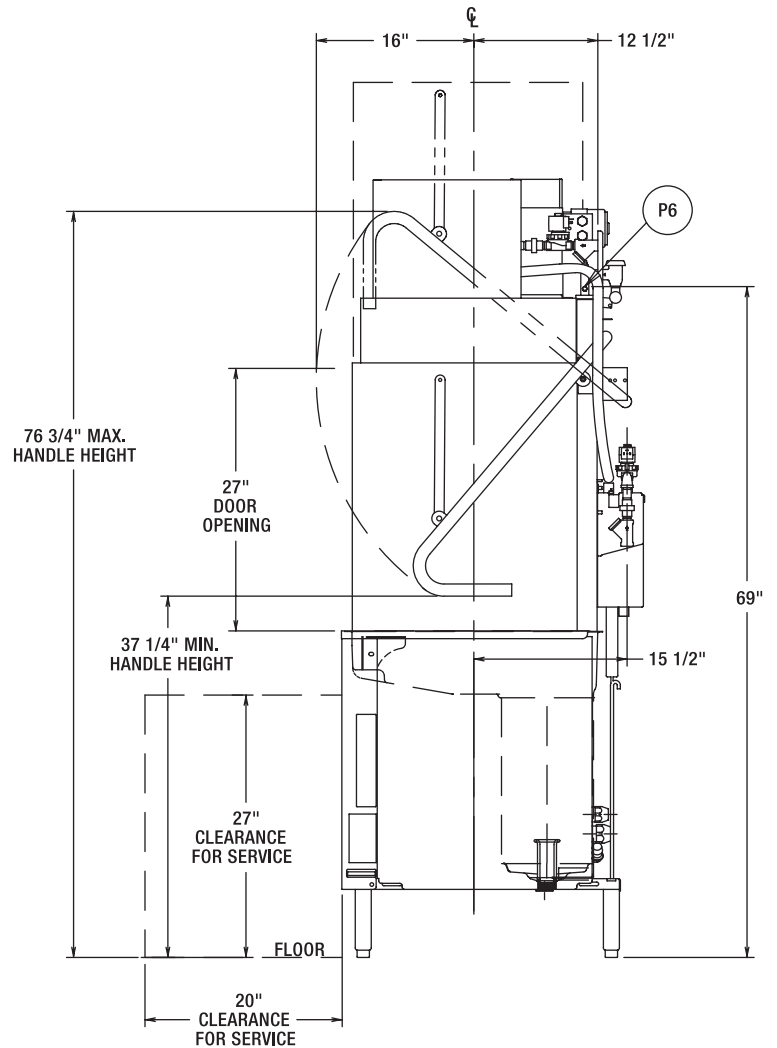
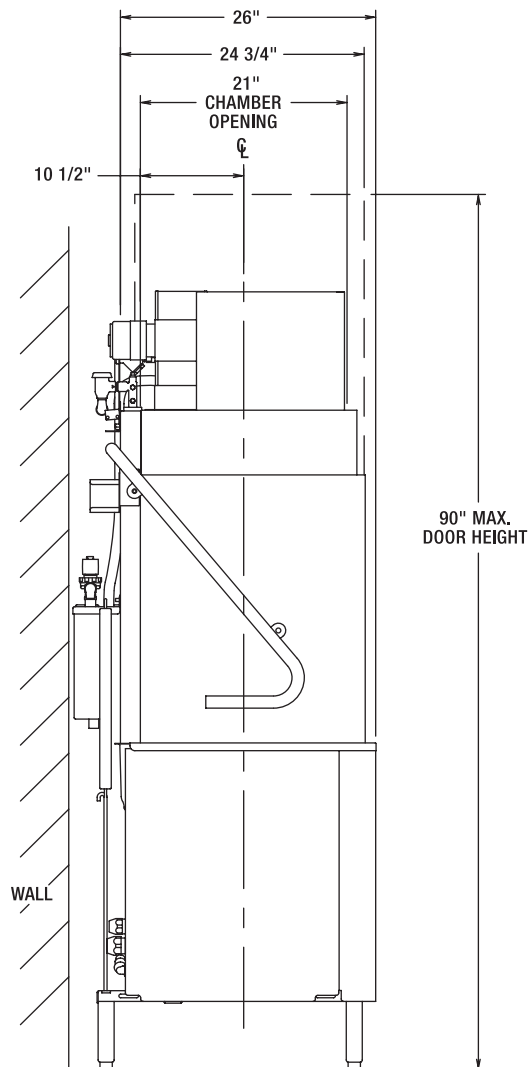
ELECTRICAL AND GROUNDING CONNECTIONS MUST COMPLY WITH THE APPLICABLE PORTIONS OF THE NATIONAL ELECTRICAL CODE AND/OR OTHER LOCAL ELECTRICAL CODES.

PLUMBING CONNECTIONS MUST COMPLY WITH APPLICABLE SANITARY, SAFETY, AND PLUMBING CODES.



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BOOSTER ELECTRICAL SPECIFICATIONS

208-240/60/1
208-240/60/3
480/60/3

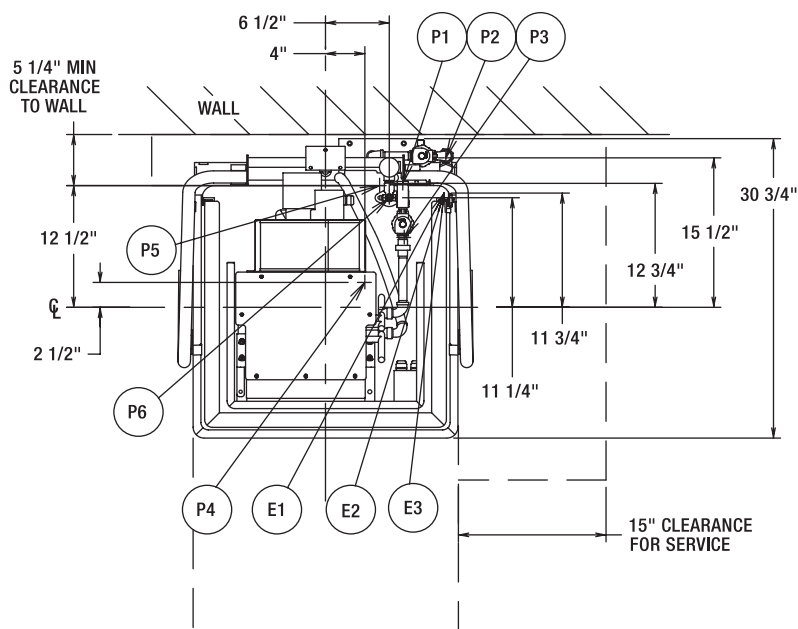
BOOSTER AMPACITY RATINGS 8.5KW			
ELEC. SPECS	RATED AMPS	MINIMUM SUPPLY CIRCUIT CONDUCTOR AMPACITY	MAXIMUM OVERCURRENT PROTECTIVE DEVICE
208-240/60/1	35.4	50	50
208-240/60/3	20.4	30	30
480/60/3	10.2	15	15

OPTIONAL AM15VLT SINGLE POINT ELECTRICAL SERVICE CONNECTION AS SHOWN BELOW			
ELEC. SPECS	RATED AMPS	MINIMUM SUPPLY CONDUCT OR AMPACITY	MAXIMUM PROTECTIVE DEVICE
208-240/60/3	45.4	60	60
480/60/3	23.7	30	30

advansys VENTLESS TALL DISHWASHER

HOBART

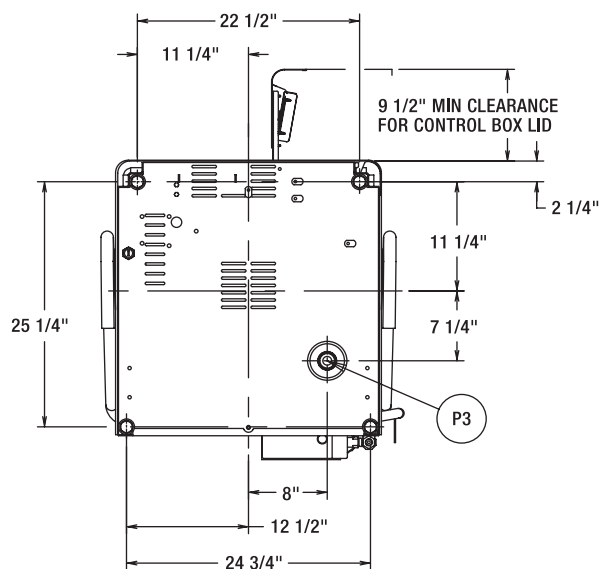
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CONNECTION INFORMATION (*AFF - ABOVE FINISHED FLOOR)

LEGEND

- E1 ELECTRICAL CONNECTION: MOTORS & CONTROLS (INCLUDING ELECTRIC HEAT), 1" OR 3/4" CONDUIT HOLE; 12-3/4" AFF.
- E2 ELECTRICAL CONNECTION: RINSE AGENT FEEDER, 1/2" CONDUIT HOLE, (DPS1 & DPS2) 1.5 AMPS @ NAMEPLATE SUPPLY VOLTAGE, (RPS1 & RPS2) 1.5 AMPS @ NAMEPLATE SUPPLY VOLTAGE; 14-3/4" AFF.
- E3 ELECTRICAL CONNECTION: ELECTRIC BOOSTER ONLY OR SINGLE POINT ELECTRICAL CONNECTION (3PH ONLY), 1" CONDUIT HOLE; 10-1/4" AFF.
- P1 COLD WATER CONNECTION: 90°F MAX. (65°F OPTIMAL); 1/2" FPT; 73-1/4" AFF.
- P2 HOT WATER CONNECTION: 110°F WATER MIN. (HOT WATER SANITIZING); 1/2" FPT; 42-1/4" AFF.
- P3 DRAIN: 1-1/2" MPT; 7-1/4" AFF.
- P4 DETERGENT PROBE SENSOR: REMOVE CAP AND STUD ASSEMBLY TO ACCESS 7/8" HOLE; 13-1/4" AFF.
- P5 DETERGENT FEEDER: REMOVE CAP PLUG TO ACCESS 7/8" HOLE; 34-3/4" AFF.
- P6 RINSE AGENT FEEDER: 1/8" NPT, REMOVE 1/8" NPT PIPE PLUG TO ACCESS TAPPED HOLE; 69" AFF.



PLUMBING NOTES:

WATER HAMMER ARRESTOR (MEETING ASSE-1010 STANDARD OR EQUIVALENT) TO BE SUPPLIED (BY OTHERS) IN COMMON WATER SUPPLY LINE AT SERVICE CONNECTION.

RECOMMENDED WATER HARDNESS TO BE 3 GRAINS OR LESS FOR BEST RESULTS.

FOR CONVENIENCE WHEN CLEANING, WATER TAP SHOULD BE INSTALLED NEAR MACHINE WITH HEAVY DUTY HOSE AND SQUEEZE VALVE.

THIS IS A PUMPED RINSE MACHINE. PRESSURE REGULATING VALVE IS NOT NECESSARY ON HOT OR COLD LINES.

MISCELLANEOUS NOTES:

ALL DIMENSIONS TAKEN FROM FLOOR LINE MAY INCREASE 3/4" OR DECREASE 1/2" DEPENDING ON LEG ADJUSTMENT.

NET WEIGHT OF MACHINE: 405 LBS.
DOMESTIC SHIPPING WEIGHT: 494 LBS.

SIZE OF RACKS - 19-3/4" X 19-3/4"

DRAIN LEVER LOCATED INSIDE TANK.

SINGLE POINT ELECTRICAL CONNECTION AVAILABLE ON 3 PH MACHINES ONLY.

RECOMMENDED CONDENSE TIMES (BASED ON INCOMING WATER TEMP.)			
INCOMING TEMP. (F°)	CONDENSE TIME (SEC.)	RINSE TIME (SEC.)	RACKS PER HOUR (1 MIN. CYCLE)
60	30	10	40
65	33	11	37
70	36	12	36
75	39	13	34
80	42	14	33
85-90	45	15	32

APPROXIMATE HEAT GAIN TO SPACE WITHOUT VENT HOOD

TYPE	BTU/HR
LATENT	13,000
SENSIBLE	4,800

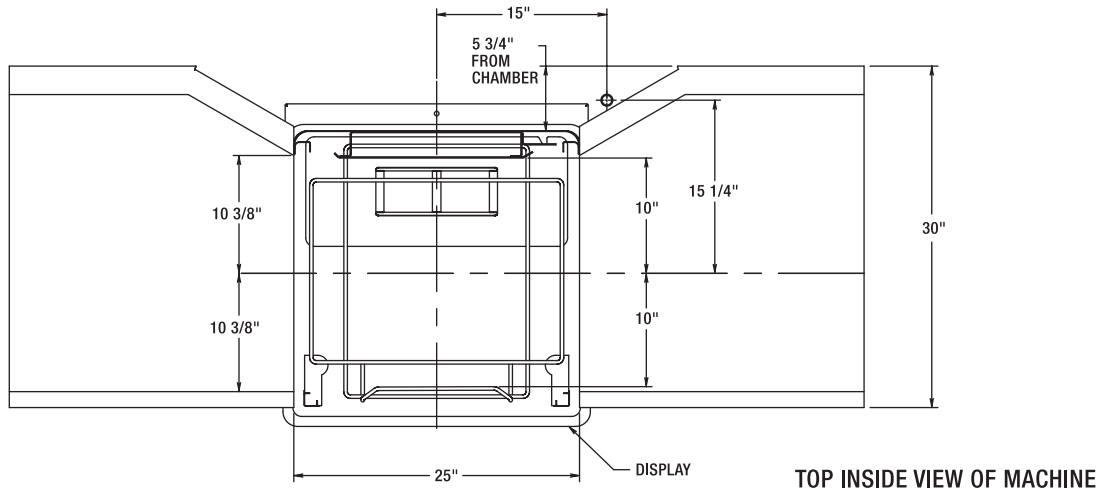
VENT HOOD IS NOT REQUIRED DUE TO INTERNAL CONDENSING SYSTEM.

CITY OF LA APPROVAL M-660004.

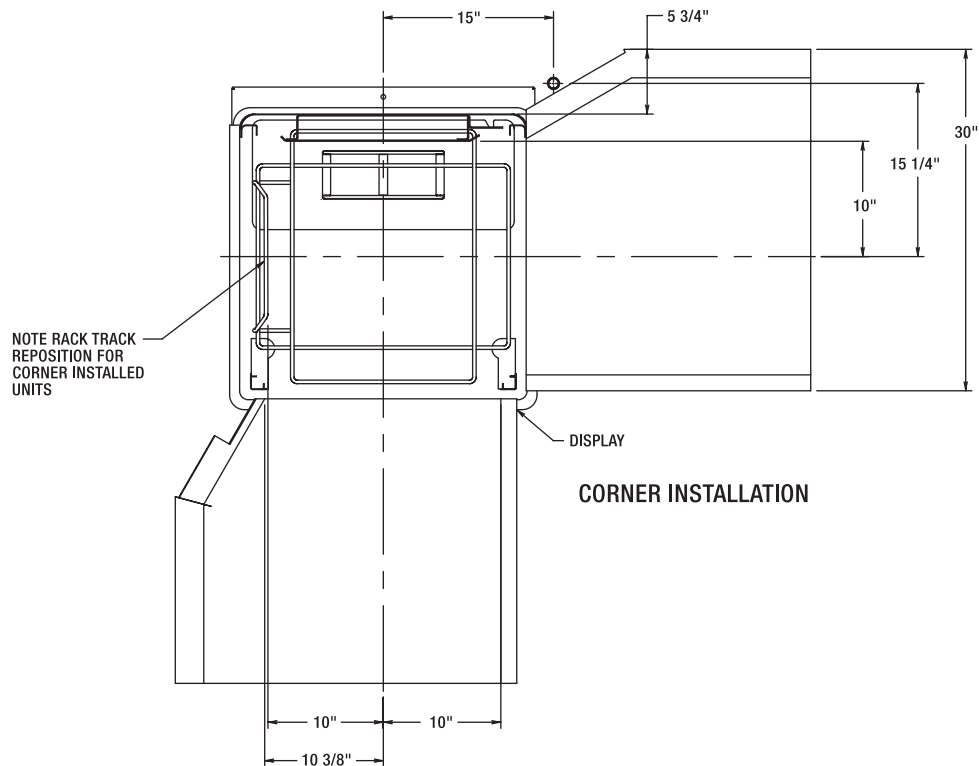


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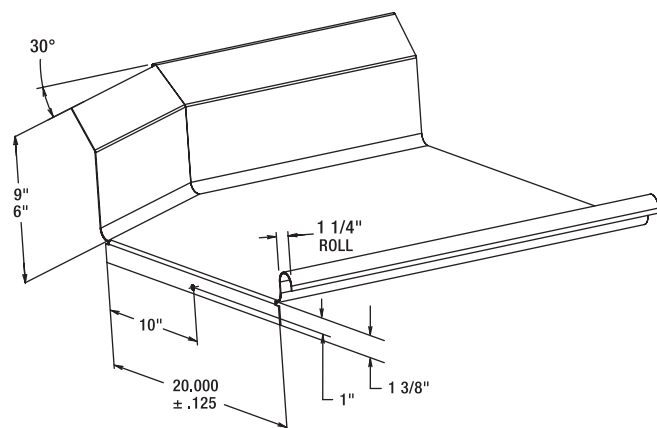


PASS THRU INSTALLATION

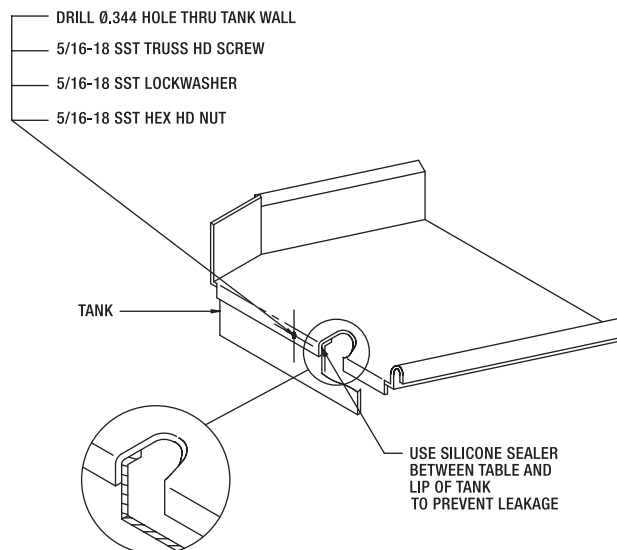


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SUGGESTED TABLE DESIGN



	advansys Ventless Tall Dishwasher
Machine Ratings (Mechanical)	
Racks per Hour (Max.)	40
Dishes per Hour (Average 25 per rack)	1,000
Glasses per Hour (Average 45 per rack)	1,800
Table to Table - Inside Tank at Table Connection (Inches)	25 1/4"
Overall Dimensions - (H x W x D) (Inches)	80" x 29 3/4" x 30"
Wash Motor H.P.	2
Wash Tank Capacity - Gallons	14
Wash Pump Capacity - Gallons per Minute - Weir Test	160
Electric Booster Heater (Kw)	8.5 Kw
Electric Heating Unit (Regulated)	5 Kw
Blower Motor H.P.	1/20
Rinse Pump Motor H.P.	1/15
Rinse - Minutes operated during hour of capacity operation	6.66
Seconds of rinse per rack	10
Rate of Rinse Flow - Gallons per Minute	4.4
Rinse Consumption - Gallons per Hour - Maximum	29.6
Rinse Cycle - Gallons per Rack	.74 - 180°F Min.
Peak Rate of Drain Flow - Gallons per Minute (Initial rate with full tank)	14
Exhaust Requirements	0
Shipping Weight Crated - Approx. lbs. - Unit only	494



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advansys VENTLESS TALL DISHWASHER

The microcomputer-based control system is built into the AM Select Ventless dishwasher. It is available in standard electrical specifications of 208-240/60/1, 208-240/60/3, 480/60/3 and is equipped with a reduced voltage pilot circuit transformer.

Water hardness must be controlled to 3 grains of hardness or less for best results.

CONSTRUCTION: Drawn tank, tank shelf and feet constructed of 16 gauge stainless steel. Wash chamber and front trim panel above motor compartment are polished, satin finish. Frame is 12 gauge stainless steel, chamber is 18 gauge, and removable trim panels are 20 gauge.

CHAMBER: Stainless steel chamber with large 20 $\frac{3}{4}$ " W x 27" H opening will accommodate 18" x 26" sheet pans or a 60-quart mixing bowl.

CHAMBER LIFT: Chamber coupled by stainless steel handle, spring counterbalanced. Chamber guided for ease of operation and long life.

WASH PUMP: With stainless steel pump and impeller, integral with motor assures alignment and quiet operation. Pump shaft seal with stainless steel parts and a carbon ceramic sealing interface. Easily removable impeller housing permits ease of inspection. Capacity 160 GPM. Pump is completely self-draining.

WASH PUMP MOTOR: Built for Hobart, 2 H.P., with inherent thermal protection, grease-packed ball bearings, splash-proof design, ventilated. Single-phase is capacitor-start, induction-run type. Three-phase is squirrel-cage, induction type.

RINSE PUMP: Powered by a $\frac{1}{15}$ H.P. single phase motor, the rinse pump is made of high strength engineered composite material.

BLOWER: The condenser blower is an all stainless steel forward curved centrifugal wheel powered by a $\frac{1}{20}$ H.P. TEFC single phase motor for nearly silent operation.

CONDENSER COIL: The condensing system using a tube and fin coil constructed of copper and corrosion resistant aluminum.

MICROCOMPUTER CONTROL SYSTEM: Hobart microcomputer controls, assembled within water-resistant enclosure, provide built-in performance and reliability.

The microcomputer control, relays and contactors are housed behind a stainless steel enclosure, hinged

to provide easy access for servicing. The line voltage electrical components are completely wired with 105°C, 600V thermoplastic insulated wire with stranded conductors. Electrical components are wired with type ST cord. Line disconnect switch NOT furnished.

CYCLE OPERATION: The microcomputer-timing program is started by closing the doors, which actuates the door cycle switch. The cycle light turns ON. The microcomputer energizes the wash pump motor contactor during the wash portion of the program. After the wash, a dwell permits the upper wash manifold to drain. At the end of the dwell, the final rinse pump is energized. After the final rinse pump turns off, Sani-Dwell permits sanitization to continue. The Rinse display remains on during this period. The Blower and Cold Water Valve turn on for 30 seconds to condense the vapor laden air inside of the chamber. The display shows a count down time (in seconds) during this operation. After the 30 seconds is complete the Cycle Light turns OFF, completing the program. If the microcomputer is interrupted during a cycle by the door-cycle switch, the microcomputer is reset to the beginning of the program. 40 racks per hour – 87 seconds: 38 Second Wash, 2 Second Dwell, 10 Second Rinse, 7 Second Sani-Dwell. 30 Second Condensing. Other programs can be pre-selected by your Hobart service technician.

Manual wash cycle selector also provides selection of 2-, 4- or 6-minute wash cycles plus condense time for heavier washing applications.

WASH: Hobart revolving stainless steel wash arms with unrestricted openings above and below provide thorough distribution of water jets to all dishware surfaces. Arms are easily removable for cleaning and are interchangeable. Stainless steel tubing manifold connects upper and lower spray system.

RINSE: Rotating rinse arms, both upper and lower, feature 14 rinse nozzles. The stainless steel upper and lower rinse arms are easily removable without tools for inspection and are interchangeable. The motor driven rinse pump gives constant rinse pressure regardless of water service supply pressure. Easy open brass line strainer furnished.

HOT FILL: Microcomputer controlled fill is supplied from the hot water service connection. It enters the machine through an air gap system which protects the potable water supply from contamination. Ratio fill method is used giving the correct fill at any flowing water pressure.

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COLD WATER: Cold water supplied to condenser coil is heated during the condensing period at the end of each cycle. This pre-heated water is supplied to the booster for subsequent heating.

DRAIN AND OVERFLOW: Large bell type automatic overflow and drain valve controlled from inside of machine. Drain automatically closed by lowering chamber. Drain seal is large diameter, high temperature "O" ring. Cover for overflow is integral part of the standpipe.

STRAINER SYSTEM: Equipped with large, exclusive self-flushing, easily removable perforated stainless steel, one-piece strainer and large capacity scrap basket. Submerged scrap basket minimizes frequent removal and cleaning.

HEATING EQUIPMENT: Standard tank heat is 5 KW electric immersion heating element. Water temperature regulation is controlled by thermistor sensor in combination with microcomputer controls. The tank heat and positive low water protection microcomputer

circuits are automatically activated when the main power switch is turned "on". If tank is accidentally drained, low water protection device automatically turns heat off. These features are standard with the Hobart Microcomputer Control System.

ENERGY RECOVERY: Heat energy is recovered from the condensation of vapors in the chamber at the end of each cycle. This pre-heats the water for the next rinse cycle from 55°F up to 140°F.

ELECTRIC BOOSTER HEATER: 8.5 KW electric booster with Sense-A-Temp™ technology adequately sized to raise 110°F inlet water to 180°F.

ACCESSORIES: 19³/₄" x 19³/₄" peg and combination dish racks. Splash shield for corner installations. End of cycle audible alarm (field activated). Delime notification (field activated). Desirable functional accessories can be furnished at added cost. See listed options and accessories on this specification sheet. Write to the factory for special requirements not listed above.

As continued product improvement is a policy of Hobart, specifications are subject to change without notice.



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Clean Dishtables, model _____. Top to be 16/430, 16/304, or 14/304 stainless steel, with all seams welded, ground smooth, and polished. Front and ends to have 3"-high upturn with 1½"-diameter rolled edge. Galvanized hat channels welded to underside. Backsplash is 8"-high. 20½" standard opening for dishwasher. Legs to be 1½" O.D. galvanized tubing, 1" diameter crossbracing and adjustable bullet feet (14/304 models come standard with stainless steel hat channels welded to underside of table, stainless steel crossbraced legs, and adjustable metal feet).



right-hand model shown with optional undershelf *
(dishwasher not included)

Options / Accessories *

- ☐ Undershelf
- ☐ Stainless steel legs
- ☐ Stainless steel gussets
- ☐ Stainless steel feet

* See Spec Sheet #EG50.07 for full line of options and accessories.

EAGLE GROUP

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Phone: 302-653-3000 • Fax: 302-653-2065

www.eaglegrp.com

Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our SpecFAB® Division.

Phone: 302-653-3000 • Fax: 302-653-3091 • e-mail: specfab@eaglegrp.com

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Clean Dishtables— Straight Design

MODELS:

<input type="checkbox"/> CDTL-24-16/4	<input type="checkbox"/> CDTR-48-16/4	<input type="checkbox"/> CDTL-84-16/4
<input type="checkbox"/> CDTL-24-16/3	<input type="checkbox"/> CDTR-48-16/3	<input type="checkbox"/> CDTL-84-16/3
<input type="checkbox"/> CDTL-24-14/3	<input type="checkbox"/> CDTR-48-14/3	<input type="checkbox"/> CDTL-84-14/3
<input type="checkbox"/> CDTR-24-16/4	<input type="checkbox"/> CDTR-48-16/4	<input type="checkbox"/> CDTR-84-16/4
<input type="checkbox"/> CDTR-24-16/3	<input type="checkbox"/> CDTR-48-16/3	<input type="checkbox"/> CDTR-84-16/3
<input type="checkbox"/> CDTR-24-14/3	<input type="checkbox"/> CDTR-48-14/3	<input type="checkbox"/> CDTR-84-14/3
<input type="checkbox"/> CDTL-30-16/4	<input type="checkbox"/> CDTL-60-16/4	<input type="checkbox"/> CDTL-96-16/4
<input type="checkbox"/> CDTL-30-16/3	<input type="checkbox"/> CDTL-60-16/3	<input type="checkbox"/> CDTL-96-16/3
<input type="checkbox"/> CDTL-30-14/3	<input type="checkbox"/> CDTL-60-14/3	<input type="checkbox"/> CDTL-96-14/3
<input type="checkbox"/> CDTR-30-16/4	<input type="checkbox"/> CDTR-60-16/4	<input type="checkbox"/> CDTR-96-16/4
<input type="checkbox"/> CDTR-30-16/3	<input type="checkbox"/> CDTR-60-16/3	<input type="checkbox"/> CDTR-96-16/3
<input type="checkbox"/> CDTR-30-14/3	<input type="checkbox"/> CDTR-60-14/3	<input type="checkbox"/> CDTR-96-14/3
<input type="checkbox"/> CDTL-36-16/4	<input type="checkbox"/> CDTL-72-16/4	<input type="checkbox"/> CDTL-120-16/4
<input type="checkbox"/> CDTL-36-16/3	<input type="checkbox"/> CDTL-72-16/3	<input type="checkbox"/> CDTL-120-16/3
<input type="checkbox"/> CDTR-36-14/3	<input type="checkbox"/> CDTL-72-14/3	<input type="checkbox"/> CDTL-120-14/3
<input type="checkbox"/> CDTR-36-16/4	<input type="checkbox"/> CDTR-72-16/4	<input type="checkbox"/> CDTR-120-16/4
<input type="checkbox"/> CDTR-36-16/3	<input type="checkbox"/> CDTR-72-16/3	<input type="checkbox"/> CDTR-120-16/3
<input type="checkbox"/> CDTR-36-14/3	<input type="checkbox"/> CDTR-72-14/3	<input type="checkbox"/> CDTR-120-14/3

Design and Construction Features

- 14 or 16 gauge stainless steel.
- 30" (762mm)-wide table furnished in nine lengths.
- 1½" (38mm) raised rolled rim on front and end.
- 1½" (41mm)-diameter galvanized legs with welded 1" (25mm)-diameter crossbracing.
- 8" (203mm)-high backsplash.
- Adjustable non-marking bullet feet with up to 1" (25mm) adjustment.
- All Spec-Master® 14 gauge type 304 dishtables come standard with stainless steel crossbraced legs and gussets, complete with metal feet.

Certifications / Approvals



EG50.00 Rev. 06/09

Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

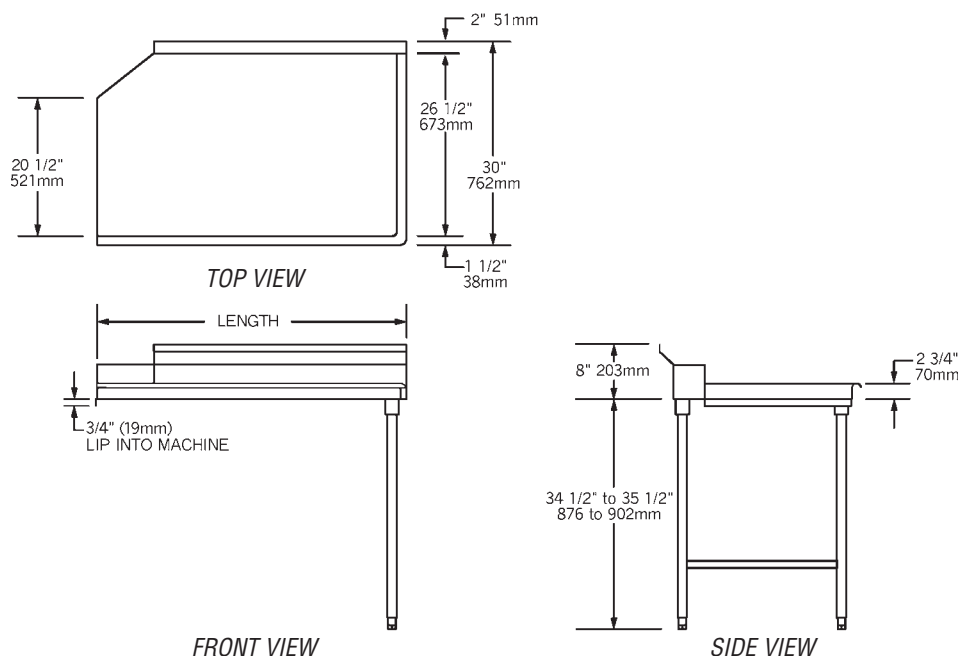
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Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Clean Dishtables—Straight Design



16 gauge type 430 model #	16 gauge type 304 model #	Spec-Master® 14 gauge type 304 model #	description	length		weight	
				in.	mm	lbs.	kg
CDTL-24-16/4	CDTL-24-14/3	CDTL-24-16/3	left-hand model	24"	610	36	16.3
CDTR-24-16/4	CDTR-24-16/3	CDTR-24-14/3	right-hand model	24"	610	36	16.3
CDTL-30-16/4	CDTL-30-16/3	CDTL-30-14/3	left-hand model	30"	762	42	19.1
CDTR-30-16/4	CDTR-30-16/3	CDTR-30-14/3	right-hand model	30"	762	42	19.1
CDTL-36-16/4	CDTL-36-16/3	CDTL-36-14/3	left-hand model	36"	914	49	22.2
CDTR-36-16/4	CDTR-36-16/3	CDTR-36-14/3	right-hand model	36"	914	49	22.2
CDTL-48-16/4	CDTL-48-16/3	CDTL-48-14/3	left-hand model	48"	1219	63	29.6
CDTR-48-16/4	CDTR-48-16/3	CDTR-48-14/3	right-hand model	48"	1219	63	29.6
CDTL-60-16/4	CDTL-60-16/3	CDTL-60-14/3	left-hand model	60"	1524	77	34.9
CDTR-60-16/4	CDTR-60-16/3	CDTR-60-14/3	right-hand model	60"	1524	77	34.9
CDTL-72-16/4	CDTL-72-16/3	CDTL-72-14/3	left-hand model	72"	1829	91	41.3
CDTR-72-16/4	CDTR-72-16/3	CDTR-72-14/3	right-hand model	72"	1829	91	41.3
CDTL-84-16/4	CDTL-84-16/3	CDTL-84-14/3	left-hand model	84"	2134	105	47.6
CDTR-84-16/4	CDTR-84-16/3	CDTR-84-14/3	right-hand model	84"	2134	105	47.6
CDTL-96-16/4	CDTL-96-16/3	CDTL-96-14/3	left-hand model	96"	2438	119	54.0
CDTR-96-16/4	CDTR-96-16/3	CDTR-96-14/3	right-hand model	96"	2438	119	54.0
CDTL-120-16/4	CDTL-120-16/3	CDTL-120-14/3	left-hand model	120"	3048	147	66.7
CDTR-120-16/4	CDTR-120-16/3	CDTR-120-14/3	right-hand model	120"	3048	147	66.7

EAGLE GROUP

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Foodservice Division: Phone 800-441-8440

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Although every attempt has been made to ensure the accuracy of the information provided, we cannot be held responsible for typographical or printing errors. Information and specifications are subject to change without notice. Please confirm at time of order.

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Rev. 06/09



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Wall Shelf, model _____. Constructed of 16 gauge type 430, 16 gauge type 304, or 14 gauge type 304 stainless steel. 1½" roll on front, with 1½" upturn on rear and ends. Stainless steel mounting brackets are stud welded to shelf.



#WS1236-16/3 wall shelf

Wall Shelves

MODELS:

- | | |
|---|---|
| <input type="checkbox"/> WS1024-* | <input type="checkbox"/> WS1224-* |
| <input type="checkbox"/> WS1036-* | <input type="checkbox"/> WS1236-* |
| <input type="checkbox"/> WS1048-* | <input type="checkbox"/> WS1248-* |
| <input type="checkbox"/> WS1060-* | <input type="checkbox"/> WS1260-* |
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| <input type="checkbox"/> WS1096-* | <input type="checkbox"/> WS1296-* |
| <input type="checkbox"/> WS10108-* | <input type="checkbox"/> WS12108-* |
| <input type="checkbox"/> WS10120-* | <input type="checkbox"/> WS12120-* |

* See chart on back page for complete model numbers.

Wall Mounted Shelves

- 1½" (38mm) roll on front.
- 1½" (38mm) upturn on rear and ends.
- Die-formed stainless steel mounting brackets are stud-welded to shelf.
- All stainless steel polished to #4 finish.
- Available in 16 gauge type 430, 16 gauge type 304, and 14 gauge type 304 stainless steel.
- Wide selection of sizes.

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Certifications / Approvals



AUTOQUOTES



EG02.05 Rev. 09/13

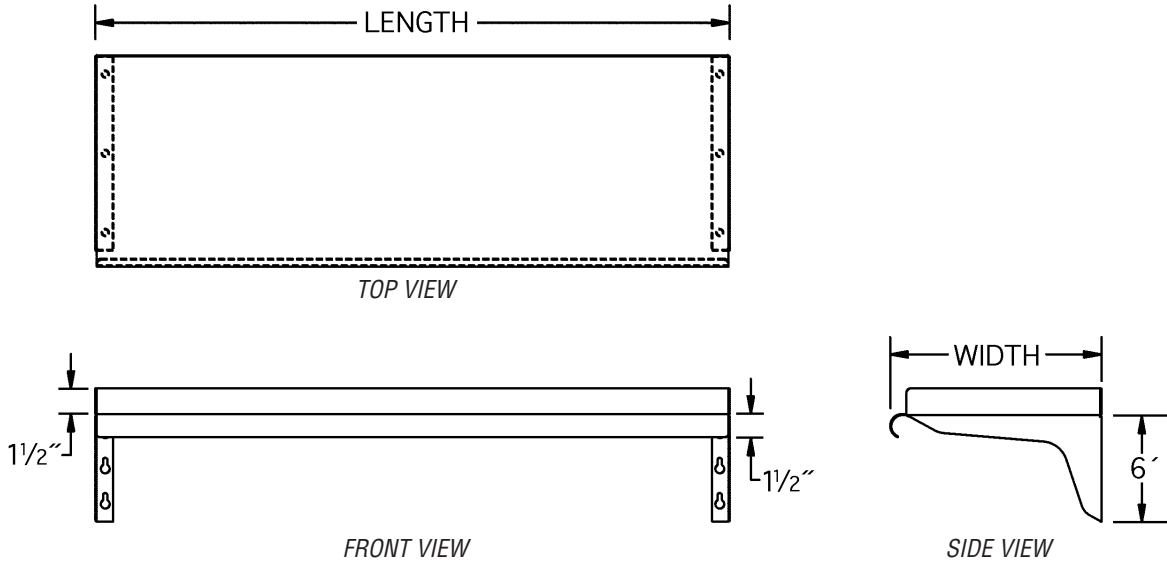
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Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Wall Mounted Shelves



16 gauge type 430 model #	16 gauge type 304 model #	14 gauge type 304 model #	width*		length		weight	
			in.	mm	in.	mm	lbs.	kg
WS1024-16/4	WS1024-16/3	WS1024-14/3	10"	254	24"	610	10	4.5
WS1036-16/4	WS1036-16/3	WS1036-14/3	10"	254	36"	914	12	5.4
WS1048-16/4	WS1048-16/3	WS1048-14/3	10"	254	48"	1219	15	6.8
WS1060-16/4	WS1060-16/3	WS1060-14/3	10"	254	60"	1524	20	9.0
WS1072-16/4	WS1072-16/3	WS1072-14/3	10"	254	72"	1829	22	10.0
WS1084-16/4	WS1084-16/3	WS1084-14/3	10"	254	84"	2134	24	10.9
WS1096-16/4	WS1096-16/3	WS1096-14/3	10"	254	96"	2438	29	13.2
WS10108-16/4	WS10108-16/3	WS10108-14/3	10"	254	108"	2743	32	14.5
WS10120-16/4	WS10120-16/3	WS10120-14/3	10"	254	120"	3048	34	15.4
WS1224-16/4	WS1224-16/3	WS1224-14/3	12"	305	24"	610	12	5.4
WS1236-16/4	WS1236-16/3	WS1236-14/3	12"	305	36"	914	14	6.4
WS1248-16/4	WS1248-16/3	WS1248-14/3	12"	305	48"	1219	17	7.7
WS1260-16/4	WS1260-16/3	WS1260-14/3	12"	305	60"	1524	23	10.4
WS1272-16/4	WS1272-16/3	WS1272-14/3	12"	305	72"	1829	25	11.3
WS1284-16/4	WS1284-16/3	WS1284-14/3	12"	305	84"	2134	28	12.7
WS1296-16/4	WS1296-16/3	WS1296-14/3	12"	305	96"	2438	31	14.1
WS12108-16/4	WS12108-16/3	WS12108-14/3	12"	305	108"	2743	36	16.3
WS12120-16/4	WS12120-16/3	WS12120-14/3	12"	305	120"	3048	39	17.6

* 15" and 18" (381 and 457mm)-wide shelves available. To order, replace "12" in model number with a "15" or "18" indicating shelf width. Example: WS1536-16/3

EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

Phone: 302-653-3000 • Fax: 302-653-2065

www.eaglegrp.com

Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

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714



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Spec-Master® Three-Compartment Sinks, model _____. Unit constructed of 14/304, 18-8 stainless steel throughout. Sink bowls coved with a full $\frac{5}{8}$ " radius, and shall have a 14" water level. Drainboards, when required, shall be "V" creased for positive drainage. 9 $\frac{1}{2}$ " high backsplash with 1" upturn and tile edge. Legs to be 1 $\frac{1}{2}$ " O.D., stainless steel, with stainless steel gussets, stainless steel crossbracing and adjustable stainless steel bullet feet.



3-compartment sink
(faucets not included)

Options / Accessories

- | | |
|--|--|
| <input type="checkbox"/> Lever drain | <input type="checkbox"/> Faucets |
| <input type="checkbox"/> Lever drain with overflow | <input type="checkbox"/> Polyboard sink covers |
| <input type="checkbox"/> Twist handle drains | <input type="checkbox"/> Stainless steel sink covers |
| <input type="checkbox"/> Overflow hole | <input type="checkbox"/> Skirted front panel |
| <input type="checkbox"/> Sink kits | |

Assembly:

- Entire assembly is fuse-welded and planished, providing a one-piece seamless sink unit.
- Welded areas are high-speed belt blended to match adjacent surfaces with continuity of satin finish.
- All outside corners of assembly are bullnosed to provide safe, clean edges.
- Water supply is $\frac{1}{2}$ " (13mm) IPS for hot and cold lines.

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For custom configuration or fabrication needs, contact our **SpecFAB®** Division.

Phone: 302-653-3000 • Fax: 302-653-3091 • e-mail: specfab@eaglegrp.com

Item No.: _____
Project No.: _____
S.I.S. No.: _____

Spec-Master® FN Series Coved Corner Three-Compartment Sinks

MODELS:

- | | |
|-------------------------------------|-------------------------------------|
| <input type="checkbox"/> FN2048-3-* | <input type="checkbox"/> FN2472-3-* |
| <input type="checkbox"/> FN2054-3-* | <input type="checkbox"/> FN2860-3-* |
| <input type="checkbox"/> FN2060-3-* | |

* See table on back for complete model numbers.

Top:

- Drainboards, backsplash and rolled rims are 14 gauge type 304 stainless steel.
- Drainboards, when provided, are integrally welded.
- All rolled edges are highlighted for enhanced appearance.
- 9 $\frac{1}{2}$ " high backsplash with 1" upturn and tile edge.
- 1 $\frac{1}{2}$ " (29mm) faucet holes** punched on 8" (203mm) centers.

Base:

- Legs: 1 $\frac{1}{2}$ " (41mm)-diameter stainless steel tubing with stainless steel gussets and fully adjustable stainless steel bullet feet.
- Crossbracing: Adjustable, 1 $\frac{1}{4}$ " (32mm)-diameter stainless steel; running left-to-right and front-to-back.
- Leg locations fall directly under sink bowls, providing increased stability and maximum weight support.
- Leg gussets welded to a die-cut heavy-gauge stainless steel reinforcing corner plate.
- Legs are crossbraced on all sides for increased stability.

Sink Bowls:

- 14 gauge type 304 stainless steel.
- 14" (356mm) water level, 17" (432mm) flood level.
- Sink compartments are coved on a full $\frac{5}{8}$ " (41mm) radius and constructed using state-of-the-art seamless welding techniques.
- Basket-type waste drain fits sink bowls' 3 $\frac{1}{2}$ " (89mm) opening and features 1 $\frac{1}{2}$ " (38mm) outlet.

** Three-compartment sinks with 20" x 16" (508 x 406mm) bowls have one set of faucet holes. All others feature two sets of faucet holes.

Certifications / Approvals



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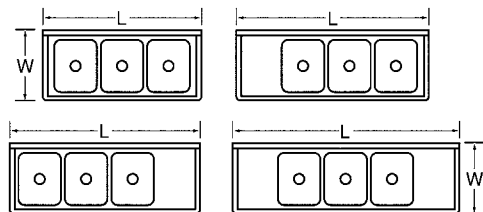
Profit from the Eagle Advantage®

Item No.: _____

Project No.: _____

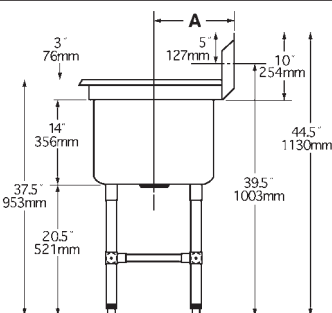
S.I.S. No.: _____

Spec-Master® FN Series Coved Corner Three-Compartment Sinks



Drain location for rough-in

bowl width in. mm	bowl length in. mm	Dimension A	
20" 508	16" 406	14"	356
20" 508	18" 457	14"	356
20" 508	20" 508	14"	356
24" 610	24" 610	16"	406
28" 711	20" 508	18"	457



	BOWL DIMENSIONS				DRAINBOARD			OVERALL DIMENSIONS					
	width		length			length		width		length		weight	
model #	in.	mm	in.	mm	quantity	in.	mm	in.	mm	in.	mm	lbs.	kg
FN2048-3-14/3	20"	508	16"	406	0	-	-	27"	686	57"	1448	99	44.9
FN2048-3-18R or L-14/3	20"	508	16"	406	1	18"	457	27"	686	73½"	1867	118	53.5
FN2048-3-18-14/3	20"	508	16"	406	2	18"	457	27"	686	90"	2286	137	61.7
FN2048-3-24R or L-14/3	20"	508	16"	406	1	24"	610	27"	686	79½"	2019	124	56.2
FN2048-3-24-14/3	20"	508	16"	406	2	24"	610	27"	686	102"	2591	149	67.6
FN2048-3-30R or L-14/3	20"	508	16"	406	1	30"	762	27"	686	85½"	2172	129	58.5
FN2048-3-30-14/3	20"	508	16"	406	2	30"	762	27"	686	114"	2896	159	72.1
FN2048-3-36R or L-14/3	20"	508	16"	406	1	36"	914	27"	686	91½"	2324	134	60.8
FN2048-3-36-14/3	20"	508	16"	406	2	36"	914	27"	686	126"	3200	169	76.7
FN2054-3-14/3 *	20"	508	18"	457	0	-	-	27"	686	63"	1600	102	46.3
FN2054-3-18R or L-14/3 *	20"	508	18"	457	1	18"	457	27"	686	79½"	2019	121	54.9
FN2054-3-18-14/3 *	20"	508	18"	457	2	18"	457	27"	686	96"	2438	140	63.5
FN2054-3-24R or L-14/3 *	20"	508	18"	457	1	24"	610	27"	686	85½"	2172	127	57.6
FN2054-3-24-14/3 *	20"	508	18"	457	2	24"	610	27"	686	108"	2743	158	71.6
FN2054-3-30R or L-14/3 *	20"	508	18"	457	1	30"	762	27"	686	91½"	2324	132	59.9
FN2054-3-30-14/3 *	20"	508	18"	457	2	30"	762	27"	686	120"	3048	162	73.5
FN2054-3-36R or L-14/3 *	20"	508	18"	457	1	36"	914	27"	686	97½"	2477	137	62.1
FN2054-3-36-14/3 *	20"	508	18"	457	2	36"	914	27"	686	132"	3358	172	78.0
FN2060-3-14/3 *	20"	508	20"	508	0	-	-	27"	686	69"	1753	114	51.7
FN2060-3-18R or L-14/3 *	20"	508	20"	508	1	18"	610	27"	686	85½"	2172	133	60.3
FN2060-3-18-14/3 *	20"	508	20"	508	2	18"	457	27"	686	102"	2591	152	68.9
FN2060-3-24R or L-14/3 *	20"	508	20"	508	1	24"	457	27"	686	91½"	2324	139	63.1
FN2060-3-24-14/3 *	20"	508	20"	508	2	24"	610	27"	686	114"	2896	164	74.4
FN2060-3-30R or L-14/3 *	20"	508	20"	508	1	30"	762	27"	686	97½"	2477	144	65.3
FN2060-3-30-14/3 *	20"	508	20"	508	2	30"	762	27"	686	126"	3200	174	78.9
FN2060-3-36R or L-14/3 *	20"	508	20"	508	1	36"	914	27"	686	103½"	2629	149	67.6
FN2060-3-36-14/3 *	20"	508	20"	508	2	36"	914	27"	686	138"	3505	184	83.5
FN2472-3-14/3 *	24"	610	24"	610	0	-	-	31"	787	81"	2057	127	57.6
FN2472-3-18R or L-14/3 *	24"	610	24"	610	1	18"	457	31"	787	97½"	2477	146	66.2
FN2472-3-18-14/3 *	24"	610	24"	610	2	18"	457	31"	787	114"	2896	165	74.8
FN2472-3-24R or L-14/3 *	24"	610	24"	610	1	24"	610	31"	787	103½"	2629	152	68.9
FN2472-3-24-14/3 *	24"	610	24"	610	2	24"	610	31"	787	126"	3200	177	80.3
FN2472-3-30R or L-14/3 *	24"	610	24"	610	1	30"	762	31"	787	109½"	2769	157	71.2
FN2472-3-30-14/3 *	24"	610	24"	610	2	30"	762	31"	787	138"	3505	187	84.8
FN2472-3-36R or L-14/3 *	24"	610	24"	610	1	36"	914	31"	787	115½"	2934	162	73.5
FN2472-3-36-14/3 *	24"	610	24"	610	2	36"	914	31"	787	150"	3810	197	89.4
FN2860-3-14/3 *	28"	711	20"	508	0	-	-	35"	889	69"	1753	130	59.0
FN2860-3-18R or L-14/3 *	28"	711	20"	508	1	18"	457	35"	889	85½"	2172	149	67.6
FN2860-3-18-14/3 *	28"	711	20"	508	2	18"	457	35"	889	102"	2591	168	76.2
FN2860-3-24R or L-14/3 *	28"	711	20"	508	1	24"	610	35"	889	91½"	2324	155	70.3
FN2860-3-24-14/3 *	28"	711	20"	508	2	24"	610	35"	889	114"	2896	180	81.6
FN2860-3-30R or L-14/3 *	28"	711	20"	508	1	30"	762	35"	889	97½"	2477	160	72.6
FN2860-3-30-14/3 *	28"	711	20"	508	2	30"	762	35"	889	126"	3200	190	86.2
FN2860-3-36R or L-14/3 *	28"	711	20"	508	1	36"	914	35"	889	103½"	2629	165	74.8
FN2860-3-36-14/3 *	28"	711	20"	508	2	36"	914	35"	889	138"	3505	200	90.7

* Features two sets of faucet holes.

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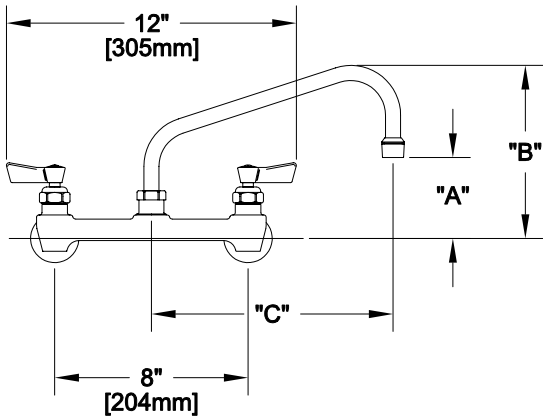
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APPLICATION:		PRODUCT NAME: <div style="text-align: center;">8" C/C BACKSPLASH FAUCET</div>	
JOB NAME:		<input type="checkbox"/> SPECIAL CONFIGURATION <input type="checkbox"/> CHECK BASE MODEL AND OPTIONS	
QUANTITY:	ITEM NO.	MODEL: <input type="checkbox"/> 13234 W/ 6" SWING SPOUT <input type="checkbox"/> 13242 W/ 8" SWING SPOUT <input type="checkbox"/> 13250 W/ 10" SWING SPOUT <input type="checkbox"/> 13269 W/ 12" SWING SPOUT <input type="checkbox"/> 13277 W/ 14" SWING SPOUT <input type="checkbox"/> 13218 W/ 16" SWING SPOUT	



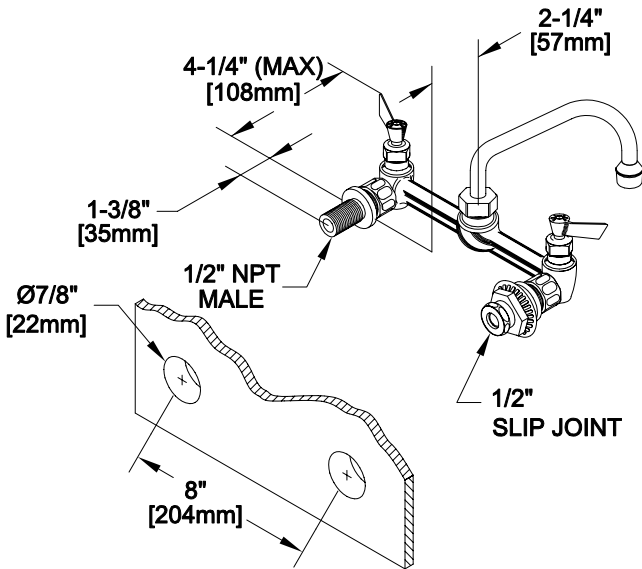
MODEL	DIM "A"	DIM "B"	DIM "C"
13234	2-1/4" [57mm]	5-7/8" [149mm]	6" [152mm]
13242	2-1/2" [64mm]	6-3/8" [162mm]	8" [204mm]
13250	3-1/8" [79mm]	6-7/8" [175mm]	10" [254mm]
13269	3-3/4" [95mm]	7-3/8" [187mm]	12" [305mm]
13277	4-3/8" [111mm]	8-1/4" [210mm]	14" [356mm]
13218	5" [127mm]	8-7/8" [225mm]	16" [406mm]


OPTIONS OR MODIFICATIONS:
☐ SUPPLY LINES (24" OR 36") CIRCLE LENGTH
☐ DJ SUB-ASSY (7-1/4" OR 13") CIRCLE LENGTH
☐ ELBOWS
☐ VANDAL RESISTANT KIT
☐ HANDLES (CROSS OR WRIST) CIRCLE STYLE
☐ OTHER _____


FEATURES
CONTROL VALVE
 * 8" C/C BACKSPLASH MOUNT
 * SWIVELLING SEAT DISKS
 * HOT SIDE STEM - RIGHT HAND
 * COLD SIDE STEM - LEFT HAND
 * STAINLESS STEEL SEATS
 * STAINLESS STEEL SEAT SCREWS
 * STAINLESS STEEL HANDLE SCREWS
 * 1/2" SLIP JOINT

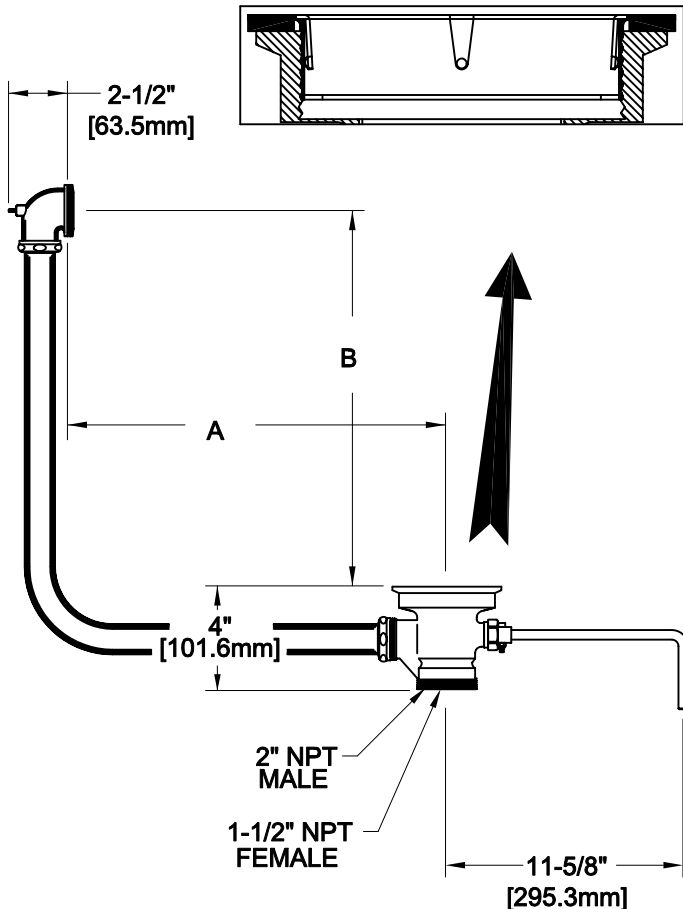

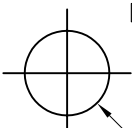


SYSTEM LIMITS
 * TEMP: 40°F MIN. TO 140°F MAX.
 * PRESSURE: 200 PSI MAX. STATIC
 * 2.20 GPM AT 80 PSI

SHIPPING WEIGHT
 * 5.0 LBS

ROUGH-IN:



ANSI/A112.18.1M


FISHER
 FISHER MANUFACTURING COMPANY
 TOLL FREE: 800-421-6162 - FAX: 800-832-8238
 information@fisher-mfg.com - www.fisher-mfg.com

APPLICATION:		PRODUCT NAME: <div style="text-align: center;">DrainKing WASTE VALVE</div>									
JOB NAME:		<input type="checkbox"/> SPECIAL CONFIGURATION CHECK BASE MODEL AND OPTIONS									
QUANTITY:	ITEM NO.	MODEL: <input type="checkbox"/> 22306 W/ FLAT STRAINER & 19" X 21" OVERFLOW <input type="checkbox"/> 22322 W/ FLAT STRAINER & 14" X 16" OVERFLOW									
		OPTIONS OR MODIFICATIONS: <input type="checkbox"/> OTHER _____									
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <th>MODEL</th> <th>19" X 21"</th> </tr> <tr> <td>22306</td> <td> DIM "A" 19" [482.6mm] DIM "B" 19-1/4" [489.0mm] </td> </tr> </table> <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <th>MODEL</th> <th>14" X 16"</th> </tr> <tr> <td>22322</td> <td> DIM "A" 14" [355.6mm] DIM "B" 14-1/4" [362.0mm] </td> </tr> </table>		MODEL	19" X 21"	22306	DIM "A" 19" [482.6mm] DIM "B" 19-1/4" [489.0mm]	MODEL	14" X 16"	22322	DIM "A" 14" [355.6mm] DIM "B" 14-1/4" [362.0mm]	FEATURES: <ul style="list-style-type: none"> * DUAL TEFLON SEALS * STAINLESS STEEL BALL * CAST RED BRASS BODY * EXTRA SURDY STAINLESS STEEL CLAMPING RING * "CLEAR THROUGH" OPENING, NO NEED TO DISASSEMBLE IF SNAKING IS REQUIRED * INDUSTRY STANDARD "SEALING" ANGLE - FITS FLUSH TO STANDARD STAINLESS STEEL SINKS * STAINLESS STEEL FLAT STRAINER * 1/4 TURN FULLY OPENS AND CLOSES VALVE DRAIN RATE: * 12 GPM	
MODEL	19" X 21"										
22306	DIM "A" 19" [482.6mm] DIM "B" 19-1/4" [489.0mm]										
MODEL	14" X 16"										
22322	DIM "A" 14" [355.6mm] DIM "B" 14-1/4" [362.0mm]										
ROUGH-IN: <div style="display: flex; justify-content: space-around; align-items: flex-end;"> <div style="text-align: center;"> OVERFLOW  Ø1-5/8" [41.3mm] </div> <div style="text-align: center;"> DRAIN  Ø3-1/2" [88.9mm] </div> </div>		SHIPPING WEIGHT * 10.0 LBS									
 ANSI/A112.18.1M		 FISHER FISHER MANUFACTURING COMPANY TOLL FREE: 800-421-6162 - FAX: 800-832-8238 information@fisher-mfg.com - www.fisher-mfg.com									



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Wall Shelf, model _____. Constructed of 16 gauge type 430, 16 gauge type 304, or 14 gauge type 304 stainless steel. 1½" roll on front, with 1½" upturn on rear and ends. Stainless steel mounting brackets are stud welded to shelf.



#WS1236-16/3 wall shelf

Wall Shelves

MODELS:

- | | |
|---|---|
| <input type="checkbox"/> WS1024-* | <input type="checkbox"/> WS1224-* |
| <input type="checkbox"/> WS1036-* | <input type="checkbox"/> WS1236-* |
| <input type="checkbox"/> WS1048-* | <input type="checkbox"/> WS1248-* |
| <input type="checkbox"/> WS1060-* | <input type="checkbox"/> WS1260-* |
| <input type="checkbox"/> WS1072-* | <input type="checkbox"/> WS1272-* |
| <input type="checkbox"/> WS1084-* | <input type="checkbox"/> WS1284-* |
| <input type="checkbox"/> WS1096-* | <input type="checkbox"/> WS1296-* |
| <input type="checkbox"/> WS10108-* | <input type="checkbox"/> WS12108-* |
| <input type="checkbox"/> WS10120-* | <input type="checkbox"/> WS12120-* |

* See chart on back page for complete model numbers.

Wall Mounted Shelves

- 1½" (38mm) roll on front.
- 1½" (38mm) upturn on rear and ends.
- Die-formed stainless steel mounting brackets are stud-welded to shelf.
- All stainless steel polished to #4 finish.
- Available in 16 gauge type 430, 16 gauge type 304, and 14 gauge type 304 stainless steel.
- Wide selection of sizes.

EAGLE GROUP

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www.eaglegrp.com

Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our **SpecFAB®** Division.

Phone: 302-653-3000 • Fax: 302-653-2065 • e-mail: quotes@eaglegrp.com

Certifications / Approvals



AUTOQUOTES



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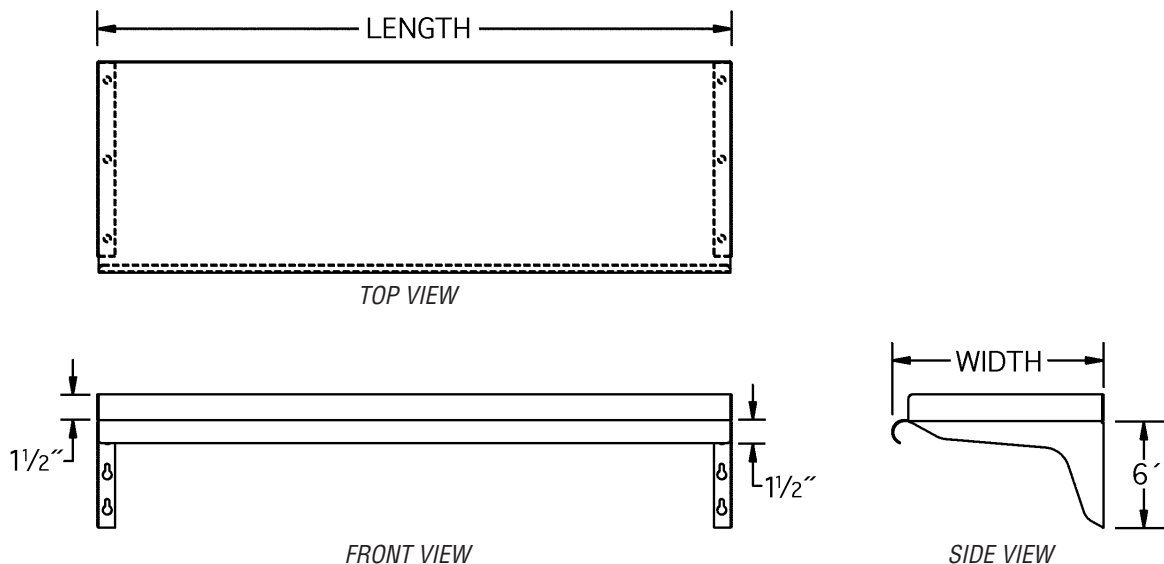
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Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Wall Mounted Shelves



16 gauge type 430 model #	16 gauge type 304 model #	14 gauge type 304 model #	width*		length		weight	
			in.	mm	in.	mm	lbs.	kg
WS1024-16/4	WS1024-16/3	WS1024-14/3	10"	254	24"	610	10	4.5
WS1036-16/4	WS1036-16/3	WS1036-14/3	10"	254	36"	914	12	5.4
WS1048-16/4	WS1048-16/3	WS1048-14/3	10"	254	48"	1219	15	6.8
WS1060-16/4	WS1060-16/3	WS1060-14/3	10"	254	60"	1524	20	9.0
WS1072-16/4	WS1072-16/3	WS1072-14/3	10"	254	72"	1829	22	10.0
WS1084-16/4	WS1084-16/3	WS1084-14/3	10"	254	84"	2134	24	10.9
WS1096-16/4	WS1096-16/3	WS1096-14/3	10"	254	96"	2438	29	13.2
WS10108-16/4	WS10108-16/3	WS10108-14/3	10"	254	108"	2743	32	14.5
WS10120-16/4	WS10120-16/3	WS10120-14/3	10"	254	120"	3048	34	15.4
WS1224-16/4	WS1224-16/3	WS1224-14/3	12"	305	24"	610	12	5.4
WS1236-16/4	WS1236-16/3	WS1236-14/3	12"	305	36"	914	14	6.4
WS1248-16/4	WS1248-16/3	WS1248-14/3	12"	305	48"	1219	17	7.7
WS1260-16/4	WS1260-16/3	WS1260-14/3	12"	305	60"	1524	23	10.4
WS1272-16/4	WS1272-16/3	WS1272-14/3	12"	305	72"	1829	25	11.3
WS1284-16/4	WS1284-16/3	WS1284-14/3	12"	305	84"	2134	28	12.7
WS1296-16/4	WS1296-16/3	WS1296-14/3	12"	305	96"	2438	31	14.1
WS12108-16/4	WS12108-16/3	WS12108-14/3	12"	305	108"	2743	36	16.3
WS12120-16/4	WS12120-16/3	WS12120-14/3	12"	305	120"	3048	39	17.6

* 15" and 18" (381 and 457mm)-wide shelves available. To order, replace "12" in model number with a "15" or "18" indicating shelf width. Example: WS1536-16/3

EAGLE GROUP

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720



Profit from the Eagle Advantage®

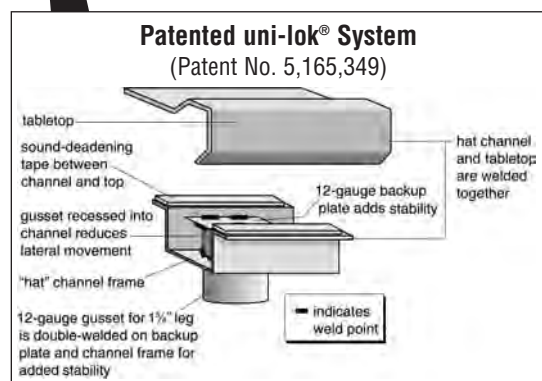
Specification Sheet

Short Form Specifications

Eagle Spec-Master® Marine Prep Table, model _____. Top to be 14/304 stainless steel with box marine edge on front and sides, and 10" backsplash with a 2" return at 45° and turned down 1". Constructed with uni-lok® patented gusset system with the gussets recessed into the hat channels to reduce lateral movement. Two 24" x 18" x 12" deep stainless steel sinks with lever drains, overflows and brackets. Heavy gauge stainless steel undershelf with 2" upturn at rear welded to leg assemblies. 20" x 20" x 5" stainless steel drawer, and 16" x 24" x 1/2" poly cutting board on stainless steel slides welded on outside of unit. Stainless steel tubular legs with stainless steel adjustable bullet feet.



SpecMaster® Marine prep table



Options / Accessories

- ☐ Lock ☐ Receptacles
☐ Overshelves ☐ Pot Rack

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For custom configuration or fabrication needs, contact our **SpecFAB® Division**.

Phone: 302-653-3000 • Fax: 302-653-3091 • e-mail: specfab@eaglegrp.com

Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

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Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Spec-Master® Marine Prep Tables

MODELS:

- ☐ **SMPT3096**
☐ **SMPT30108**
☐ **SMPT30132**
☐ **SMPT30144**

Tabletop

- 14 gauge type 304 stainless steel.
- Stainless steel gussets with uni-lok® design (patent #5,165,349).
- Full-perimeter underside channeling.
- Box marine edges on front and each end.
- 10" (254mm)-high backsplash with downturn.
- T&S faucet mounted on backsplash, on 8" (203mm) center lines.
- NSF-approved drawer with integrated full-length front pull flange.

Legs

- Stainless steel 1 1/2" (41mm) diameter.
- Stainless steel flanged adjustable feet.

Other features

- Heavy gauge type 304 stainless steel undershelf with 2" (51mm) rear upturn welded to leg assembly.
- Sink features two 24" x 18" x 12" (610 x 457 x 305mm) sink bowls with twist handle drains, overflows and brackets.
- 20" x 20" x 5" (508 x 508 x 127mm) NSF-approved stainless steel drawer with full-length front pull flange.
- 1/2" (13mm)-thick poly cutting board is 16" x 24" (406 x 610mm), with set of slides welded to outside of unit.

Certifications / Approvals

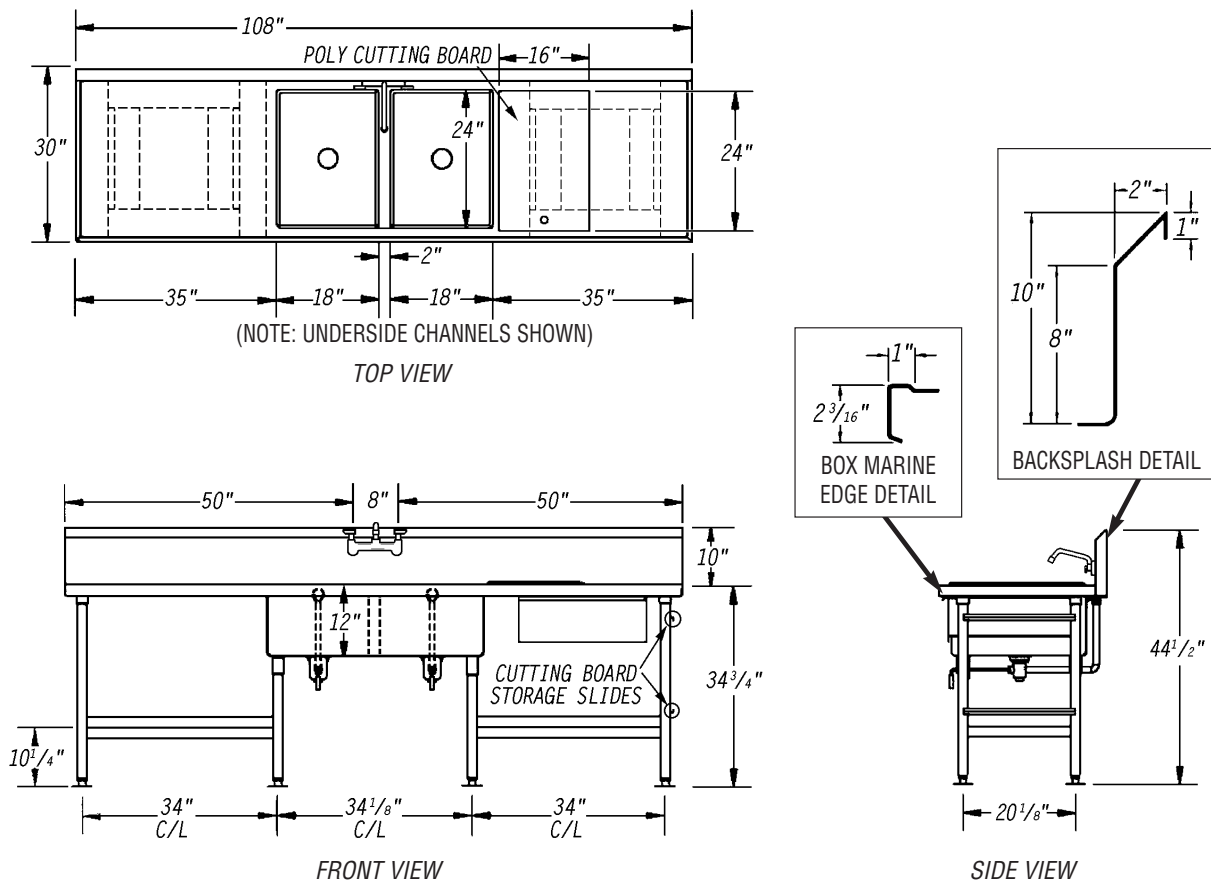




Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Spec-Master® Marine Prep Tables



model # SMPT30108 shown

model #	width		length		weight	
	in.	mm	in.	mm	lbs.	kg
SMPT3096	30"	762	96"	2438	452	205.0
SMPT30108	30"	762	108"	2743	480	217.7
SMPT30120	30"	762	120"	3048	555	251.8
SMPT30144	30"	762	144"	3658	591	268.1

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722



Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle Wall Shelf, model _____. Constructed of 16 gauge type 430, 16 gauge type 304, or 14 gauge type 304 stainless steel. 1½" roll on front, with 1½" upturn on rear and ends. Stainless steel mounting brackets are stud welded to shelf.



#WS1236-16/3 wall shelf

Item No.:	_____
Project No.:	_____
S.I.S. No.:	_____

Wall Shelves

MODELS:

- | | |
|---|---|
| <input type="checkbox"/> WS1024-* | <input type="checkbox"/> WS1224-* |
| <input type="checkbox"/> WS1036-* | <input type="checkbox"/> WS1236-* |
| <input type="checkbox"/> WS1048-* | <input type="checkbox"/> WS1248-* |
| <input type="checkbox"/> WS1060-* | <input type="checkbox"/> WS1260-* |
| <input type="checkbox"/> WS1072-* | <input type="checkbox"/> WS1272-* |
| <input type="checkbox"/> WS1084-* | <input type="checkbox"/> WS1284-* |
| <input type="checkbox"/> WS1096-* | <input type="checkbox"/> WS1296-* |
| <input type="checkbox"/> WS10108-* | <input type="checkbox"/> WS12108-* |
| <input type="checkbox"/> WS10120-* | <input type="checkbox"/> WS12120-* |

* See chart on back page for complete model numbers.

Wall Mounted Shelves

- 1½" (38mm) roll on front.
- 1½" (38mm) upturn on rear and ends.
- Die-formed stainless steel mounting brackets are stud-welded to shelf.
- All stainless steel polished to #4 finish.
- Available in 16 gauge type 430, 16 gauge type 304, and 14 gauge type 304 stainless steel.
- Wide selection of sizes.

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Certifications / Approvals



AUTOQUOTES



EG02.05 Rev. 09/13

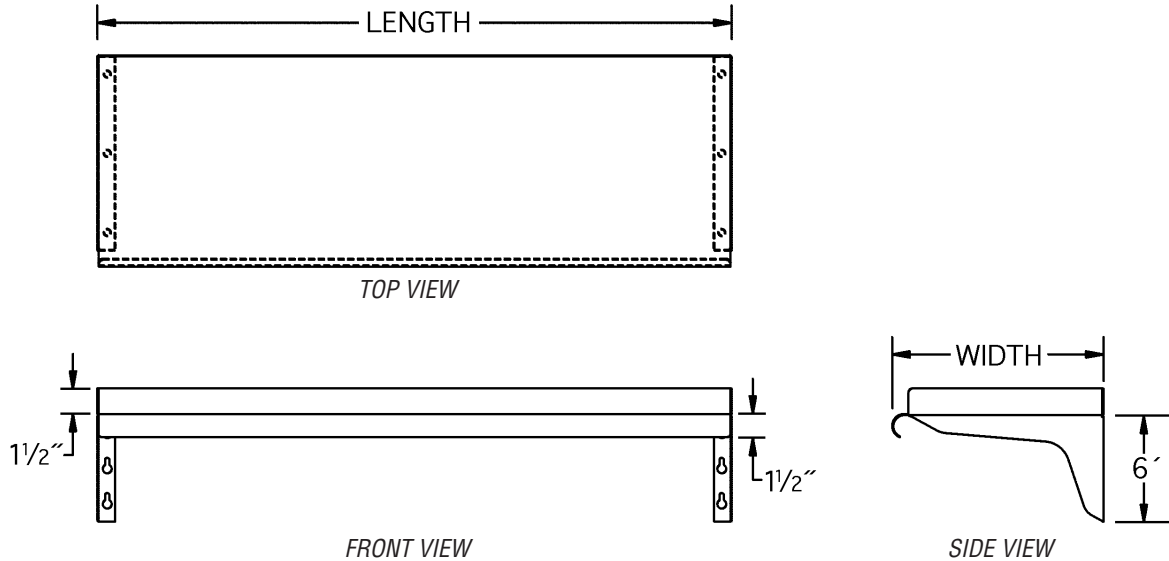
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Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Wall Mounted Shelves



16 gauge type 430 model #	16 gauge type 304 model #	14 gauge type 304 model #	width*		length		weight	
			in.	mm	in.	mm	lbs.	kg
WS1024-16/4	WS1024-16/3	WS1024-14/3	10"	254	24"	610	10	4.5
WS1036-16/4	WS1036-16/3	WS1036-14/3	10"	254	36"	914	12	5.4
WS1048-16/4	WS1048-16/3	WS1048-14/3	10"	254	48"	1219	15	6.8
WS1060-16/4	WS1060-16/3	WS1060-14/3	10"	254	60"	1524	20	9.0
WS1072-16/4	WS1072-16/3	WS1072-14/3	10"	254	72"	1829	22	10.0
WS1084-16/4	WS1084-16/3	WS1084-14/3	10"	254	84"	2134	24	10.9
WS1096-16/4	WS1096-16/3	WS1096-14/3	10"	254	96"	2438	29	13.2
WS10108-16/4	WS10108-16/3	WS10108-14/3	10"	254	108"	2743	32	14.5
WS10120-16/4	WS10120-16/3	WS10120-14/3	10"	254	120"	3048	34	15.4
WS1224-16/4	WS1224-16/3	WS1224-14/3	12"	305	24"	610	12	5.4
WS1236-16/4	WS1236-16/3	WS1236-14/3	12"	305	36"	914	14	6.4
WS1248-16/4	WS1248-16/3	WS1248-14/3	12"	305	48"	1219	17	7.7
WS1260-16/4	WS1260-16/3	WS1260-14/3	12"	305	60"	1524	23	10.4
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WS12108-16/4	WS12108-16/3	WS12108-14/3	12"	305	108"	2743	36	16.3
WS12120-16/4	WS12120-16/3	WS12120-14/3	12"	305	120"	3048	39	17.6

* 15" and 18" (381 and 457mm)-wide shelves available. To order, replace "12" in model number with a "15" or "18" indicating shelf width. Example: WS1536-16/3

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724

CUSTOM FABRICATED _____

SPARE NUMBER _____X_____

MILLWORK _____

EXISTING _____

NOT IN KITCHEN
EQUIP. CONTRACT
(NIKEC) _____

FURNISHED BY:

OWNER _____

OPERATOR _____

SUPPLIER/
VENDOR _____

DIV. 15, PLUMB _____

DIV. 16, ELEC. _____

ARCHITECT _____

OTHER _____

NOTES:

CUSTOM FABRICATED ☒

SPARE NUMBER ☐

MILLWORK ☐

EXISTING ☐

NOT IN KITCHEN
EQUIP. CONTRACT
(NIKEC) ☐

FURNISHED BY:

OWNER ☐

OPERATOR ☐

SUPPLIER/
VENDOR ☐

DIV. 15, PLUMB ☐

DIV. 16, ELEC. ☐

ARCHITECT ☐

OTHER ☐

NOTES:



by Tyco Fire Suppression & Building Products

R-102™ RESTAURANT FIRE SUPPRESSION SYSTEMS

Data/Specifications

FEATURES

- Low pH Agent
- Proven Design
- Reliable Gas Cartridge Operation
- Aesthetically Appealing
- UL Listed – Meets Requirements of UL 300
- ULC Listed – Meets Requirements of ULC/ORD-C1254.6
- CE Marked

APPLICATION

The ANSUL® R-102™ Restaurant Fire Suppression System is an automatic, pre-engineered, fire suppression system designed to protect areas associated with ventilating equipment including hoods, ducts, plenums, and filters. The system also protects auxiliary grease extraction equipment and cooking equipment such as fryers; griddles and range tops; upright, natural charcoal, or chain-type broilers; electric, lava rock, mesquite, or gas-radiant char-broilers; and woks.

The system is ideally suitable for use in restaurants, hospitals, nursing homes, hotels, schools, airports, and other similar facilities.

Use of the R-102 system is limited to indoor applications or locations that provide weatherproof protection within tested temperature limitations. The regulated release and tank assemblies must be mounted in an area where the air temperature will not fall below 32 °F (0 °C) or exceed 130 °F (54 °C). The system must be designed and installed within the guidelines of the UL/ULC Listed Design, Installation, Recharge, and Maintenance Manual.

SYSTEM DESCRIPTION

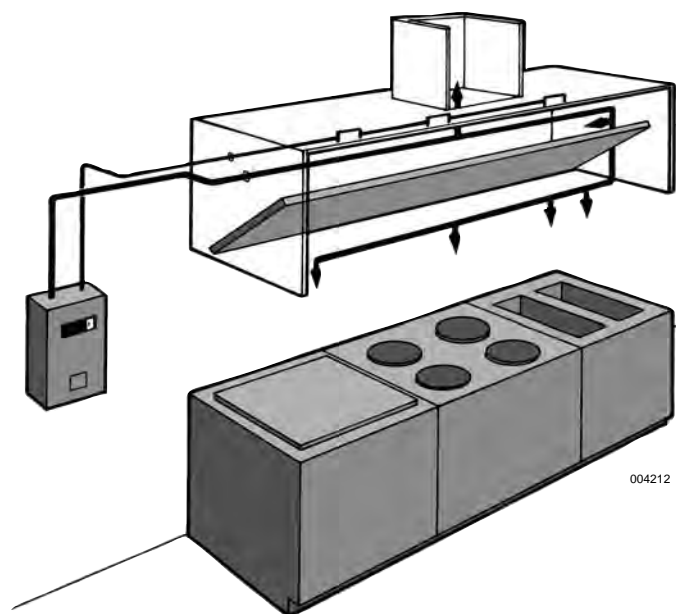
The restaurant fire suppression system is a pre-engineered, wet chemical, cartridge-operated, regulated pressure type with a fixed nozzle agent distribution network. It is listed with Underwriters Laboratories, Inc. (UL/ULC).



004215

The system is capable of automatic detection and actuation as well as remote manual actuation. Additional equipment is available for building fire alarm panel connections, electrical shutdown and/or interface, and mechanical or electrical gas line shut-off applications.

The detection portion of the fire suppression system allows for automatic detection by means of specific temperature-rated alloy type fusible links, which separate when the temperature exceeds the rating of the link, allowing the regulated release to actuate.



004212

A system owner's guide is available containing basic information pertaining to system operation and maintenance. A detailed technical manual, including system description, design, installation, recharge and resetting instructions, and maintenance procedures, is available to qualified individuals.

The system is installed and serviced by authorized distributors that are trained by the manufacturer.

The basic system consists of an ANSUL AUTOMAN® regulated release assembly which includes a regulated release mechanism and a wet chemical storage tank housed within a single enclosure. Nozzles with blow-off caps, detectors, cartridges, agent, fusible links, and pulley elbows are supplied in separate packages in the quantities needed for fire suppression system arrangements.

Additional equipment includes a remote manual pull station(s), mechanical and electrical gas valves, and electrical switches for automatic equipment and gas line shut-off. Accessories can be added such as alarms, warning lights, etc., to installations where required.

Additional tanks and corresponding equipment can be used in multiple arrangements to allow for larger hazard coverage. Each tank is limited to a listed maximum amount of flow numbers.



004213

COMPONENT DESCRIPTION

Wet Chemical Agent – The extinguishing agent is a mixture of organic salts designed for rapid flame knockdown and foam securement of grease related fires. It is available in plastic containers with instructions for wet chemical handling and usage.

Agent Tank – The agent tank is installed in a stainless steel enclosure or wall bracket. The tank is constructed of stainless steel.

Tanks are available in two sizes: 1.5 gallon (5.7 L) and 3.0 gallon (11.4 L). The tanks have a working pressure of 110 psi (7.6 bar), a test pressure of 330 psi (22.8 bar), and a minimum burst pressure of 660 psi (45.5 bar).

The tank includes an adaptor/tube assembly. The adaptor assembly includes a chrome-plated steel adaptor with a 1/4 in. NPT female gas inlet, a 3/8 in. NPT female agent outlet, and a stainless steel agent pick-up tube. The adaptor also contains a bursting disc seal which helps to prevent the siphoning of agent up the pipe during extreme temperature variations.

Regulated Release Mechanism – The regulated release mechanism is a spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one, two, or three agent tanks depending on the capacity of the gas cartridge used. It contains a factory installed regulator deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar). It has automatic actuation capabilities by a fusible link detection system and remote manual actuation by a mechanical pull station.

The regulated release mechanism contains a release assembly, regulator, expellant gas hose, and agent storage tank housed in a stainless steel enclosure with cover. The enclosure contains knock-outs for 1/2 in. conduit. The cover contains an opening for a visual status indicator.

It is compatible with mechanical gas shut-off devices; or, when equipped with a field or factory-installed switch and manual reset relay, it is compatible with electric gas line or appliance shut-off devices.

Regulated Actuator Assembly – When more than two agent tanks (or three 3.0 gallon (11.4 L) tanks in certain applications) are required, the regulated actuator is available to provide expellant gas for additional tanks. It is connected to the cartridge receiver outlet of the regulated release mechanism providing simultaneous agent discharge. It contains a regulated actuator deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar). It has automatic actuation capabilities using pressure from the regulated release mechanism cartridge.

The regulated actuator assembly contains an actuator, regulator, expellant gas hose, and agent tank housed in a stainless steel enclosure with cover. The enclosure contains knockouts to permit installation of the expellant gas line.

Discharge Nozzles – Each discharge nozzle is tested and listed with the R-102 system for a specific application. Nozzle tips are stamped with the flow number designation (1/2, 1, 2, or 3). Each nozzle must have a metal or rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up.

Agent Distribution Hose – Kitchen appliances manufactured with or resting on casters (wheels/rollers) may include an agent distribution hose as a component of the suppression system. This allows the appliance to be moved for cleaning purposes without disconnecting the appliance fire suppression protection. The hose assembly includes a restraining cable kit to limit the appliance movement within the range (length) of the flexible hose.

Flexible Conduit – Flexible conduit allows for quicker installations and the convenience of being able to route the cable over, under and around obstacles. Flexible conduit can be used as a substitute for standard EMT conduit or can be used with EMT conduit.

Flexible conduit can be used only with the Molded Remote Manual Pull Station.

Pull Station Assembly – The remote manual pull station is made out of a molded red composite material. The red color makes the pull station more readily identifiable as the manual means for fire suppression system operation.

The pull station is compatible with the ANSUL Flexible Conduit.

APPROVALS

- UL/ULC Listed
- CE Marked
- New York City Department of Buildings
- LPCB
- TFR1
- Marine Equipment Directive (MED)
- DNV
- ABS
- Lloyd's Register
- Meets requirements of NFPA 96 (Standard for the Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment)
- Meets requirements of NFPA 17A (Standard on Wet Chemical Extinguishing Systems)

ORDERING INFORMATION

Order all system components through your local authorized ANSUL Distributor.

SPECIFICATIONS

An ANSUL R-102 Fire Suppression System shall be furnished. The system shall be capable of protecting all hazard areas associated with cooking equipment.

1.0 GENERAL

1.1 References

- 1.1.1 Underwriters Laboratories, Inc. (UL)
 - 1.1.1.1 UL Standard 1254
 - 1.1.1.2 UL Standard 300
- 1.1.2 Underwriters Laboratories of Canada (ULC)
 - 1.1.2.1 ULC/ORD-C 1254.6
- 1.1.3 National Fire Protection Association (NFPA)
 - 1.1.3.1 NFPA 96
 - 1.1.3.2 NFPA 17A

1.2 Submittals

- 1.2.1 Submit two sets of manufacturer's data sheets
- 1.2.2 Submit two sets of piping design drawings

1.3 System Description

- 1.3.1 The system shall be an automatic fire suppression system using a wet chemical agent for cooking grease related fires.
- 1.3.2 The system shall be capable of suppressing fires in the areas associated with ventilating equipment including hoods, ducts, plenums, and filters as well as auxiliary grease extraction equipment. The system shall also be capable of suppressing fires in areas associated with cooking equipment, such as fryers; griddles and range tops; upright, natural charcoal, or chain-type broilers; electric, lava rock, mesquite or gas-radiant char-broilers; and woks.
- 1.3.3 The system shall be the pre-engineered type having minimum and maximum guidelines established by the manufacturer and listed by Underwriters Laboratories (UL/ULC).
- 1.3.4 The system shall be installed and serviced by personnel trained by the manufacturer.
- 1.3.5 The system shall be capable of protecting cooking appliances by utilizing either dedicated appliance protection and/or overlapping appliance protection.

1.4 Quality Control

- 1.4.1 Manufacturer: The R-102 Restaurant Fire Suppression System shall be manufactured by a company with at least forty years experience in the design and manufacture of pre-engineered fire suppression systems. The manufacturer shall be ISO 9001 registered.
- 1.4.2 Certificates: The wet agent shall be a specially formulated, aqueous solution of organic salts with a pH range between 7.7 – 8.7, designed for flame knock-down and foam securement of grease-related fires.

1.5 Warranty, Disclaimer, and Limitations

- 1.5.1 The pre-engineered restaurant fire suppression system components shall be warranted for five years from date of delivery against defects in workmanship and material.

1.6 Delivery

- 1.6.1 Packaging: All system components shall be securely packaged to provide protection during shipment.

1.7 Environmental Conditions

- 1.7.1 The R-102 system shall be capable of operating within a temperature range of 32 °F to 130 °F (0 °C to 54 °C).

2.0 PRODUCT

2.1 Manufacturer

- 2.1.1 Tyco Fire Suppression & Building Products, One Stanton Street, Marinette, Wisconsin 54143-2542, Telephone (715) 735-7411.

2.2 Components

- 2.2.1 The basic system shall consist of an ANSUL AUTOMAN regulated release assembly which includes a regulated release mechanism and a wet chemical storage tank housed within a single enclosure. Nozzles, blow-off caps, detectors, cartridges, agent, fusible links, and pulley elbows shall be supplied in separate packages in the quantities needed for fire suppression system arrangements. Additional equipment shall include remote manual pull station, mechanical and electrical gas valves, and electrical switches for automatic equipment and gas line shut-off, and building fire alarm control panel interface.
- 2.2.2 Wet Chemical Agent: The extinguishing agent shall be a specially formulated, aqueous solution of organic salts with a pH range between 7.7 – 8.7, designed for flame knockdown and foam securement of grease related fires.
- 2.2.3 Agent Tank: The agent tank shall be installed in a stainless steel enclosure or wall bracket. The tank shall be constructed of stainless steel. Tanks shall be available in two sizes; 1.5 gallon (5.7 L) and 3.0 gallon (11.4 L). The tank shall have a working pressure of 110 psi (7.6 bar), a test pressure of 330 psi (22.8 bar), and a minimum burst pressure of 660 psi (45.5 bar). The tank shall include an adaptor/tube assembly containing a burst disc union.
- 2.2.4 Regulated Release Mechanism: The regulated release mechanism shall be a spring-loaded, mechanical/pneumatic type capable of providing the expellant gas supply to one or two agent tanks depending on the capacity of the gas cartridge used or three 3.0 gallon (11.4 L) agent storage tanks in certain applications. It shall contain a factory installed regulator deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar).
It shall have the following actuation capabilities: automatic actuation by a fusible link detection system and remote manual actuation by a mechanical pull station.
The regulated release mechanism shall contain a release assembly, regulator, expellant gas hose, and agent storage tank housed in a stainless steel enclosure with cover. The enclosure shall contain knockouts for 1/2 in. conduit. The cover shall contain an opening for a visual status indicator.
It shall be compatible with mechanical gas shut-off devices; or, when equipped with a field or factory-installed switch(es), it shall be compatible with electric gas line or appliance shut-off devices, or connections to a building fire alarm control panel.
- 2.2.5 Regulated Actuator Assembly: When more than two agent tanks or three agent tanks in certain applications are required, the regulated actuator shall be available to provide expellant gas for additional tanks. It shall be connected to the cartridge receiver outlet of the regulated release mechanism providing simultaneous agent discharge. The regulator shall be deadset at 110 psi (7.6 bar) with an external relief of approximately 180 psi (12.4 bar). The regulated actuator assembly shall contain an actuator, regulator, expellant gas hose, and agent tank housed in a stainless steel enclosure with cover. The enclosure shall contain knockouts to permit installation of the expellant gas line.
- 2.2.6 Discharge Nozzles: Each discharge nozzle shall be tested and listed with the R-102 system for a specific application. Nozzles tips shall be stamped with the flow number designation (1/2, 1, 2, or 3). Each nozzle shall have a metal or rubber blow-off cap to keep the nozzle tip orifice free of cooking grease build-up.

SPECIFICATIONS**2.0 PRODUCT (Continued)****2.2 Components (Continued)**

- 2.2.7 Distribution Piping: Distribution piping shall be Schedule 40 black iron, chrome-plated, or stainless steel conforming to ASTM A120, A53, or A106.
- 2.2.8 Detectors: The detectors shall be the fusible link style designed to separate at a specific temperature.
- 2.2.9 Cartridges: The cartridge shall be a sealed steel pressure vessel containing either carbon dioxide or nitrogen gas. The cartridge seal shall be designed to be punctured by the releasing device supplying the required pressure to expel wet chemical agent from the storage tank.
- 2.2.10 Agent Distribution Hose: An optional agent distribution hose shall be available for kitchen appliances manufactured with or resting on casters (wheels/rollers). This shall allow the appliance to be moved for cleaning purposes without disconnecting the appliance fire suppression protection. Hose assembly shall include a restraining cable kit to limit the appliance movement within the range (length) of the flexible hose.
- 2.2.11 Flexible Conduit: The manufacturer supplying the Restaurant Fire Suppression System shall offer flexible conduit as an option to rigid EMT conduit for the installation of pull stations and/or mechanical gas valves. The flexible conduit shall be UL Listed and include all approved components for proper installation.
- 2.2.12 Pull Station Assembly: The Fire Suppression System shall include a remote pull station for manual system actuation. The pull station shall be designed to include a built-in guard to protect the pull handle. The pull station shall also be designed with a pull handle to allow for three finger operation and shall be red in color for quick visibility.

3.0 IMPLEMENTATION**3.1 Installation**

- 3.1.1 The R-102 fire suppression system shall be designed, installed, inspected, maintained, and recharged in accordance with the manufacturer's listed instruction manual.

3.2 Training

- 3.2.1 Training shall be conducted by representatives of the manufacturer.

► Indicates revised information

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CUSTOM FABRICATED _____

SPARE NUMBER _____X_____

MILLWORK _____

EXISTING _____

NOT IN KITCHEN
EQUIP. CONTRACT
(NIKEC) _____

FURNISHED BY:

OWNER _____

OPERATOR _____

SUPPLIER/
VENDOR _____

DIV. 15, PLUMB _____

DIV. 16, ELEC. _____

ARCHITECT _____

OTHER _____

NOTES:



ITEM NO. _____

COMBITHERM®

CTP7-20G

GAS BOILER-FREE



CAPACITY

- Seven (7) full-size sheet pans; seven (7) GN 2/1 pans; fourteen (14) full-size or GN 1/1 pans, two rows deep
- Two (2) side racks with seven (7) non-tilt support rails; 13" (330mm) horizontal width between rails, 2-3/4" (70mm) vertical spacing between rails

CONSTRUCTION

- Stainless steel exterior, bright annealed interior
- Seamless welded interior stainless steel cavity
- CoolTouch3™ triple pane window door with hinged inner glass prevents additional heat loss and increases cooking efficiency
- Door is hinged right with a 130° swing
- High efficiency LED lighting integrated in the door

- Door mounted self-draining drip tray
- Hands free positive catch door handle with lighted visual alerts [PATENT PENDING]
- PROrinse™ ergonomic retractable hand shower includes a safety shutoff interlock that shuts off water to the hose [PATENT PENDING] and a built-in backflow preventer in the hand shower handle
- SafeVent™ provides automatic steam venting at the end of the cooking cycle [PATENT #7,282,674]
- Zero Clearance design maximizes floor space utilization with features that carefully protect temperature sensitive components and controls [PATENT PENDING]
- Adjustable stainless steel legs provide stability
- High efficiency modulating gas burner maximizes the residence time of flue gases [PATENT PENDING]

CT PROFORMANCE™ STANDARD FEATURES

- Oven with state-of-the-art innovative solutions that meld together perfectly to deliver the highest performance standards, consistent food quality, and production efficiency.
- PROtouch™ control provides a simple and intuitive touch screen interface, large screen display and icons that are easy to use and identify.
- Software operation in English, French, German, Korean, Mandarin, Russian, or Spanish.
- Four cooking modes:
Steam - 85°F to 250°F (30°C to 120°C)
Convection - 85°F to 575°F (30°C to 300°C)
Combination - 85°F to 575°F (30°C to 301°C)
Retherm - 245°F to 320°F (120°C to 160°C)
- Cook time is displayed in hours : minutes : seconds for greater precision.

- Access an unlimited number of programmed titled recipes that you've customized, marked as favorites, or placed into category folders.
- Removable, single-point, quick-connect, core temperature product probe.
- Three power levels: reduced power to manage kitchen power peaks, eco power for optimal oven efficiency, and PROpower™ - an accelerated turbo power for an instant boost of heat or quick heat recovery [PATENT PENDING].
- Absolute Humidity Control™ (AHC) provides 0 - 100% humidity levels allowing more control over the ideal cooking environment and product finish [PATENT PENDING].
- Auto-reversing fan with five different fan speeds expands cooking capabilities - from braising, roasting, to flow sensitive products such as soufflés and meringues, or any product affected by a high velocity of air movement.
- Moisture injection feature provides perfect sheen and crust on breads and pastry items.

- Auto-detect USB for HACCP data access, Recipe Management, and software updates.
- Multi-shelf timers can be labeled by product name and programmed in hours, minutes and seconds giving greater control for delicate items.
- Sleep mode can be used to save valuable time by eliminating the need to power down and restart.
- Low temperature Delta-T feature for lower temperature cooking or longer term roasting.
- Programmable cool down feature provides the operator with the ability to lower the temperature of the oven compartment at an accelerated pace.
- Dehydration auxiliary function.
- CombiClean PLUS™ fully automated cleaning with 5 cleaning levels.
- Odometer tracking and audit trail provides extensive diagnostic and troubleshooting features.

SHORT FORM SPEC

Provide Alto-Shaam Combitherm® CT PROformance™ counter-top model CTP7-20G boiler-free gas CombiOven designed with EcoSmart® technology for reduced energy and water consumption. Includes operational modes for steam, convection, a combination of steam and convection heat, and retherm. Oven is to be constructed of 18 gauge stainless steel interior cavity. Oven includes an attached retractable hand shower spray hose with safety shutoff interlock system and a backflow preventer. PROtouch™ control features

includes a cool-down function, automatic cleaning function, recipe programming, three power levels, 0-100% humidity levels, auto-reversing fan with five (5) fan speeds, multi-shelf timers, and sleep mode. Oven includes USB port, HACCP data access, and four (4) adjustable stainless steel legs. Each oven is to accommodate up to seven (7) full-size sheet pans or fourteen (14) full-size hotel pans (GN 1/1), include standard right-hand door hinging, seven (7) non-tilt support rails, and four (4) stainless steel shelves.

FACTORY INSTALLED OPTIONS

Electrical Choices

- ☐ 120V 1ph ☐ 208-240V 1ph
☐ 208-240V 3ph ☐ 380-415V 3ph

Cord and Plug

- ☐ NEMA 5-20P, 20A, 125V Plug
(no-cost option for 120V models)

Gas Type

- ☐ Natural ☐ Propane

Door Swing

- ☐ Right-hand Door Hinging, standard
☐ Recessed Door, optional; increases oven width by 4" (102mm)

- ☐ Extended One-year Warranty

- ☐ Alternate Burner Orifice - specify elevation for elevations higher than 2,000 feet (610m) above sea level

- ☐ Automatic Grease Collection System [PATENT PENDING], includes four (4) 6-piece, self-trussing poultry racks #5014438, interior drip collection pan, and grease collection container with shut off valve (not available on units with smoking feature)

Cleaning system choices

- ☐ Automatic tablet-based cleaning system, standard
☐ Automatic liquid cleaning system pumps through the system for a deep cleaning, hands free process, includes one (1) removable support tray for liquid cleaner container, optional

- ☐ CombiLatch™ door interlock with adjustable timer safeguards operators from heat and steam in the oven cavity when opening the door during a cooking cycle

- ☐ Installation Start-Up Check - AVAILABLE THROUGH AN ALTO-SHAAM FASTEAM CENTER

- ☐ Smoking Feature - including one-step cold smoking (NOT AVAILABLE ON UNITS WITH SECURITY DEVICES)

Probe Choices

- ☐ Removable, single-point, quick-connect core temperature probe, standard
☐ Removable, single-point, quick-connect sous vide temperature probe, optional
☐ Hard-wired, multi-point core temperature probe, optional

Security Devices for correctional facility use

- ☐ Optional base package:
includes tamper-proof screw package, excludes temperature probe
☐ Anti entrapment device, optional
☐ Control panel security cover, optional
☐ Hasp door lock (padlock not included), optional
☐ Removable, single-point, quick-connect core temperature probe, optional
☐ Seismic feet package, optional

- ☐ Stacking Hardware



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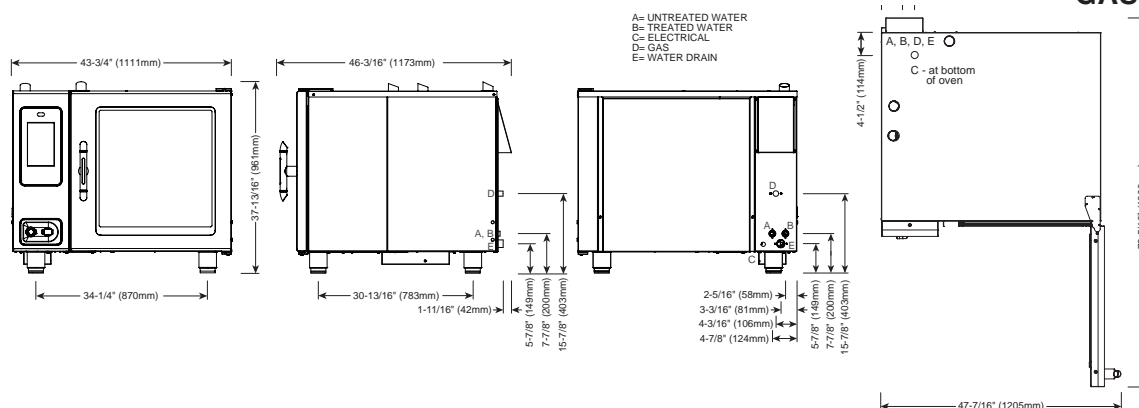




COMBITHERM®

CTP7-20G

GAS BOILER-FREE

**DIMENSIONS: H x W x D****EXTERIOR:**

37-13/16" x 43-3/4" x 46-3/16" (961mm x 1111mm x 1173mm)

EXTERIOR WITH RECESSED DOOR:

37-13/16" x 47-3/4" x 46-3/16" (961mm x 1213mm x 1173mm)

INTERIOR:

23-1/4" x 24-1/4" x 32-3/4" (590mm x 616mm x 832mm)

WATER REQUIREMENTS**TWO (2) COLD WATER INLETS - DRINKING QUALITY**

ONE (1) TREATED WATER INLET: 3/4" NPT*
ONE (1) UNTREATED WATER INLET: 3/4" NPT*
LINE PRESSURE: 30 to 90 psi 2.1 to 6.3 bar
WATER DRAIN: 1-1/2" (40mm) CONNECTION WITH A 2" (51mm) MINIMUM AIR GAP INSTALLED AS CLOSE TO THE OVEN AS POSSIBLE. MATERIALS MUST WITHSTAND TEMPERATURES UP TO 200°F (93°C).

CLEARANCE REQUIREMENTS

LEFT: 0" (0mm) 18" (457mm) FOR SERVICE ACCESS

RIGHT: 0" (0mm) NON-COMBUSTIBLE SURFACES 2" (51mm) DOOR SWING OR COMBUSTIBLE SURFACES

TOP: 20" (508mm) FOR AIR MOVEMENT

BACK: 4" (102mm) BOTTOM: 5-1/8" (130mm) FOR LEGS, AIR INTAKE

INSTALLATION REQUIREMENTS

- Oven must be installed level.
- Hood installation is required.
- Water supply shut-off valve and back-flow preventer when required by local code.

GAS REQUIREMENTS (GAS TYPE MUST BE SPECIFIED ON ORDER)

HOOK-UP: 3/4" NPT

WATER QUALITY STANDARDS

It is the sole responsibility of the owner/operator/purchaser of this equipment to verify that the incoming water supply is comprehensively tested and if required, a means of "water treatment" provided that would meet compliance requirements with the published water quality standards published below. Non-compliance with these minimum standards will potentially damage this equipment and/or components and void the original equipment manufacturer's warranty. Alto-Shaam recommends using OptiPure® [www.optipurewater.com] products to properly treat your water.

Contaminant Inlet Water Requirements

Free Chlorine Less than 0.1 ppm (mg/L)

Hardness 30-70 ppm

Chloride Less than 30 ppm (mg/L)

pH 7.0 to 8.5

Silica Less than 12 ppm (mg/L)

Total Dissolved Solids (tds) 50-125 ppm

RATED THERMAL LOAD				CONNECTED PRESSURE			
NORTH AMERICA		INTERNATIONAL		NORTH AMERICA		INTERNATIONAL	
Natural Gas/Propane		G20, G25, G31		Natural Gas	Propane	G20	20mbar
Gross Heating Value (HHV)		Net Heating Value (LHV)		Minimum: 5.5" W.C.	Minimum: 9" W.C.	G25	20mbar
98,000 Btu / hr		26.5 kW		Maximum: 14" W.C.	Maximum: 14" W.C.	G31	30mbar

ELECTRICAL - CTP7-20G (DEDICATED CIRCUIT REQUIRED) DO NOT CONNECT TO A G.F.I. OUTLET**WITH COMBISMOKER® OPTION**

	VOLTAGE	PH	HZ	AWG	CONNECTION no cord, no plug	AMPS	BREAKER	kW	CONNECTION no cord, no plug	AMPS	BREAKER	kW
☞	120	1	60	14	L1, N, G	6.8	20	.84	L1, N, G	12.0	20	1.46
☞	208 - 240	1*	50/60	14	L1, L2/N, G	4.8 - 4.2	15	1.0	L1, L2/N, G	7.3 - 7.1	15	1.5 - 1.7
☞	208 - 240	3	50/60	14	L1, L2, L3, G	4.8 - 4.2	15	1.0	L1, L2, L3, G	7.3 - 7.1	15	1.5 - 1.7
☞	380 - 415	3	50	14	L1, L2, L3, N, G	4.6 - 4.2	15	1.0	L1, L2, L3, N, G	7.2 - 7.1	15	1.6 - 1.7

☞ NORTH AMERICA VOLTAGE CHOICE

☞ INTERNATIONAL VOLTAGE CHOICE

*ELECTRICAL SERVICE CHARGE APPLIES

WEIGHT	SHIP DIMENSIONS	PAN CAPACITY
NET 680 lbs est 308 kg	(L x W x H) 56" x 48" x 51"	FULL-SIZE: 20" x 12" x 2-1/2" Fourteen (14)
SHIP 720 lbs* 327 kg*	(1422 x 1219 x 1295mm)*	GN 1/1: 530 x 325 x 65mm Fourteen (14)
*DOMESTIC GROUND SHIPPING INFORMATION. CONTACT FACTORY FOR EXPORT WEIGHT AND DIMENSIONS.		GN 2/1: 650 x 530 x 65mm Seven (7)
		*FULL-SIZE SHEET: 18" x 26" x 1" Seven (7)
		PRODUCT MAXIMUM: 168 lb (76 kg)
		VOLUME MAXIMUM: 105 quarts (133 liters)
		*ADDITIONAL WIRE SHELVES REQUIRED FOR MAXIMUM CAPACITY

733


CT *PROformance™*
CT *Classic™*

ITEM NO. _____

COMBITHERM® COMBIOven



☐ **SCALE FREE™**
CITRUS BASED, NON-CORROSIVE
DELMING PRODUCT
CE-27889

☐ **POULTRY GREASE
COLLECTION CONTAINER**
15" x 9-3/4" x 9-3/4"
(381 x 248 x 248mm)
5014846

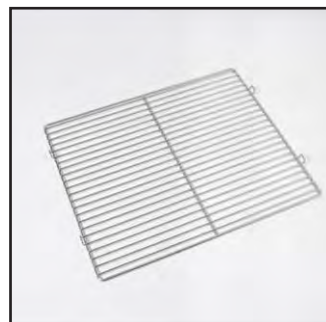
☐ **MOBILE GREASE
COLLECTION CART**
37" x 11-3/16" X 28-1/3"
(940 x 284 x 724mm)
5014542



☐ **FRY BASKET**
12" x 20"
(325mm x 530mm)
BS-26730



☐ **GRILLING GRATE**
12" x 20"
(325mm x 530mm)
SH-26731



SHELF, STAINLESS STEEL WIRE
*SH-22473 SHOWN



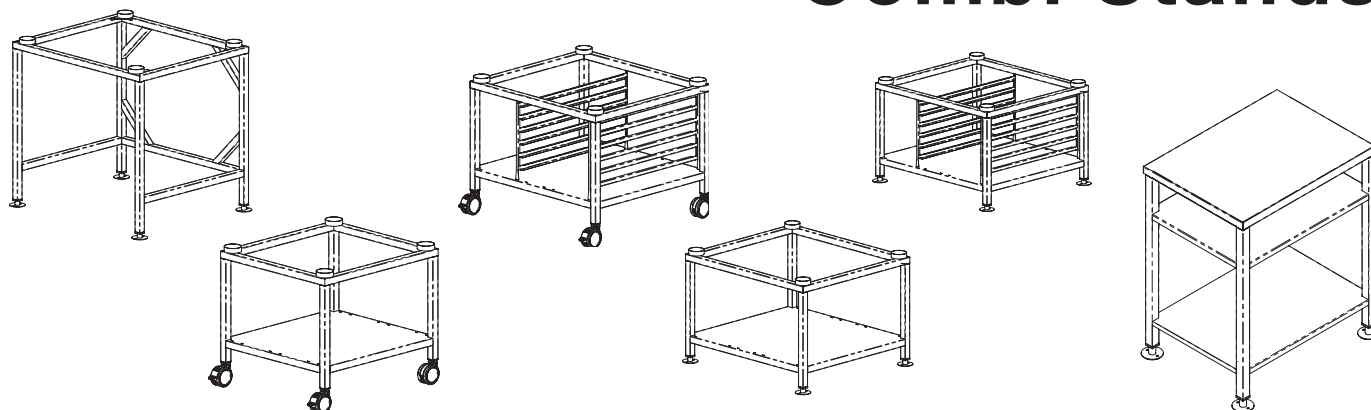
WOOD CHIPS

OPTIONS & ACCESSORIES

<input type="checkbox"/> COMBICLEAN® COMBITABS™ — SPECIALLY FORMULATED FOR COMBITHERM OVENS 90 (1 OUNCE) PACKETS EACH CONTAINER	CE-36354
<input type="checkbox"/> COMBITHERM® CLEANING LIQUID — SPECIALLY FORMULATED FOR COMBITHERM OVENS TWELVE (12) CONTAINERS/CASE, 1 QUART (C. 1 LITER) EACH [SPECIAL HANDLING REQUIRED]	CE-24750
<input type="checkbox"/> LIQUID CLEANER — APPROVED FOR COMBITHERM OVENS EQUIPPED WITH THE OPTIONAL AUTOMATIC LIQUID CLEANING SYSTEM	CE-36457
<input type="checkbox"/> GAS LINE QUICK DISCONNECT	CR-33543
GREASE COLLECTION PAN WITH DRAIN (NOT NEEDED FOR GREASE COLLECTION SYSTEM)	
<input type="checkbox"/> 6-10, 10-10, 20-10 — 1-1/2" (38mm) DEEP	5003463
<input type="checkbox"/> 7-20, 10-20, 20-20 — 1-1/2" (38mm) DEEP	4758
<input type="checkbox"/> 7-20, 10-20, 20-20 — 2-3/4" (70mm) DEEP	14475
<input type="checkbox"/> PROBE, SOUS VIDE	PR-36576
SHELF, STAINLESS STEEL WIRE	
<input type="checkbox"/> 7-20, 10-20	SH-22584
<input type="checkbox"/> 6-10, 10-10, 20-10	SH-2903
<input type="checkbox"/> 20-20	SH-22473
WOOD CHIPS — BULK PACK 20 LB (9 KG)	
<input type="checkbox"/> APPLE	WC-22543
<input type="checkbox"/> CHERRY	WC-22541
<input type="checkbox"/> HICKORY	WC-2829
<input type="checkbox"/> MAPLE	WC-22545



COMBITHERM® COMBIoven Combi Stands



OVENS

STANDS, STAINLESS STEEL (H x W x D)

	4-10	6-10	10-10	7-20	10-20
5015711 MOBILE WITH PAN SLIDES & SHELF SPACING: 2-11/16" (68MM)				✓	✓
	28-15/16" x 38-3/4" x 38-5/16" (734mm x 983mm x 972mm)				
5016083 STATIONARY WITH SHELF				✓	✓
	25-7/16" x 39-13/16" x 36-5/16" (645mm x 1010mm x 922mm)				
5016084 STATIONARY WITH PAN SLIDES & SHELF SPACING: 2-11/16" (68MM)				✓	✓
	25-7/16" x 39-13/16" x 36-5/16" (645mm x 1010mm x 922mm)				
5016085 MOBILE WITH SHELF				✓	✓
	28-15/16" x 38-3/4" x 38-5/16" (734mm x 983mm x 972mm)				
5016087 STATIONARY				✓	✓
	38-3/4" x 42" x 36-5/16" (984mm x 1067mm x 922mm)				
5016088 STATIONARY WITH SHELF		✓	✓		
	25-3/8" x 31-3/4" x 34-5/16" (645mm x 805mm x 870mm)				
5016089 STATIONARY WITH PAN SLIDES & SHELF SPACING: 2-11/16" (68MM)		✓	✓		
	25-7/16" x 31-3/4" x 34-5/16" (645mm x 805mm x 870mm)				
5016090 MOBILE WITH SHELF		✓	✓		
	28-15/16" x 30-5/8" x 36-1/4" (734mm x 779mm x 920mm)				
5016091 MOBILE WITH PAN SLIDES & SHELF SPACING: 2-11/16" (68MM)		✓	✓		
	28-15/16" x 30-11/16" x 36-1/4" (734mm x 779mm x 920mm)				
5016092 STATIONARY		✓	✓		
	38-3/4" x 34" x 34-1/4" (984mm x 864mm x 870mm)				
5014737 STATIONARY WITH SINGLE SHELF	✓				
	15-1/4" x 22-5/16" x 31-5/8" (386mm x 565mm x 802mm)				
5014738 MOBILE WITH SINGLE SHELF	✓				
	18-5/16" x 21-13/16" x 31-1/8" (464mm x 552mm x 789mm)				
5014985 STATIONARY WITH DOUBLE SHELF	✓				
	36-1/4" x 22-5/16" x 31-5/8" (919mm x 565mm x 802mm)				
5014986 STATIONARY WITH DOUBLE SHELF	✓				
	36-3/16" x 23-3/4" x 31-9/16" (919mm x 603mm x 802mm)				



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DUE TO ONGOING PRODUCT IMPROVEMENT, SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

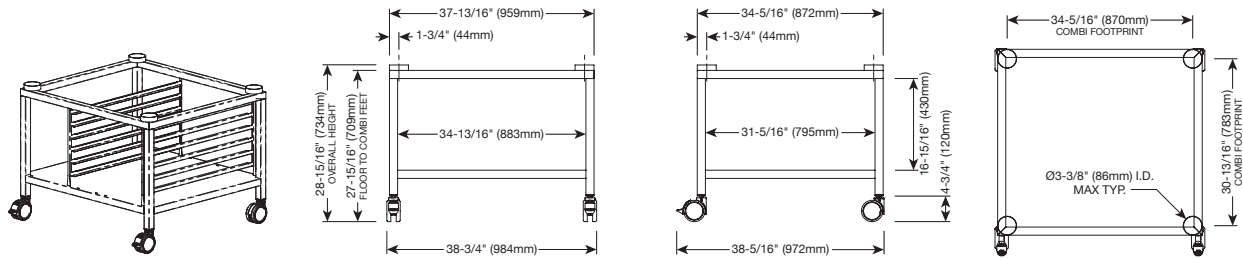
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COMBITHERM® COMBIoven Combi Stands

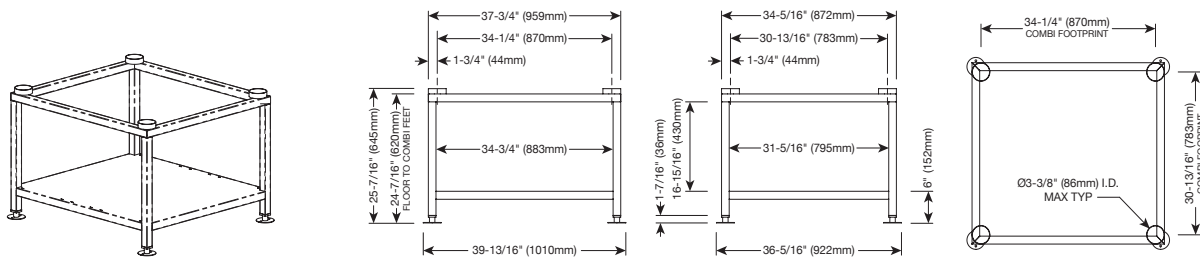
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Mobile Pan Slides & Shelf



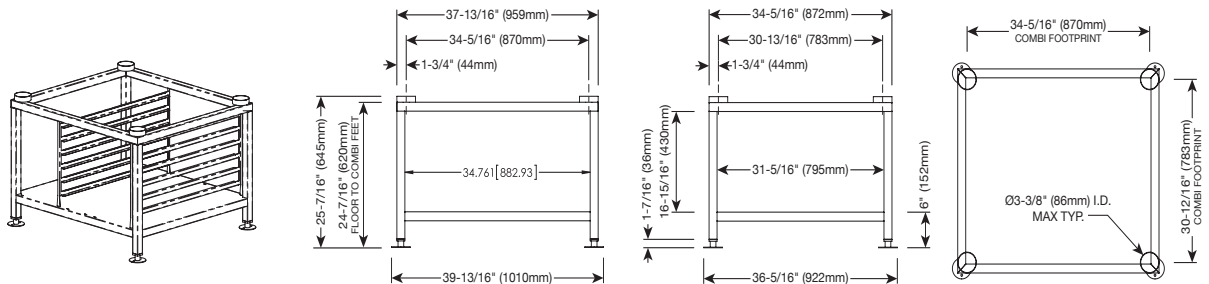
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Stationary with Shelf



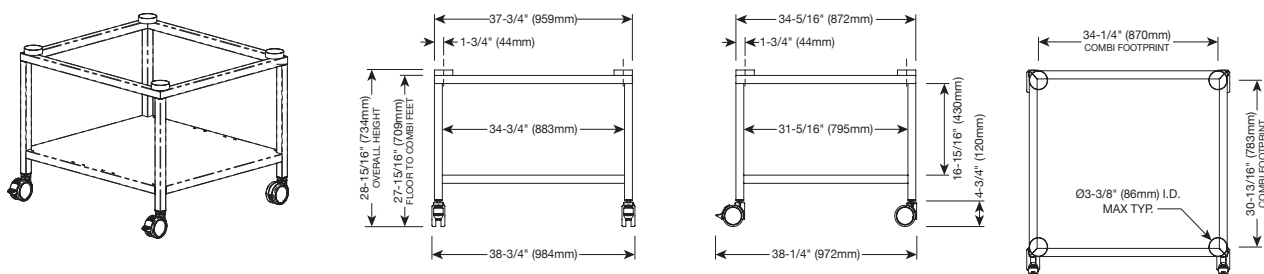
5016084

Stationary with Pan Slides & Shelf



5016085

Mobile with Shelf

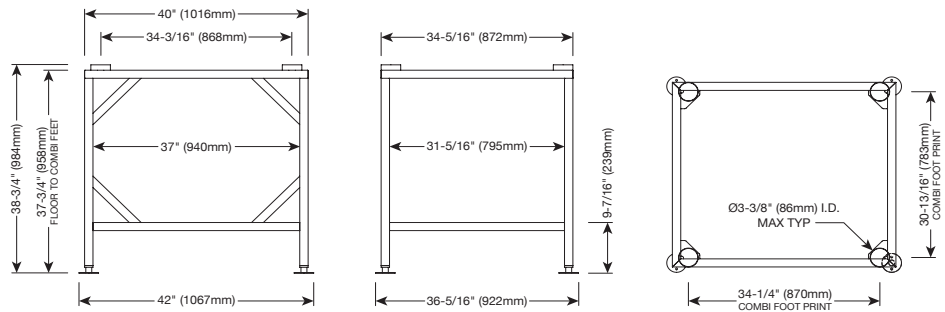
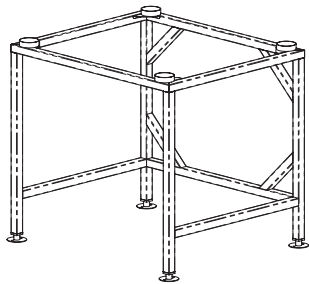




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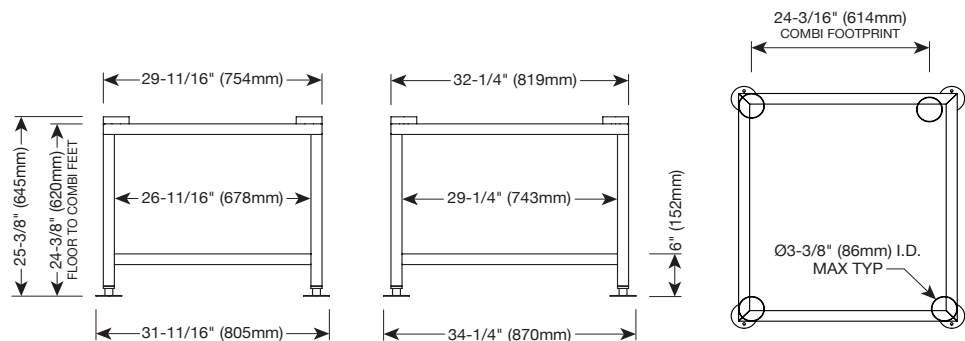
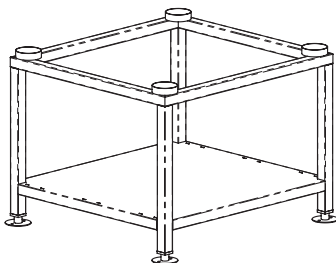
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Stationary



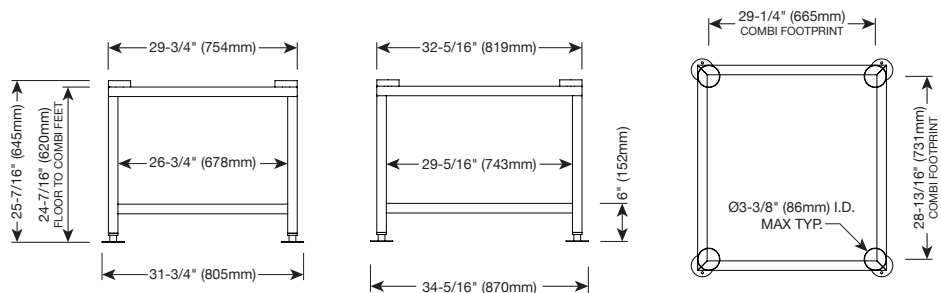
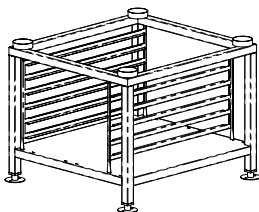
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Stationary with Shelf



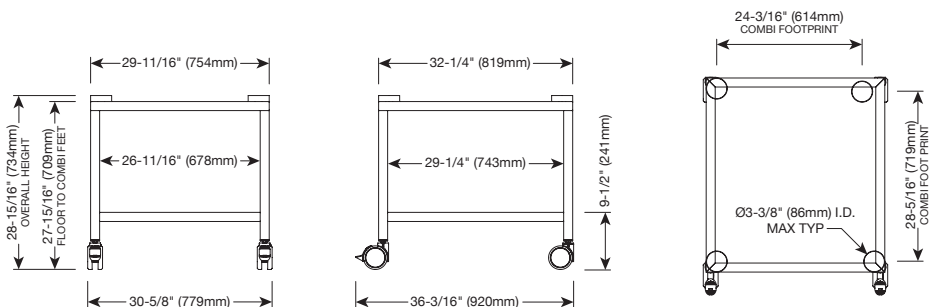
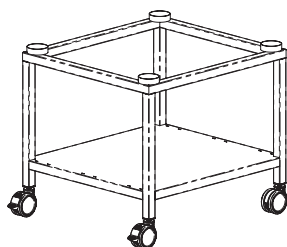
5016089

Stationary with Pan Slides & Shelf



5016090

Mobile with Shelf

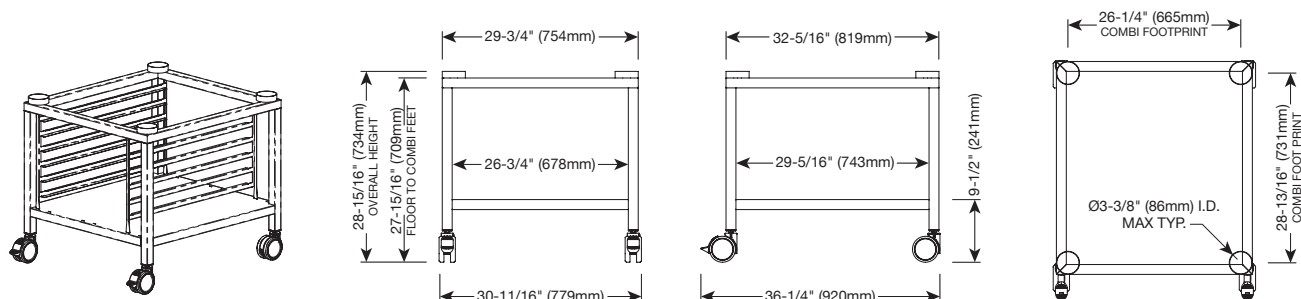




COMBITHERM® COMBIoven Combi Stands

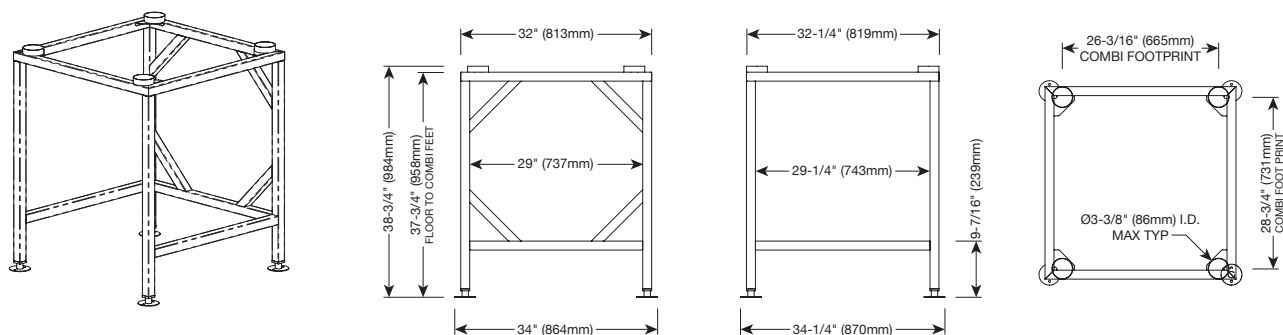
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Mobile with Pan Slides & Shelf



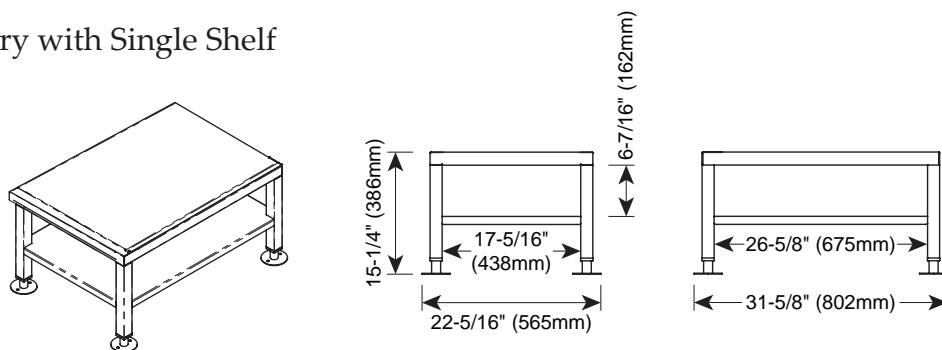
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Stationary



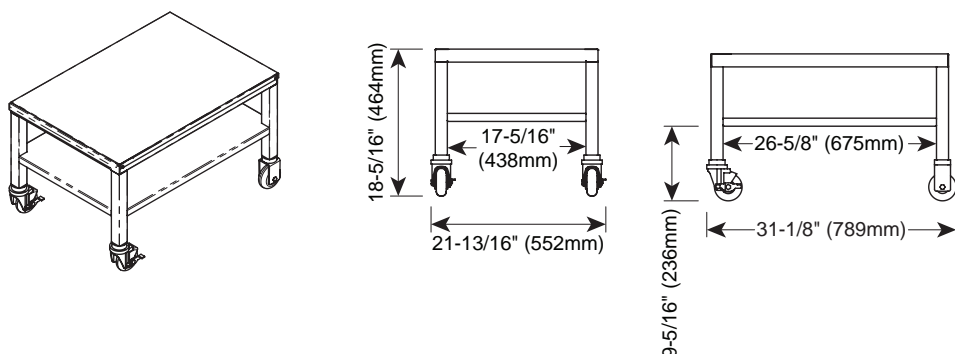
5014737

Stationary with Single Shelf



5014738

Mobile with Single Shelf

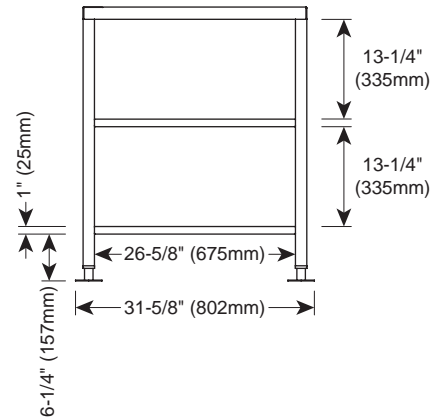
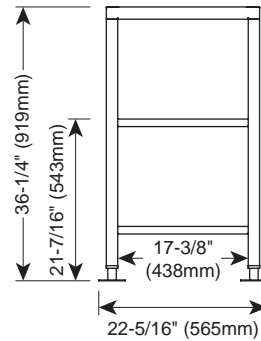
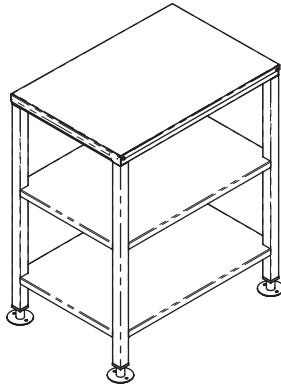




COMBITHERM® COMBIoven Combi Stands

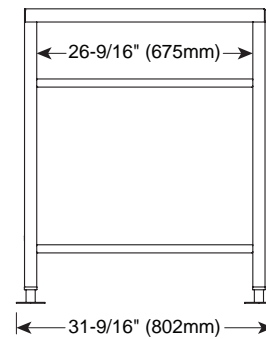
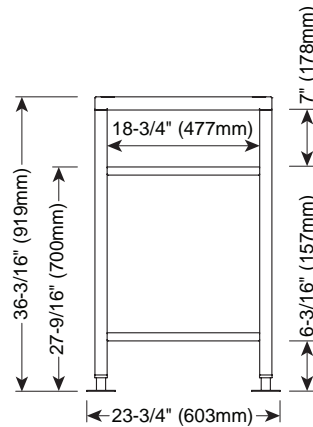
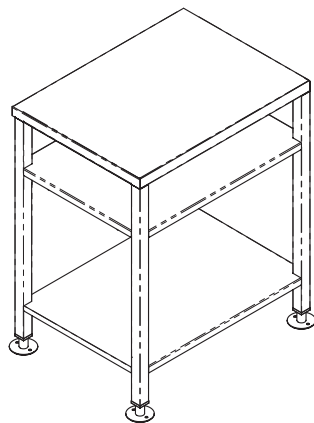
5014985

Stationary with Double Shelf



5014986

Stationary with Double Shelf



For Foodservice Applications

Job Name _____

Contractor _____

Job Location _____

Approval _____

Engineer _____

Contractor's P.O. No. _____

Approval _____

Representative _____

LEAD FREE*

Hydro-Safe®

Series QT™ Steam Max™

Steam and Combi Oven Filtration Systems

Flow Rate: 1.5 to 4.5 GPM (5.7 to 17 LPM)

Hydro-Safe® QT Steam Max systems have been specifically engineered to address and correct multiple common water related problems both efficiently and economically. It is designed for foodservice applications for the treatment of steamers, combi ovens and specific ice machines. Different configurations have been developed to address unique water treatment needs. Utilizing multiple treatment technologies, from poly spun sediment and high capacity carbon block for de-chlorination to phosphate or OneFlow® media for scale control, this Steam Max line has the solution for your steam cooking water treatment needs. Filter cartridge replacement is quick, easy, and sanitary because of the encapsulated design. The Hydro-Safe QT Steam Max features Lead Free* construction to comply with Lead Free* installation requirements.

Applications

- Steamers
- Combi Ovens
- Ice Machines

Features

- Simple filter replacement using QT cartridges
- Reduces scale build-up
- Reduces sediment, chlorine taste and odor
- Reduces maintenance and system downtime
- Increases kitchen equipment life, performance and quality
- In/Out valves allow for easy filter service
- Pressure Gauges and flush kit included
- Easy to install

System Specifications

Maximum Pressure:

QT Steam Max Models-

QTSTMMAX-2S-10M, QTSTMMAX-3S-10M, QTSTMMAX-2S-1M, QTSTMMAX-2L-10M, QTSTMMAX-3L-10M, QTSTMMAX-4L-10M, QTSTMMAX-2L-1M, QTSTMMAX-2L-1M-P, QTSTMMAX-3L-1M-P, QTSTMMAX-4L-1M-P: 100psi (6.8 bar)

QT Steam Max Models-

QTSTMMAX-3S-1M, QTSTMMAX-3L-1M, QTSTMMAX-4L-1M: 90psi (6.2 bar)

Minimum Pressure: 20 psi/1.4 bar



QTSTMMAX-4L-10M



QT Steam Max Systems have been tested and certified according to NSF/ANSI 42 for reduction of the substances listed below. The concentration of the indicated substances in water entering the system was reduced to a concentration less than or equal to the permissible limit for water leaving the system, as specified in NSF/ANSI 42. These systems have been tested and certified according to NSF/ANSI Standard 372 for "lead free" compliance.

⚠ WARNING

Do not use with water that is microbiologically unsafe or of unknown quality without adequate disinfection before or after the system.

***The wetted surface of this product contacted by consumable water contains less than 0.25% of lead by weight.**

Watts product specifications in U.S. customary units and metric are approximate and are provided for reference only. For precise measurements, please contact Watts Technical Service. Watts reserves the right to change or modify product design, construction, specifications, or materials without prior notice and without incurring any obligation to make such changes and modifications on Watts products previously or subsequently sold. Refer to the owner's manual for warranty information.

WATTS®
740

Maximum Temperature: 100°F/38°C

Minimum Temperature: 40°F/4.4°C

Feed Water Quality: pH 6.5 to 8.5

Hardness (maximum for systems containing OneFlow) 75 grains (1282 ppm CaCO₃)

Chlorine < 2ppm

Iron (maximum) 0.3 mg/l

Manganese (maximum) 0.05 mg/l

Copper (for systems containing OneFlow) - None allowed

Oil & H₂S- None allowed

Polyphosphate (for systems containing OneFlow) - None allowed

Silica (maximum for systems containing OneFlow) 10 ppm

For all other feed water quality requirements abide by the current USEPA Safe Drinking Water Act standards.

** Steam Max models that contain OneFlow® Media:

QTSTMMAX-2S-1M, QTSTMMAX-3S-1M, QTSTMMAX-2L-1M,

QTSTMMAX-3L-1M, QTSTMMAX-4L-1M

System Model	Max Flow Rate	Chlorine Capacity*	Connection Size	Reduces			
				Sediment	Chlorine*	Scale	Chloramine
QTSTMMAX-2S-10M	1.5 GPM (5.7 LPM)	15,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓
QTSTMMAX-3S-10M	3 GPM (11.4 LPM)	30,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓
QTSTMMAX-2S-1M	1.5 GPM (5.7 LPM)	15,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓
QTSTMMAX-3S-1M	3 GPM (11.4 LPM)	30,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓
QTSTMMAX-2L-10M	1.5 GPM (5.7 LPM)	22,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓
QTSTMMAX-3L-10M	3 GPM (11.4 LPM)	44,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓
QTSTMMAX-4L-10M	4.5 GPM (17.1 LPM)	66,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓
QTSTMMAX-2L-1M	1.5 GPM (5.7 LPM)	22,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓
QTSTMMAX-3L-1M	3 GPM (11.4 LPM)	44,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓
QTSTMMAX-4L-1M	4.5 GPM (17.1 LPM)	66,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓
QTSTMMAX-2L-1M-P	1.5 GPM (5.7 LPM)	22,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓
QTSTMMAX-3L-1M-P	3 GPM (11.4 LPM)	44,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓
QTSTMMAX-4L-1M-P	4.5 GPM (17.1 LPM)	66,000 Gallons	1/2" (15mm) NPT	✓	✓	✓	✓

*Chlorine capacity and chlorine reduction was Tested and Certified by WQA against NSF/ANSI standard 42. Testing was conducted with water having an influent challenge concentration of 2.0 mg/L (± 10%) free chlorine and an effluent reduction requirement of equal to or greater than 50%. Testing was performed under standard laboratory conditions, actual performance may vary. Other contaminant reduction claims are non certified.

OneFlow® Application Practices

Note: Systems using OneFlow technology prevent hard water scale formation inside the plumbing system at influent hardness levels of 75 grains per gallon of calcium carbonate and less. Due to variances in water chemistry certain aesthetic conditions external of the plumbing system may not be attained. OneFlow is designed for the treatment of potable water that meets the requirements of the current USEPA Safe Drinking Water Act. The addition of soaps, chemicals, or cleaners, before or after OneFlow treatment, may reverse its anti-scale treatment effects and/or create water with a heavy residue or spotting potential. Any adverse conditions caused by the addition of soaps, chemicals, or cleaners are the sole responsibility of the end user. New copper lines need to be passivated before placing unit into service. Copper usually originates from new copper plumbing upstream of the OneFlow system. All new copper plumbing before the system should be allowed to passivate by operating under normal conditions for a period of 4 weeks prior to starting the system up. This will allow the copper surfaces to be fully flushed and develop a natural protective surface. To further minimize any problem with excess copper, avoid applying excess flux on the inner surfaces of the pipe and use a low-corrosivity water soluble flux listed under the ASTM B813 standard. OneFlow is not designed for use on closed loop systems.

Filter Cartridge Life Span

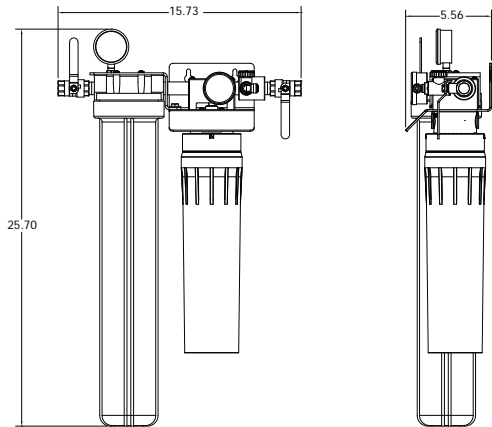
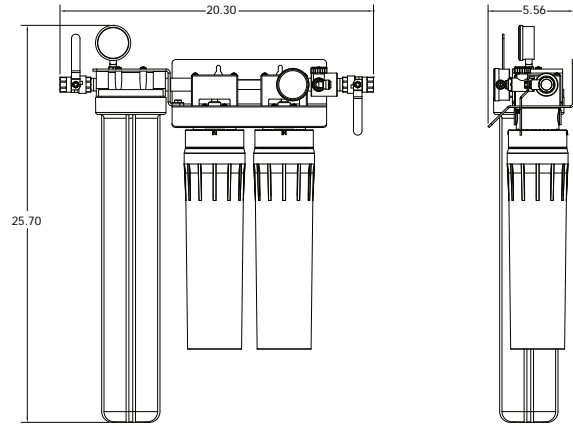
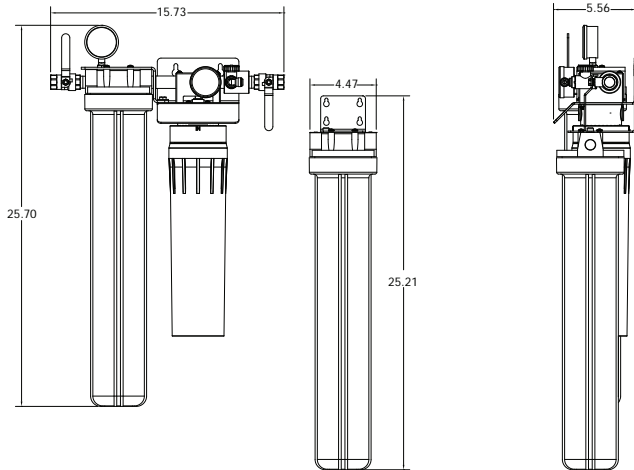
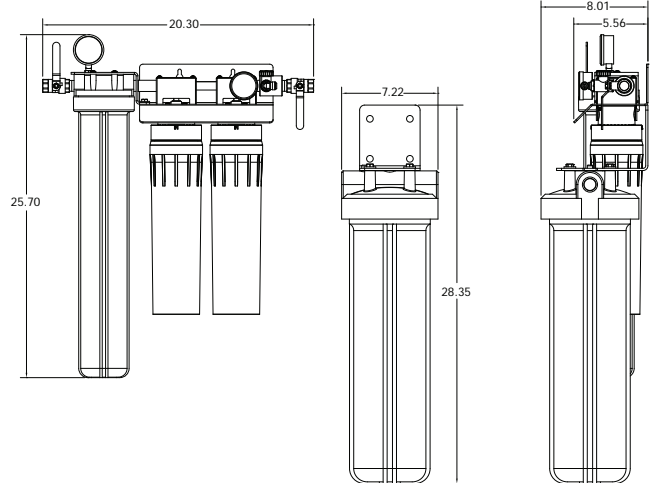
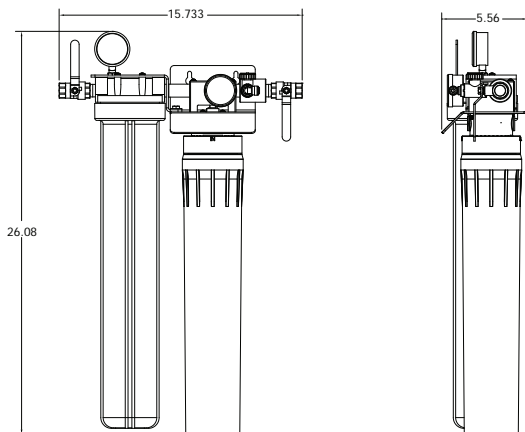
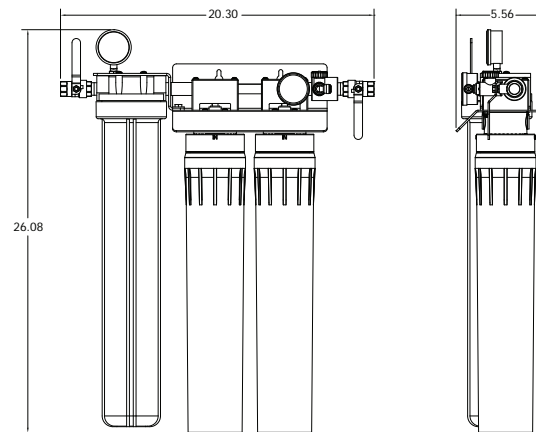
Filter cartridges should be changed at end of filter life, due to lack of filtering performance, or whenever a 15psi pressure drop or greater is experienced during normal operation, whichever comes first.

Replacement Filters

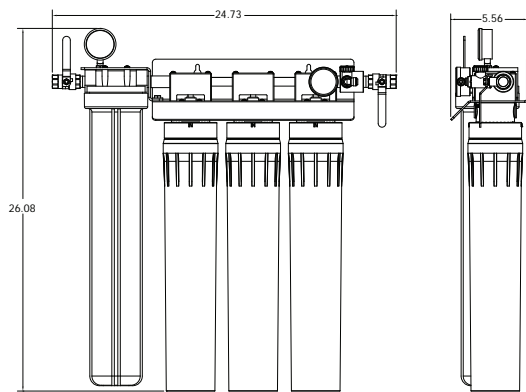
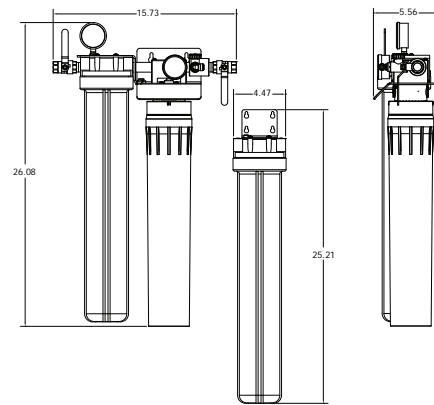
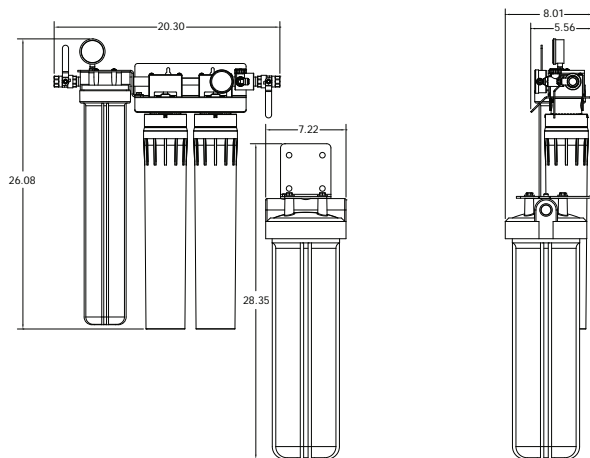
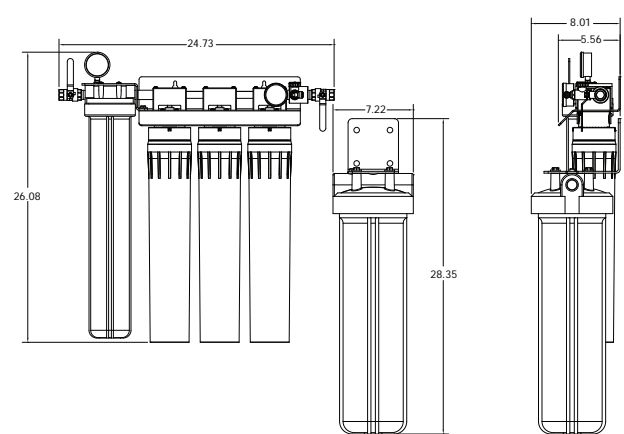
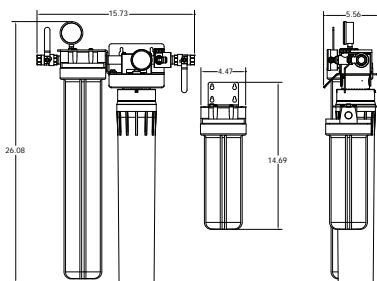
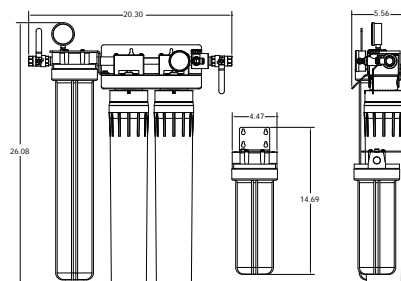
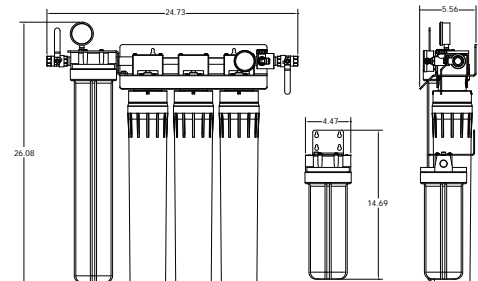
System Replacement Filters			
System Model	Filter Ordering Code	Frequency	Description
QTSTMMAX-2S-10M	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSM15	6 Months	15" QT 1 Micron Carbon Block with Phosphate Scale Control
QTSTMMAX-3S-10M	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSM15	6 Months	15" QT 1 Micron Carbon Block with Phosphate Scale Control (2)
QTSTMMAX-2S-1M	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSMX15	6 Months	15" QT 1 Micron Carbon Block
	DOR-OF120RM	12 Months	20" OneFlow Anti-Scale Cartridge
QTSTMMAX-3S-1M	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSMX15	6 Months	15" QT 1 Micron Carbon Block (2)
	DOR-OF140RM	12 Months	20" OneFlow Anti-Scale Cartridge
QTSTMMAX-2L-10M	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSM20	6 Months	20" QT 1 Micron Carbon Block with Phosphate Scale Control
QTSTMMAX-3L-10M	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSM20	6 Months	20" QT 1 Micron Carbon Block with Phosphate Scale Control (2)
QTSTMMAX-4L-10M	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSM20	6 Months	20" QT 1 Micron Carbon Block with Phosphate Scale Control (3)
QTSTMMAX-2L-1M	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSMX20	6 Months	20" QT 0.5 Micron Carbon Block
	DOR-OF120RM	12 Months	20" OneFlow Anti-Scale Cartridge
QTSTMMAX-3L-1M	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSMX20	6 Months	20" QT 0.5 Micron Carbon Block (2)
	DOR-OF140RM	12 Months	20" OneFlow Anti-Scale Cartridge
QTSTMMAX-4L-1M	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSMX20	6 Months	20" QT 0.5 Micron Carbon Block (3)
	OFTWHRM	12 Months	20" OneFlow Anti-Scale Cartridge
QTSTMMAX-2L-1M-P	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSMX20	6 Months	20" QT 0.5 Micron Carbon Block
	STMAXR-S-ACSC	6 Months	10" Phosphate Scale Control
QTSTMMAX-3L-1M-P	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSMX20	6 Months	20" QT 0.5 Micron Carbon Block (2)
	STMAXR-S-ACSC	6 Months	10" Phosphate Scale Control
QTSTMMAX-4L-1M-P	HSR-L-SED-5M	6 Months	20" 5 Micron Sediment Pre Filter
	QTSMX20	6 Months	20" QT 0.5 Micron Carbon Block (3)
	STMAXR-S-ACSC	6 Months	10" Phosphate Scale Control

NOTICE

Cartridge capacities are estimates and may be less depending on incoming water quality. Once installed, flush new cartridges for 5 minutes prior to use for proper conditioning.

QTSTMMAX-2S-10M**QTSTMMAX-3S-10M****QTSTMMAX-2S-1M****QTSTMMAX-3S-1M****QTSTMMAX-2L-10M****QTSTMMAX-3L-10M**

Note: Allow 3" of clearance at bottom of system for removal of filter bowls for filter cartridge replacement

QTSTMMAX-4L-10M**QTSTMMAX-2L-1M****QTSTMMAX-3L-1M****QTSTMMAX-4L-1M****QTSTMMAX-2L-1M-P****QTSTMMAX-3L-1M-P****QTSTMMAX-4L-1M-P**

Note: Allow 3" of clearance at bottom of system for removal of filter bowls for filter cartridge replacement



A Watts Water Technologies Company



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BRAISING PANS / TILTING SKILLETS

Project _____
Item _____
Quantity _____
FCSI Section _____
Approval _____
Date _____

DuraPan™ SERIES

GAS, OPEN OR MODULAR BASE,
30 & 40 GALLON (115 & 150 LITER)

Cleveland Standard Features

- Leg or Modular Base
- Full 30/40 Gallon (115/150 Liters) Capacity Rating to Bottom of Pouring Lip
- Power Tilt (Hydraulic Hand Tilt Optional)
- Stainless Steel Clad 5/8" Cooking Surface Guaranteed against warping
- Stainless Steel Coved Cornered Pans with both Gallon and Liter Markings
- All Stainless Steel Construction for durability and easy cleaning
- Adjustable, Electronic Thermostat controls temperature from 100°F to 425°F
- High Efficiency Heating System with even heat distribution
- Electronic Spark Ignition (ESS)
- Fast Heat-Up and Recovery Time-Preheats in 11 minutes, full capacity from cold to boiling in 60 minutes
- Spring Assist Cover with Adjustable Vent and Full Width Handle
- On/Off Switch, Thermostat Knob and Pilots, recessed to avoid breakage
- Four Stainless Steel, Level adjustable feet, rear flanged for bolting
- All Controls are serviceable from the front of the unit
- Two pilot lights; Green = Power on, Amber = Temperature Cycling
- Splash Proof Controls and Water Tight Electrical Connections
- High Limit Safety Device set at 475°F (246°C)
- Anti-Splash Pouring Lip
- Supplied with Cord & Plug for 115-volt controls
- Typical approvals include AGA, CSA, CE and NSF

Options & Accessories

- ☐ Sliding Drain Drawer with Splash Screen (SLD) (for SGL models only)
- ☐ Hydraulic Hand Tilt with quick lowering feature (HTS)
- ☐ Power Tilt with Hand Tilt Override (PT1)
- ☐ Double or Single Pantry Faucet (SPS14, DPS14), includes Faucet Mounting Bracket
- ☐ Double or Single Pantry Skillet Filler with 60" hose (SKF-S or DKF-S)

MODELS: ☐ SGL-30-TR ☐ SGM-30-TR
☐ SGL-40-TR ☐ SGM-40-TR



Open base model shown with optional Drain Drawer (SLD) and Power Tilt (PT1)

Short Form Specifications

Shall be CLEVELAND, Tilting Skillet; Model SG ____ - ____ - TR gas (TYPE ____)- holding no less than ____gallons (____ liters); complete with Thermostatic Safety and Gas Controls; Gallon Markings; Stainless Steel Clad 5/8" Cooking Surface; Power Tilt; Spring Assist Cover with adjustable Vent. All Stainless Steel Construction.

- ☐ Hot & Cold Water Pre-Rinse Spray Head with Hose (PRS-S)
- ☐ Gas types other than natural
- ☐ Voltage Option:
 - VOSK4, 220/240 Volt, 50 Hz, 1 Phase - for export
- ☐ Food Strainers for pouring spout (FS)
- ☐ Vegetable Steamers (VS)
- ☐ Poaching Pans (PP)
- ☐ Wall Mounting (WMS)
- ☐ In-Wall Carrier (IWCS)
- ☐ Pan Carriers (PCS), not available on 30 gallon models with a Tangent Draw-Off Valve
- ☐ 2" Tangent Draw-Off Valve (TD2), left side only

SECT. **XII** PAGE **7**
0707

CAPACITIES

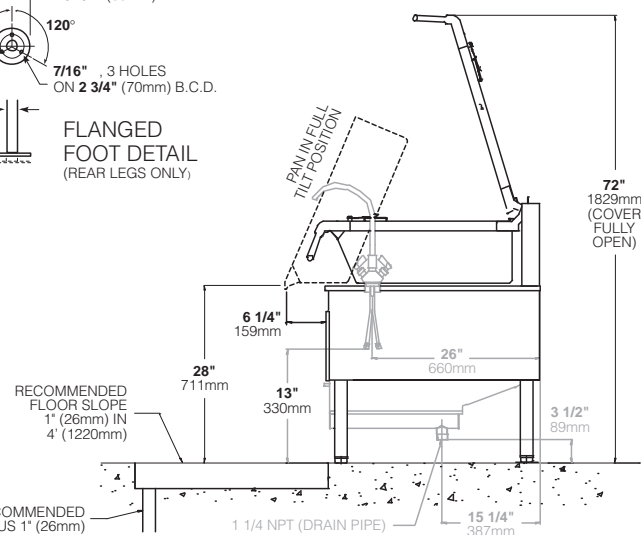
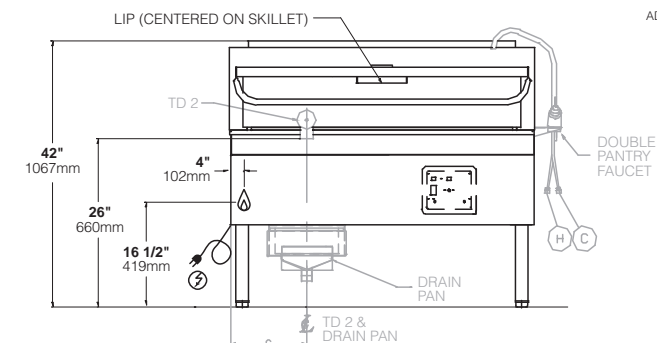
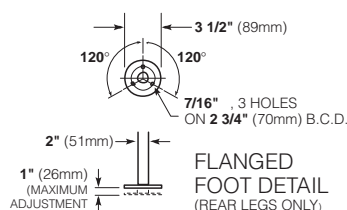
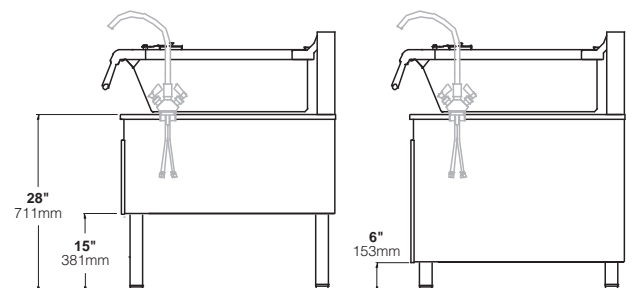
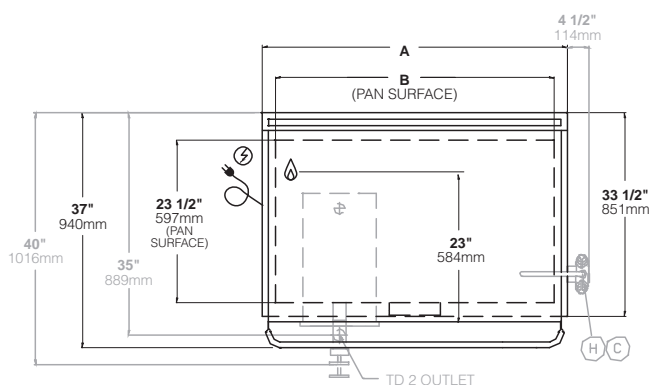
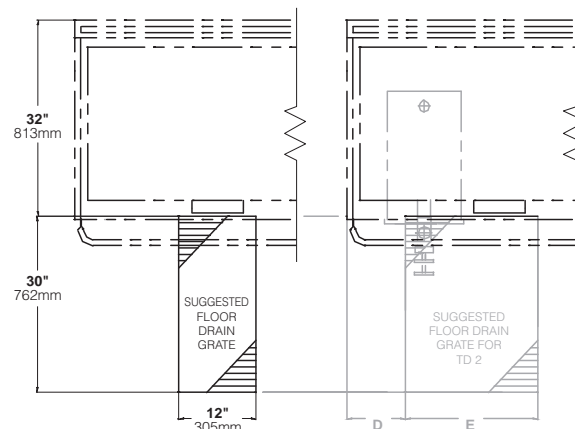
In 4 oz. servings. Other sizes may be calculated.
 30 gallons / 115 Liters 960
 40 gallons / 150 Liters 1280

DIMENSIONS

MODEL	A	B	C	D	E
SGL-30-TR	36" (915mm)	32" (812mm)	9" (229mm)	5" (127mm)	20" (508mm)
SGL-40-TR	48" (1220mm)	44" (1118mm)	12 1/8" (308mm)	8" (203mm)	22" (559mm)

SPECIFICATIONS

ELECTRICAL SUPPLY (6' CORD & PLUG)			GAS SUPPLY (PIPING 3/4" NPT)		CLEARANCE		APPROX. SHIPPING WEIGHTS	
VOLTS:	120	220/240	TYPE: NAT or LP		MIN. TO COMBUSTIBLE SURFACES:		SGL-30-TR	
PHASE:	1	1	WATER COLUMN: 4.5 (NAT), 10.5 (LP)		SIDES: 0, REAR: 6" (153mm)		440 LBS.	
AMPS:	1.8	.83	BTU PER CU. FT.: 1000 (NAT), 2500 (LP)		MIN. TO NON COMBUSTIBLE SURFACES: SIDES & REAR: 0		200 KG.	
FREQ:	60 HZ	50 HZ	SUPPLY PRESSURE:		NOTE: 4 1/2" (115mm) required on right hand side for faucet		SGL-40-TR	
			5" W.C. MIN (NAT), 11" W.C. MIN (LP)				520 LBS.	
			BTU RATINGS:				237 KG	
			SGL-30-TR: 91,000 per hour					
			SGL-40-TR: 130,000 per hour					



NOTE: NON STANDARD ITEMS ARE SHOWN IN GRAY

NOTES:

Cleveland Range reserves right of design improvement or modification, as warranted.

Many regional, state and local codes exist and it is the responsibility of the owner and installer to comply with the codes.

Cleveland Range equipment is built to comply with applicable standards for manufacturers. Included among those approval agencies are U.L., NSF, CGA, CSA, ETL and others.

(NOT TO SCALE)

SECT. XII PAGE 8

0707

Litho in U.S.A.

745



DFG-100 XCEL

Full-Size Dual Flow Gas Convection Oven



OPTIONS AND ACCESSORIES (AT ADDITIONAL CHARGE)

- Control options:
 - ☐ SSD - Solid state digital control with LED display,
 - ☐ Cook & Hold and Pulse Plus®
 - ☐ SmartTouch touchscreen control allows cooking with timer and core probe simultaneously. Includes shelf timing, cooking compensation and multi-shelf recipes. Holds up to 255 recipes.
- Legs/casters/stands:
 - ☐ 6" (152mm) adjustable seismic legs
 - ☐ 6" (152mm) casters
 - ☐ 4" (102mm) low profile casters (double only)
 - ☐ 25" (635mm) stainless steel stand w/rack guides
 - ☐ 29" (737mm) stainless steel, fully welded open stand with pan supports
- Gas hose w/quick disconnect restraining device:
 - ☐ 48" (1219mm) hose
 - ☐ 36" (914mm) hose
- ☐ Stainless steel oven liner
- ☐ Extra EZ slide oven racks
- ☐ Extra oven racks
- ☐ Gas manifold (for double sections)
- ☐ Prison package (includes security control panel and stainless steel back)
- ☐ Stainless steel solid back panel
- ☐ Security control panel

OPTIONS AND ACCESSORIES (AT NO CHARGE)

- ☐ Solid stainless steel doors

Project _____

Item No. _____

Quantity _____

Standard depth baking compartment - accepts five 18" x 26" standard full-size baking pans in left-to-right positions.

All data is shown per oven section, unless otherwise indicated.

Refer to operator manual specification chart for listed model names.

EXTERIOR CONSTRUCTION

- Welded full angle-iron frame
- Rigid mineral fiber insulation at top, back, sides and bottom
- Stainless steel front, top, and sides for easy cleaning
- Dual pane thermal glass windows encased in stainless steel door frames
- Porcelain door handle with simultaneous door operation
- Triple-mounted pressure lock door design with turnbuckle assembly
- Modular slide out front control panel for easy access

INTERIOR CONSTRUCTION

- Double-sided porcelainized baking compartment liner (14 gauge) with coved corners for easy cleaning
- Stainless and aluminized steel combustion chamber
- Dual inlet blower wheel
- Eleven rack positions with a minimum of 1-5/8" (41mm) spacing
- Interior oven lights

OPERATION

- Dual Flow Gas system combines direct and indirect heat
- Electronic spark ignition control system
- Long life inshot burners
- Toggle switch to select either 60,000 BTU or 80,000 BTU input
- Manual gas service cut-off switch on front panel
- Solid state thermostat with temperature control range of 150°F (66°C) to 550°F (288°C)
- Two speed, 3/4 horsepower, convection motor with automatic thermal overload protection
- Control area cooling fan

STANDARD FEATURES

- SSI-M - Solid state infinite control w/manual timer
- 25" (635mm) adjustable stainless steel legs (for single units)
- 6" (152mm) adjustable stainless steel legs (for double sections)
- Draft diverter or draft hood for venting (select one)
- Flue connector (for double & additional sections)
- Porcelainized crumb pans collects cooking residues for easy oven cleaning.
- One chrome plated EZ-Slide rack with ball bearing slides capable of gliding completely out of the oven cavity. Heavy duty design holds up to 50 lbs.
- Four chrome-plated racks
- Three year oven parts and two year labor warranty*
- Five year limited oven door warranty*

** For all international markets, contact your local distributor.*



BLODGETT OVEN COMPANY

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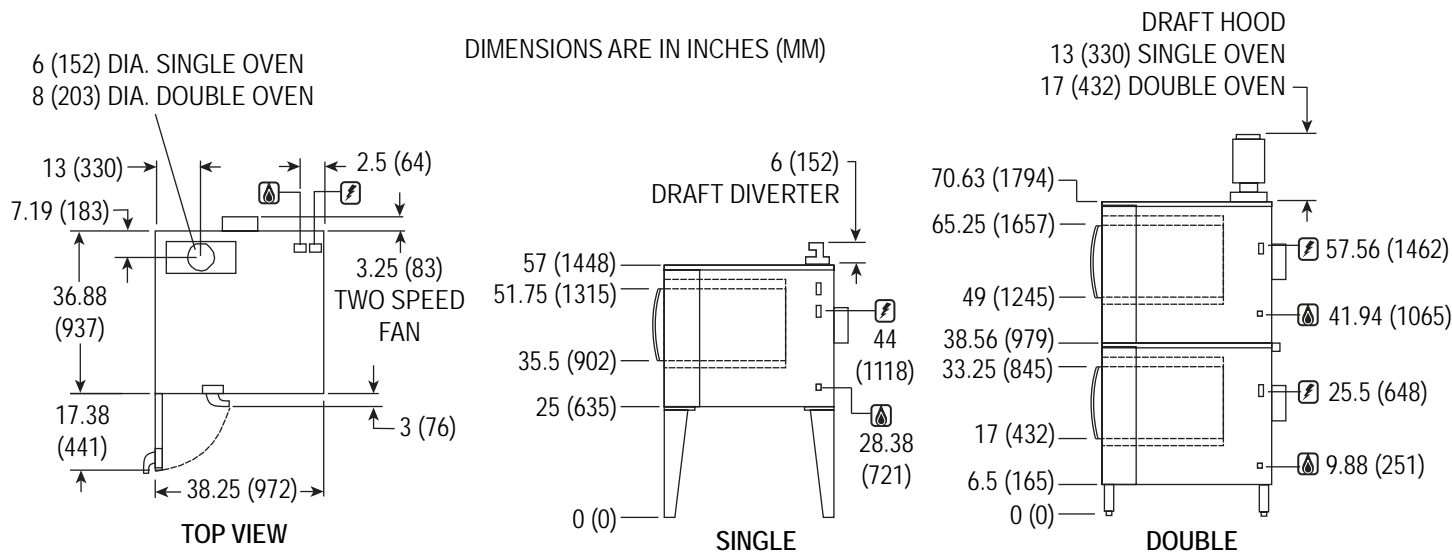
DFG-100 XCEL



DFG-100 XCEL



APPROVAL/STAMP



SHORT FORM SPECIFICATIONS: Provide Blodgett full-size convection oven model DFG-100 XCEL, (single/double) compartment with fully welded angle iron frame. Each compartment shall have double-sided, porcelainized or stainless steel liner. Liner to be coved top and bottom. Unit shall accept five 18" x 26" standard full-size bake pans. Stainless steel front, top and sides. Doors shall be triple mounted, dual pane thermal glass windows encased in stainless steel door frames. Porcelain door handle with simultaneous door operation. Unit shall be gas heated with electronic spark ignition and shall cook by means of a dual-flow system combining direct and indirect heat with a toggle switch to select either 60,000 or 80,000 BTUs. Air in baking chamber distributed by dual inlet blower wheel powered by a two-speed, 3/4 HP motor with thermal overload protection. Each chamber shall be fitted with commercial oven lights, one chrome-plated EZ slide racks capable of holding 50 lbs, four standard chrome-plated removable racks and a two piece porcelain crumb pan. Control panel shall be recessed with Cook/Cool Down mode selector, solid state (manual) infinite thermostat (200- 500°F), and 60-minute timer. Manual gas service cut-off switch on front panel. Three year oven parts and two year labor warranty and five year limited oven door warranty. Provide options and accessories as indicated.

DIMENSIONS:

Floor space 38-1/4" (972mm) W x 36-7/8" (937mm) D
Interior 29" (737mm) W x 20" (508mm) H x 24-1/4" (616mm) D
If oven is on casters
Single Add 4-1/2" (114mm) to all height dimensions
Double Height dimensions remain the same
Double Low Profile Subtract 2-1/2" (64) to all height dimensions

PRODUCT CLEARANCE

Oven back 0" from combustible and non-combustible construction
Oven sides 0" from combustible and non-combustible construction

MINIMUM ENTRY CLEARANCE:

Uncrated 32-1/16" (814mm)
Crated 37-1/2" (953mm)

SHIPPING INFORMATION:

Approx. Weight

Single 590 lbs. (268 kg)
Double 1095 lbs. (497 kg)

Crate sizes

37-1/2" (952mm) x 43-1/2" (1105mm) x 51-3/4" (1315mm)
(2 crates required for double)

GAS SUPPLY:

3/4" NPT

Manifold Pressure:

Natural 3.5" W.C.
Propane 10" W.C.

Inlet Pressure:

Natural 7.0" W.C. min. – 10.5" W.C. max.
Propane 11.0" W.C. min. – 13.0" W.C. max.

INPUT:

Single 80,000 BTU/hr (23.5 Kw)
Double 160,000 BTU/hr (47 Kw)

POWER SUPPLY:

115 VAC, 1 phase, 10 Amp, 60 Hz., 2-wire with ground,
3/4 H.P., 2 speed motor, 1725 and 1140 RPM
230, 220/240VAC, 1 phase, 3 Amp, 50 Hz., 2-wire with ground, 3/4
H.P., 2 speed motor, 1425 and 950 RPM
6' (1.8m) electric cord set furnished on 115 VAC ovens only.
Each unit requires a dedicated 15 amp. circuit.
Blodgett recommends a Pass & Seymour, model 2095, GFCI for this
oven.

NOTE: The company reserves the right to make substitutions of components without prior notice

BLODGETT OVEN COMPANY

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Project _____ Consultant _____ Model Number _____ Item Number _____

ASFT Floor Troughs Anti-Spill Design

SPECIFICATION:

ASFT Model Floor Troughs are 14-gauge type 304 stainless steel. Horizontal corners are coved and the trough is integrally pitched toward a waste outlet with a stainless steel beehive strainer and a 4" OD tailpiece.

Anti-Spill features are built into the trough, which is 6" deep.

Recessed flange and 1" deep ledge for IMC grating are integral with the unit.

Joints are TIG welded and leak-proof. Exposed surfaces finished brush satin.

PRODUCT GUIDE:

Use in Commercial and Institutional Buildings or large food prep facilities for high volume, rapid discharge application.

Anti-Spill feature directs splashing waste water to inside corners of the trough away from the equipment.

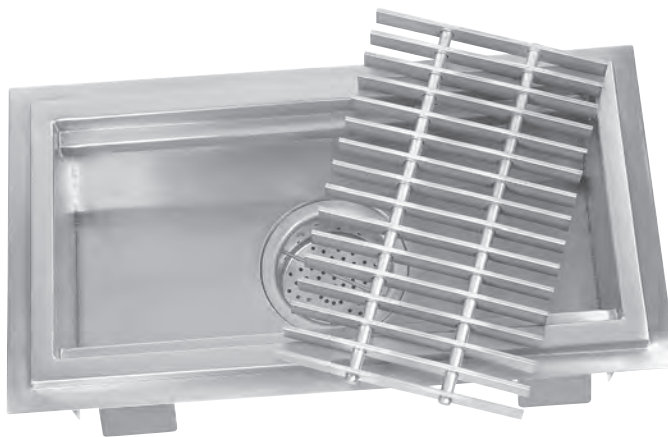
Recessed flange supports floor tile and provides a grout pocket.

Setting frame for waterproof membrane and/or integral seepage flange with "weep" holes can be added for wet floor areas.

Extension arms and intersections available for multiple equipment layout.

OPTIONS:

- ☐ 12-gauge stainless steel
- ☐ Scrap collection tray
- ☐ Use with any style IMC trough grating
- ☐ Custom designs, sizes and waste location
- ☐ Optional wastes and locations
- ☐ Seepage flange and "weep" holes
- ☐ See Price Book for other options
- ☐ Standard and stock sizes fit most applications



*Price page 35

Specifications subject to change without notice.



P.O. Box 206
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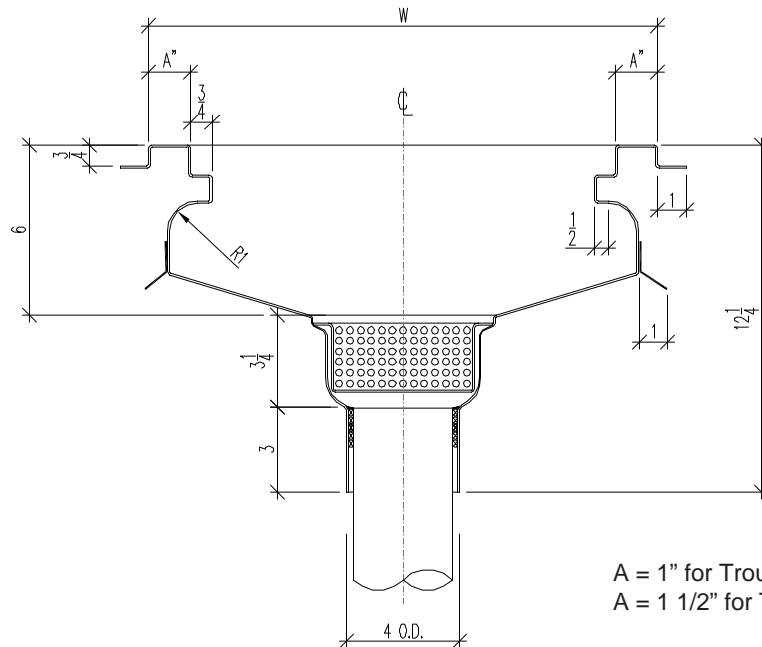
www.imcteddy.com

800-221-5644/631-789-8881
Fax: 631-789-3633

ASFT-30 1007

748

ASFT Floor Troughs Anti-Spill Design



ANTI-SPILL FLOOR TROUGHS, STANDARD DESIGN - 6" Deep

MODEL	SIZE (W x L)	METRIC	WEIGHT	MODEL	SIZE (W x L)	METRIC	WEIGHT
ASFT-1224	12" x 24"	305 x 610	20	ASFT-2424	24" x 24"	610 x 610	32
ASFT-1236	12" x 36"	305 x 914	30	ASFT-2436	24" x 36"	610 x 914	48
ASFT-1248	12" x 48"	305 x 1219	40	ASFT-2448	24" x 48"	610 x 1219	64
ASFT-1260	12" x 60"	305 x 1524	50	ASFT-2460	24" x 60"	610 x 1524	80
ASFT-1272	12" x 72"	305 x 1829	60	ASFT-2472	24" x 72"	610 x 1829	96
ASFT-1284	12" x 84"	305 x 2134	70	ASFT-2484	24" x 84"	610 x 2134	112
ASFT-1296	12" x 96"	305 x 2438	80	ASFT-2496	24" x 96"	610 x 2438	128
ASFT-12108	12" x 108"	305 x 2743	90	ASFT-24108	24" x 108"	610 x 2743	144
ASFT-12120	12" x 120"	305 x 3048	100	ASFT-24120	24" x 120"	610 x 3048	160
ASFT-1824	18" x 24"	458 x 610	24	ASFT-3024	30" x 24"	762 x 610	44
ASFT-1836	18" x 36"	458 x 914	36	ASFT-3036	30" x 36"	762 x 914	66
ASFT-1848	18" x 48"	458 x 1219	48	ASFT-3048	30" x 48"	762 x 1219	88
ASFT-1860	18" x 60"	458 x 1524	60	ASFT-3060	30" x 60"	762 x 1524	110
ASFT-1872	18" x 72"	458 x 1829	72	ASFT-3072	30" x 72"	762 x 1829	132
ASFT-1884	18" x 84"	458 x 2134	84	ASFT-3084	30" x 84"	762 x 2134	154
ASFT-1896	18" x 96"	458 x 2438	96	ASFT-3096	30" x 96"	762 x 2438	176
ASFT-18108	18" x 108"	458 x 2743	108	ASFT-30108	30" x 108"	762 x 2743	198
ASFT-18120	18" x 120"	458 x 3048	120	ASFT-30120	30" x 120"	762 x 3048	220

Note - Standard troughs up to 96" have one (1) waste at center. Over 96", troughs have two (2) wastes equidistant.

*See Price book page 35, 39, 43, 47, 53 & 55-59 for additional sizes and options.

Specifications subject to change without notice.



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ASFT-30 1007

749

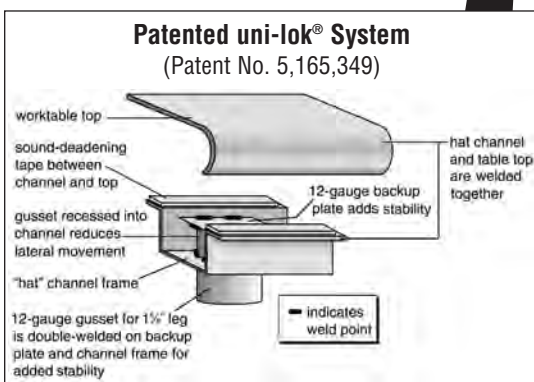


Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle worktables, Spec-Master® series, model _____. Top to be constructed of 14/304 stainless steel, with 1½" roll on front and rear, and sides turned down 90°. Undershelf to be adjustable and constructed of 18/304 stainless steel with marine edge. Top reinforced with stainless steel hat channels and sound deadened. Constructed with uni-lok® patented gusset system with the gussets recessed into the hat channels to reduce lateral movement. Legs to be 1½" O.D., stainless steel, with stainless steel gussets and 1" stainless steel adjustable bullet feet.



EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

Phone: 302-653-3000 • Fax: 302-653-2065

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Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our SpecFAB® Division.

Phone: 302-653-3000 • Fax: 302-653-3091 • e-mail: specfab@eaglegrp.com

Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

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Item No.: _____
Project No.: _____
S.I.S. No.: _____

Worktables with Flat Top and Stainless Steel Base with Undershelf—Spec-Master® Series

MODELS:

<input type="checkbox"/> T2424SE	<input type="checkbox"/> T24144SE	<input type="checkbox"/> T30132SE	<input type="checkbox"/> T36144SE
<input type="checkbox"/> T2430SE	<input type="checkbox"/> T3030SE	<input type="checkbox"/> T30144SE	<input type="checkbox"/> T4848SE
<input type="checkbox"/> T2436SE	<input type="checkbox"/> T3036SE	<input type="checkbox"/> T3648SE	<input type="checkbox"/> T4860SE
<input type="checkbox"/> T2448SE	<input type="checkbox"/> T3048SE	<input type="checkbox"/> T3660SE	<input type="checkbox"/> T4872SE
<input type="checkbox"/> T2460SE	<input type="checkbox"/> T3060SE	<input type="checkbox"/> T3672SE	<input type="checkbox"/> T4884SE
<input type="checkbox"/> T2472SE	<input type="checkbox"/> T3072SE	<input type="checkbox"/> T3684SE	<input type="checkbox"/> T4896SE
<input type="checkbox"/> T2484SE	<input type="checkbox"/> T3084SE	<input type="checkbox"/> T3696SE	<input type="checkbox"/> T48108SE
<input type="checkbox"/> T2496SE	<input type="checkbox"/> T3096SE	<input type="checkbox"/> T36108SE	<input type="checkbox"/> T48120SE
<input type="checkbox"/> T24108SE	<input type="checkbox"/> T30108SE	<input type="checkbox"/> T36120SE	<input type="checkbox"/> T48132SE
<input type="checkbox"/> T24120SE	<input type="checkbox"/> T30120SE	<input type="checkbox"/> T36132SE	<input type="checkbox"/> T48144SE
<input type="checkbox"/> T24132SE			

Tabletop

- Patented uni-lok® gusset system (patent #5,165,349): gussets are recessed into hat channel, reducing lateral movement.
- Top reinforced with welded-on hat channel.
- Sound-deadened between top and channels.
- 1½" (38mm)-diameter 180° rolled edges on front and rear. Ends are turned down 90° providing for flush installations when required.
- 14 gauge type 304 polished stainless steel.

Adjustable Undershelf

- 18 gauge type 304 stainless steel.
- Gusset welded to each corner.
- Heavy duty marine edge design.

Legs—1½" (41mm)-diameter

- 24" to 36" (610 to 914mm)-wide units that are 96" (2438mm) and longer come with six legs or more. 48" (1219mm)-wide units that are 72" (1829mm) and longer come with six legs or more.
- Heavy gauge stainless steel.
- 1" (25mm) adjustable stainless steel feet.

Options / Accessories

- | | |
|--|--|
| <input type="checkbox"/> Drawer | <input type="checkbox"/> Duplex receptacles |
| <input type="checkbox"/> Lock | <input type="checkbox"/> Pot rack |
| <input type="checkbox"/> Casters | <input type="checkbox"/> Sink |
| <input type="checkbox"/> Stainless steel bullet feet | <input type="checkbox"/> Additional undershelf |
| <input type="checkbox"/> Overshelves | <input type="checkbox"/> Stabilizer Bar (for 30"- and 36"-wide tables) |

Certifications / Approvals



AUTOQUOTES



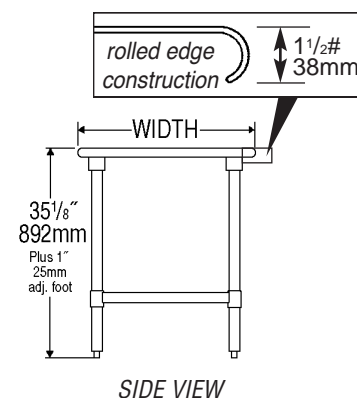
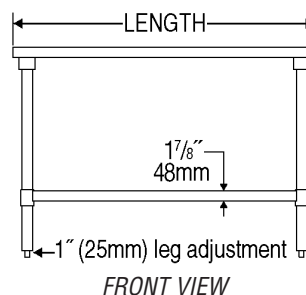
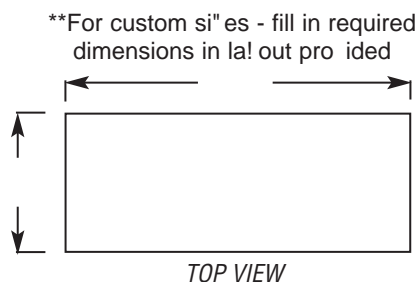
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Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Worktables with Flat Top and Stainless Steel Base with Undershelf—Spec-Master® Series



model #	# of legs	width		length		weight	
		in.	mm	in.	mm	lbs.	kg
T2424SE	4	24#	610	24#	610	46	20.9
T2430SE	4	24#	610	30#	762	50	22.7
T2436SE	4	24#	610	36#	914	55	24.9
T2448SE	4	24#	610	48#	1219	67	30.4
T2460SE	4	24#	610	60#	1524	78	35.4
T2472SE	4	24#	610	72#	1829	90	40.8
T2484SE	4	24#	610	84#	2134	103	46.3
T2496SE	6	24#	610	96#	2438	125	56.7
T24108SE	6	24#	610	108#	2743	144	65.3
T24120SE	6	24#	610	120#	3048	163	73.9
T24132SE	8	24#	610	132#	3353	186	84.4
T24144SE	8	24#	610	144#	3658	200	90.7
T3030SE	4	30#	762	30#	762	54	24.5
T3036SE	4	30#	762	36#	914	57	25.9
T3048SE	4	30#	762	48#	1219	75	34.0
T3060SE	4	30#	762	60#	1524	87	39.5
T3072SE	4	30#	762	72#	1829	101	45.8
T3084SE	4	30#	762	84#	2134	116	52.6
T3096SE	6	30#	762	96#	2438	139	63.1
T30108SE	6	30#	762	108#	2743	161	73.0
T30120SE	6	30#	762	120#	3048	182	82.6
T30132SE	8	30#	762	132#	3353	204	92.5
T30144SE	8	30#	762	144#	3658	224	101.6
T3648SE	4	36#	914	48#	1219	83	37.6
T3660SE	4	36#	914	60#	1524	97	44.0
T3672SE	4	36#	914	72#	1829	114	51.7
T3684SE	4	36#	914	84#	2134	132	59.9
T3696SE	6	36#	914	96#	2438	153	69.4
T36108SE	6	36#	914	108#	2743	180	81.6
T36120SE	6	36#	914	120#	3048	207	93.9
T36132SE	8	36#	914	132#	3353	234	106.1
T36144SE	8	36#	914	144#	3658	261	118.4
T4848SE	4	48#	1219	48#	1219	136	61.7
T4860SE	4	48#	1219	60#	1524	161	73.0
T4872SE	6	48#	1219	72#	1829	188	85.3
T4884SE	8	48#	1219	84#	2134	217	98.4
T4896SE	8	48#	1219	96#	2438	265	120.2
T48108SE	8	48#	1219	108#	2743	306	138.8
T48120SE	8	48#	1219	120#	3048	348	157.9
T48132SE	8	48#	1219	132#	3353	388	176.0
T48144SE	8	48#	1219	144#	3658	430	195.0

EAGLE GROUP

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Rev. 08/12

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751



PROJECT:	MODEL:	QUANTITY:	ITEM NO:

PRECISE HUMIDITY TEMPERATURE TECHNOLOGY

Universal - Various Size Trays, Pans and Gastro-Norm

CLYMATE IQ® "PHTT" SERIES

Clymate IQ® cabinets take the guesswork out of holding foods and provides professional results every time.



- 1 Heats up fast - the Clymate IQ® cabinets' intuitive climate control technology reaches the set humidity and temperature faster than the competition
- 2 Simple to use - user-friendly, easy to read, easy to set, color-coded controls allow you to set the unit from 10% - 90% relative humidity and 90°F - 200°F
- 3 FWE's unique removable and adjustable stainless steel tray slides accommodate a universal range of pans and trays
- 4 Fast Recovery - Clymate IQ® gets back to temperature fast - you don't have to worry about losing heat and humidity if you open and close the door repeatedly during peak service times
- 5 Consistency throughout - All Clymate IQ® cabinets feature a unique push/pull air distribution system to provide uniform temperature and humidity on every level, throughout the unit
- 6 Place the unit anywhere - all units come with a tri-directional AC cord pocket to give you a better plug placement
- 7 Low water and temperature alarm
- 8 Unmatched ease of cleaning - the exclusive large volume, removable water pan makes clean up a breeze - just pull out the pan and lift up the heating element for easy cleaning

***Two year limited warranty**



PHTT-12
Shown with optional Flip-Up Doors and Handles

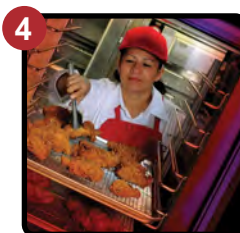
PHTT-4



Control Panel



Adjustable Tray Slides



Fast Recovery



Tri-Directional Cord



PROJECT:

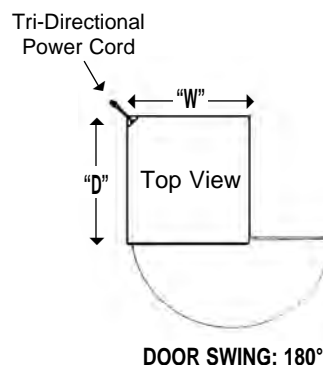
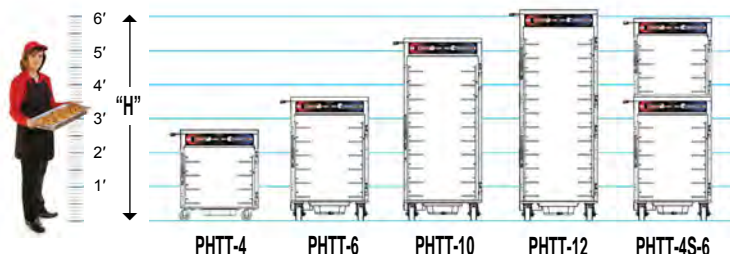
MODEL:

QUANTITY:

ITEM NO:

SPECIFICATIONS:

HEATED HOLDING & HUMIDIFIED CABINETS



ELECTRICAL DATA

VOLTS	120	220 - 240
WATTS	2200	2580
AMPS	18.3	10.8
HERTZ	60	60
PHASE	Single	Single
PLUG USA	5-20P	6-15P
PLUG CANADA	5-30P	6-15P

Dedicated circuit. Two dedicated circuits required for the PHTT-4S-6.

QUICK
SHIP
ITEM

CAPACITIES OF TRAYS / PANS: 4.5" (114 mm) Spacings are Standard [A]																		OVERALL EXTERIOR DIMENSIONS IN. (mm) (Height Includes Casters)			CLASS 100				
MODEL NUMBER	STANDARD CAPACITY @ 4.5" Spacings (114 mm)								OPTIONAL CAPACITY @ 3" Spacings (76 mm)								NO. OF DOORS				CASTER SIZE	SHIP WT. LBS. (KG)			
	TRAY/PAN SLIDES PROVIDED	18 x 26	12 x 20	14 x 18	18 x 13	20 x 22	10 x 20	GN 1/1	GN 2/1	TRAY/PAN SLIDES REQUIRED	(Additional)	18 x 26	12 x 20	14 x 18	18 x 13	20 x 22		10 x 20	GN 1/1	GN 2/1			HIGH "H"	DEEP "D"	WIDE "W"
PHTT-4 Under Counter	4 pr	4	8	8	8	4	8	8	4	6 pr (2 pr)	6	12	12	12	6	12	12	6		32.25" (819)	31.25" (794)	27.75" (705)	1	3.5**	255 (116)
PHTT-6	6 pr	6	12	12	12	6	12	12	6	9 pr (3 pr)	9	18	18	18	9	18	18	9		43.75" (1111)	31.25" (794)	27.75" (705)	1	5"	290 (132)
PHTT-10	10 pr	10	20	20	20	10	20	20	10	14 pr (4 pr)	14	28	28	28	14	28	28	14		61" (1549)	31.25" (794)	27.75" (705)	1	5"	300 (136)
PHTT-12	12 pr	12	24	24	24	12	24	24	12	17 pr (5 pr)	17	34	34	34	17	34	34	17		74.5" (1892)	31.25" (794)	27.75" (705)	2	5"	420 (189)
PHTT-4S-6 Double Stack	10 pr	10	20	20	20	10	20	20	10	15 pr (5 pr)	15	30	30	30	15	30	30	15		74.5" (1892)	31.25" (794)	27.75" (705)	2	5"	490 (222)

[A] Universal Tray slides accommodate (1) 18" x 26", (2) 14" x 18", (2) 12" x 20", (2) 12" x 18", (1) 20" x 22", (2) 10" x 20", (2) GN 1/1, (1) GN 2/1 trays/pans. Number of tray slides are listed above. Uprights punched on 1.5" (38 mm) centers. Tray slides are adjustable. Number of tray slides are listed above. Standard spacings are 4.5" (114 mm).

- **Pass-thru Door** [add "P"] is available on all model sizes.
- **Stackable Design** [add "S"] is available on the PHTT-4. Please consult factory.
- * PHTT-4 is standard with all swivel casters.

CONSTRUCTION. Helicarc welded, single unit construction of stainless steel; 20-gauge polished exterior, 22-gauge stainless steel interior with easy-to-clean covered corners. Welded tubular base frame shall be 1" square, heavy gauge stainless steel tubing, with 10-gauge stainless steel reinforcing stress plates at corners.

INSULATION. "Ultra-Guard" UG-26 high density fiberglass insulation throughout; top, back, bottom, sides and door(s).

HANDLES. Form grip flush-in-wall hand grips recess mounted on each side of unit.

DOORS AND LATCHES. Flush mounted, stainless steel insulated doors. High temperature gasket sealed; gasket shall be cabinet mounted. Each door shall have two (2) heavy-duty edgmount die cast hinges. Door latch shall be field reversible, magnetic edgmounted, full grip, and positive closing. The hinge and latch mountings are reinforced with stainless steel backing plates. PHTT-12 shall be standard with dutch doors. Dutch door: 2 half size doors.

CASTERS. Maintenance free polyurethane tire casters in a configuration of two (2) rigid and two (2) swivel with brake. PHTT-4 shall have a caster configuration of four (4) swivel with brake. Casters shall have a reinforced yoke mounted to 10-gauge caster plate. The caster mounting plate shall be secured to a 10-gauge stainless steel reinforcing stress plate via welded in place stainless steel studs. The reinforcing stress plates shall be welded to the heavy gauge tubular frame of the unit.

TRAY SLIDES. Welded rod-style tray slides are stainless steel for greater durability and sanitation. Fully adjustable / removable and designed to give secure bottom tray support. Removable stainless steel uprights shall be punched on 1.5" (38) spacings, o.c., for easy tray adjustment, and shall easily lift off heavy-duty stainless steel brackets without the use of tools for cleaning.

PHTT SYSTEM/CONTROLS. Built in humidified holding system shall include two (2) separate long life Incoloy nickel-chromium alloy heating elements per cavity to provide separate, adjustable, precise food temperature from 90°F to 180°F (32°C to 82°C) and maintain food texture with settings from OFF to 95% RH (Crisp to Moist). Patented Precise Humidity Temperature Technology controls shall be provided for each function. One to control the interior air temperature, and one to control the interior air moisture with hydro immersion water bath. Stainless steel water reservoir shall be removable for ease of cleaning/sanitation. Built-in drip through has removable drain plug. System shall have circulating fan circulating fan to assist heat recovery/moist air distribution. Controls shall be up-front, recessed and eye-level for convenience and safety. ON/OFF power switch, humidity cycle light and thermostat cycling light shall also be included.

ELECTRICAL CHARACTERISTICS. 3 wire grounded 10 foot extension power cord and plug, rear mounted for safety. See electrical data chart above for amperage and receptacle configuration. Dedicated circuit. **INSTALLATION.** Unit should not be installed in an area where adverse environmental conditions are present.

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R.15.05

Optional Accessories

- ELECTRICAL**
 - 220 volt, 50/60 Hz single phase
 - Element upgrade
- DOORS**
 - Key locking door latch
 - Paddle latch
 - Left hand door hinging
 - Glass doors
 - Flip-up doors
- SPACINGS**
 - Extra stainless steel tray slides
 - Fixed rack
 - Shelves
- CASTERS**
 - All swivel or larger casters
 - Legs
- EXTRAS**
 - Full extension bumper
 - Heavy-duty push/pull handles
 - Top corner bumpers (set of 4)
 - Security packages
 - Auto water fill

FOOD WARMING EQUIPMENT COMPANY, INC.

5599 HWY. 31 W. Portland, TN 37148
800.222.4393 | 815.459.7500 | Fax: 815.459.7989
www.FWE.com | sales@fwe.com

COOK | HOLD | TRANSPORT | SERVE | REFRIGERATION | BARS



CUSTOM FABRICATED ☒

SPARE NUMBER ☐

MILLWORK ☐

EXISTING ☐

NOT IN KITCHEN
EQUIP. CONTRACT
(NIKEC) ☐

FURNISHED BY:

OWNER ☐

OPERATOR ☐

SUPPLIER/
VENDOR ☐

DIV. 15, PLUMB ☐

DIV. 16, ELEC. ☐

ARCHITECT ☐

OTHER ☐

NOTES:



Project:

Item Number:

Quantity:

MODULAR DROP-IN: THREE WELL HOT



Modular Drop-In: Three Well Hot

DESCRIPTION

The modular drop-in is designed for top-mount installation and does not require hard-wiring. The drop-in comes complete with a 6-ft. (182.8 cm) power cord with plug and a 4-ft. (121.9 cm) control cord for remote installation.

Full-perimeter drip-edge contains spills and condensation within the stainless steel countertop area of the drop-in. Drip-edge adds additional strength to the flange area.

Drop-in can operate wet or dry, however, moist operation is recommended for even heating of the food product. It meets NSF4 performance standards when using moist heat.

High-density glass-fiber insulation allows zero-clearance installation and use of 625W elements for lower energy consumption and reduced costs. Also available with 1000W elements.

Stainless steel wells are 6 $\frac{3}{8}$ " (16.2 cm) deep to allow use of full-size and fractional pans up to 6" (15.2 cm) deep while still providing moist heat. Adaptor bars are recommended when using fractional pans.

WARRANTY: All models shown come with Vollrath's standard warranty against defects in materials and workmanship. For full warranty details, please refer to the Vollrath Equipment and Smallwares Catalog.

Agency Listings



Due to continued product improvement, please consult www.vollrathco.com for current product specifications.

MODELS	1000W Per Well	625W Per Well	Drain	Auto-Fill
120V	3640401	36404	Standard	-
Infinite	3640451	3640450	Manifold	-
Control	3640461	3640460	Manifold	Yes
120V	3640411	3640410	Standard	-
Thermostatic	3640471	3640470	Manifold	-
Control	3640481	3640480	Manifold	Yes
208V		36405	Standard	-
Infinite		3640550	Manifold	-
Control		3640560	Manifold	Yes
208V		3640510	Standard	-
Thermostatic		3640570	Manifold	-
Control		3640580	Manifold	Yes
208-240V	3640501		Standard	-
Infinite	3640551		Manifold	-
Control	3640561		Manifold	Yes
208-240V	3640511		Standard	-
Thermostatic	3640571		Manifold	-
Control	3640581		Manifold	Yes
240V		36473	Standard	-
Infinite		3647350	Manifold	-
Control		3647360	Manifold	Yes
240V		3647310	Standard	-
Thermostatic		3647370	Manifold	-
Control		3647380	Manifold	Yes

FEATURES

- ☐ Top is 18-gauge stainless steel, with $\frac{3}{8}$ " (9.5 mm) overhang on all sides and die-stamped with full-perimeter drip-edge.
- ☐ Breaker gasket included for installation under drip-edge.
- ☐ Flat work surface around opening.
- ☐ Deep drawn well is 20-gauge stainless steel, 6 $\frac{3}{8}$ " (16.2 cm) deep.
- ☐ Standard 1000W or 625W heating element.
- ☐ Infinite or thermostatic control.
- ☐ Power indicator light.
- ☐ Standard drain is $\frac{1}{2}$ " (1.3 cm) stainless steel fitting welded to pan with ball valve shutoff below exterior housing.
- ☐ Manifold drain option is 1" (2.5 cm) copper tubing and retains individual well shut-off and adds manifold shutoff.
- ☐ Unit insulated on sides, between wells, and below element assembly with high-density glass fiber insulation.
- ☐ Exterior housing is 20-gauge galvanized steel.
- ☐ Drop-in is supplied with stainless steel control panel connected to bottom of unit for shipping.
- ☐ Control panel may remain on unit or be remote mounted.
- ☐ Control wires contained in flexible rubber cord.
- ☐ Unit comes with cord and plug and does not require hard-wiring installation.
- ☐ Positioning clips provided to center drop-in within cutout.
- ☐ Standard mounting clips adjustable for up to 3" (7.6 cm) thick counters.
- ☐ Full one-year parts and labor warranty.
- ☐ Sheet pan adapter available. Item No. 19186.

Approvals

Date



Setting
the Standard™

www.vollrathco.com

The Vollrath Company, L.L.C.
1236 North 18th Street
Sheboygan, WI 53081-3201 U.S.A.
Customer Service: 800.628.0830
Canada Customer Service: 800.695.8560
Main Fax: 800.752.5620 or 920.459.6573

Technical Services: 800.628.0832
Technical Services Fax: 920.459.5462

755

MODULAR DROP-IN: THREE WELL HOT

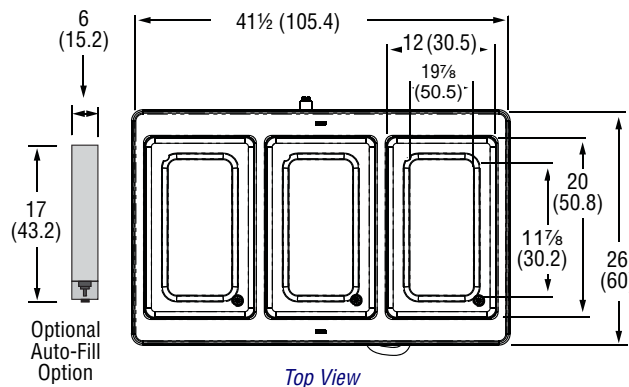
AUTO-FILL OPTION

Field-installed option that efficiently maintains a constant water level. Eliminates the need to monitor wells and add water, reducing operating and labor costs. Attaches easily to manifold drain assembly using simple tools. The check valve/siphon prevents cross contamination of drain and potable water lines. NOTE: The auto-fill reservoir is approximately 6 x 17 (15.2 x 43.2) and requires additional space in the cabinet.

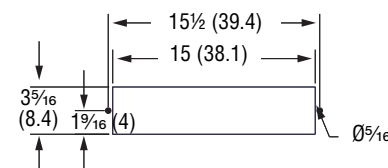
DIMENSIONS

- Cutout Dimensions: 27½" x 25¼" (69.9 cm x 64.1 cm). Opening cutout must have a 7/8" (2.2 cm) corner radius.

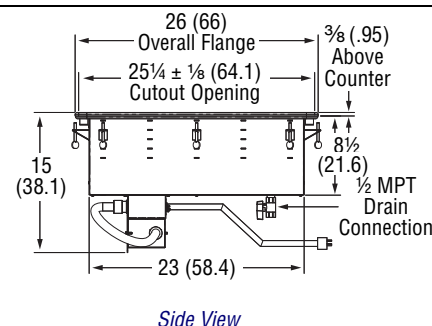
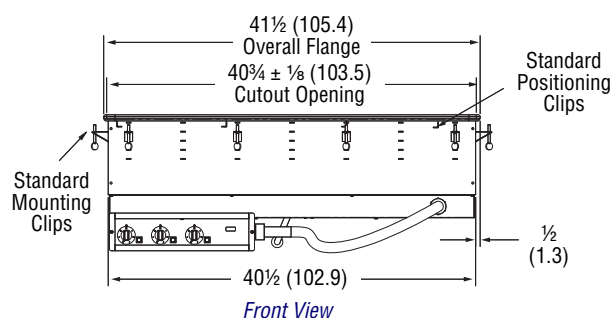
Dimensions shown in
inches (centimeters).



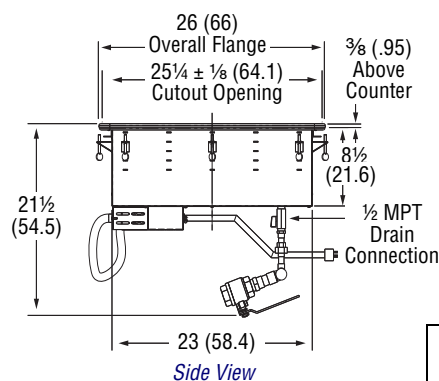
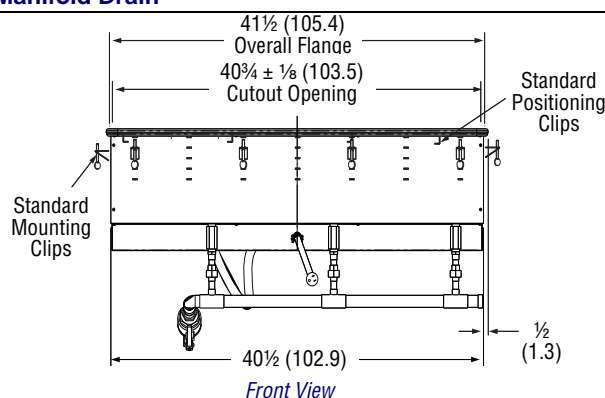
Control Panel Cutout +.063/-0 (+.160/-0) Tolerance



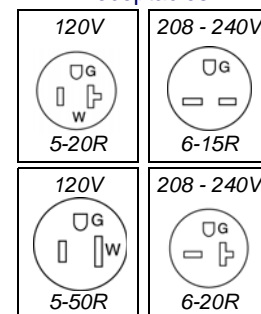
Standard Drain



Manifold Drain



Receptacles



ELECTRICAL SPECIFICATIONS

Model	Watts Per Well	Total Watts	Volts	Nominal Amps	NEMA Plug
36404, 3640450, 3640460, 3640410, 3640470, 3640480	625	1875	120V AC	15.6	5-20P
3640401, 3640451, 3640461, 3640411, 3640471, 3640481	1000	3000	120V AC	25	5-50P
36405, 3640550, 3640560, 3640510, 3640570, 3640580	625	1875	208V AC	9	6-15P
3640501, 3640551, 3640561, 3640511, 3640571, 3640581	1000	2250 - 3000	208 - 240V AC	10.8 - 12.5	6-20P
36473, 3647350, 3647360, 3647310, 3647370, 3647380	625	1875	240V AC	7.8	6-15P





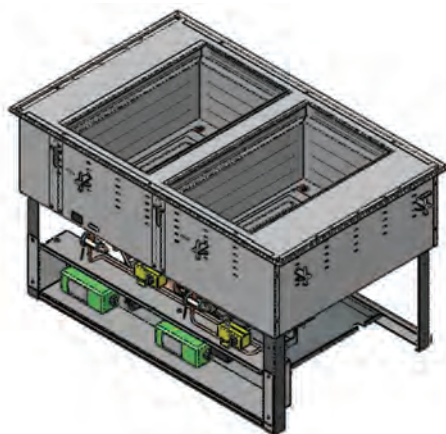
Outperform every day.™

Project:

Item Number:

Quantity:

MODULAR DROP-IN: TWO WELL HOT/COLD TOP-MOUNT



Modular Drop-In: Two Well Hot/Cold

DESCRIPTION

Wells in this top-mount modular drop-in independently operate in hot or cold mode. In cold operation, the wells meet NSF7 standard. In hot operation, the wells meet NSF4 standard when using moist heat.

A full-perimeter drip edge contains spills and condensation within the stainless steel countertop area of the drop-in.

High-density polyurethane foam insulation surrounds the exterior of the wells to provide most efficient performance with energy savings.

A 2" (5.1 cm) recess lowers the food pans below the work surface to minimize the impact of ambient air.

Manual or automatic manifolds hold or drain water in hot and cold cycles.

Modular drop-in orders cannot be canceled or returned.

Agency Listings



Wells pass NSF 4 and NSF 7 performance testing for open top hot food holding and refrigerated buffet units. They are listed under NSF/ANSI 169 for special purpose food equipment and devices.

MODELS

- 3667201DA** 2 Well, Auto Manifold Drain, 120V (US/Canada)
- 3667202DA** 2 Well, Auto Manifold Drain, 120/208-240V (US/Canada)
- 3667201D** 2 Well, Manual Manifold Drain, 120V (US/Canada)
- 3667202D** 2 Well, Manual Manifold Drain, 120/208-240V (US/Canada)

FEATURES

- Each well is individually controlled, enabling each well to independently operate in hot or cold mode
- Top is 18-gauge 300 series stainless steel, with a flat work surface around the opening and die stamped with full-perimeter drip edge. A molded breaker gasket is fitted under the drip edge.
- Seamless well is 18-gauge 300 series stainless steel
- Exterior housing is 18-gauge galvanized steel
- Refrigeration coils surround the exterior side walls of each well for maximum cooling
- 625 Watt rope heater is attached to the bottom of each well
- The inner well assembly is insulated with foamed-in-place polyurethane foam insulation
- Hot/Cold operation toggle switch with lighted indicator
- Thermostatic hot control
- Factory set cold control on compressor
- Condensing unit suspended below well
- ¾" (1.9 cm) integral drain is standard
- Unit comes with 6 ft. (1.5 m) cord and plug and does not require hard wiring
- 4 ft. (1.2 m) flexible control cord
- Positioning clips are provided to center drop-in within the cutout
- One year parts and labor warranty. Additional four years on compressor

WARRANTY: All models shown come with Vollrath's standard warranty against defects in materials and workmanship. For full warranty details, please refer to the Vollrath Equipment and Smallwares Catalog.

Approvals

Date

Due to continued product improvement, please consult www.vollrath.com for current product specifications.



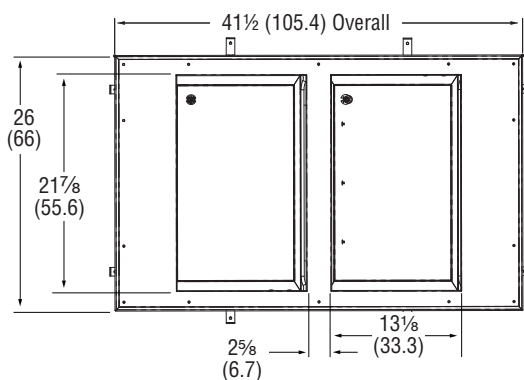
Outperform every day.™

www.vollrath.com

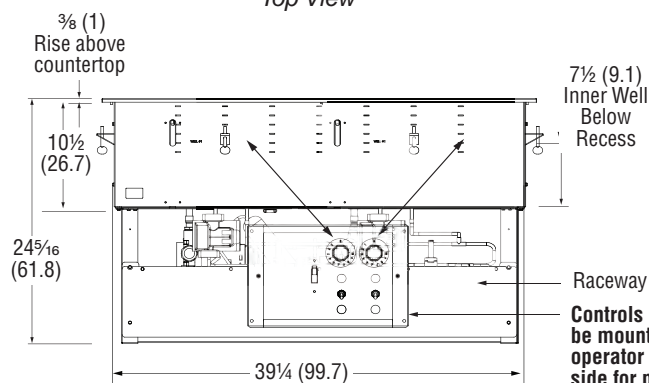
The Vollrath Company, L.L.C.
1236 North 18th Street
Sheboygan, WI 53081-3201 U.S.A.
Customer Service: 800.628.0830
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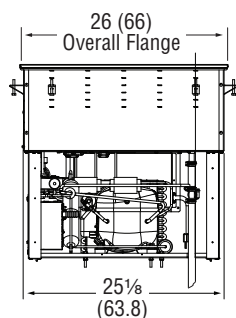
757

MODULAR DROP-IN: TWO WELL HOT/COLD TOP-MOUNT**DIMENSIONS** (Shown in inches (cm))

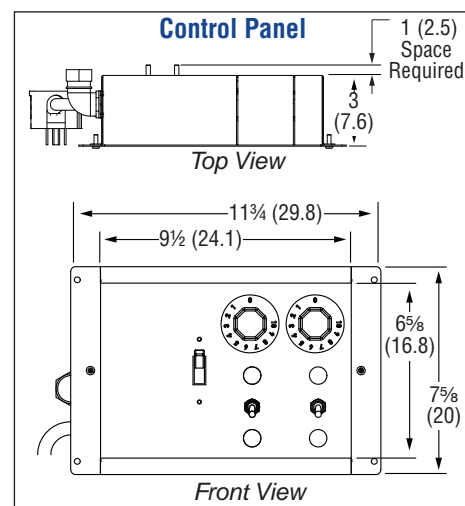
Top View



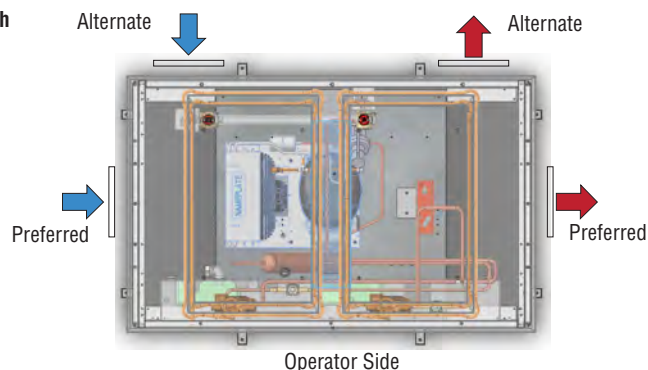
Operator (Raceway) Side View



Side View



NOTE: Vollrath drop-ins are made to order and cannot be returned. It is the responsibility of the installer to ensure cut-outs on new installations are correct, or retrofit installation dimensions match up with Vollrath product dimensions. Vollrath will not guarantee that our models retrofit with specific competitive models (as competitive specifications can change without notice). We recommend countertop cut-outs be made after receipt of the Vollrath drop-in, to ensure proper fit prior to cutting into countertop materials.

VENTING REQUIREMENTS

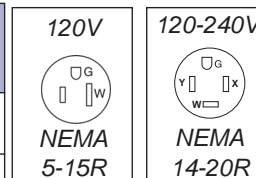
Customer supplied louvers must be installed in surrounding cabinet to ensure adequate ventilation. One intake and one discharge louver are required. Preferred louver location is the short ends of the cabinet.

SPECIFICATIONS

Item	Description	Cutout Dimensions			Compressor (HP)	Voltage	Watts Per Well	Max Amp Draw	Plug
		Drop-in*	Control**	Louvers					
3667201D	Manual Manifold Drain	40 3/4 x 25 1/4 (103.5 x 64.1)	7 x 10 1/2 (17.8 x 26.7)	8 x 10 (20.3 x 25.4)	1/4	120	625	11.2	NEMA 5-15P
3667201DA	Auto Manifold Drain					120/208-240			NEMA 5-15R
3667202D	Manual Manifold Drain								NEMA 14-20P
3667202DA	Auto Manifold Drain								NEMA 14-20R

* Well cutout must have a 7/8" (2.2 cm) corner radius.

** Control cutout must have a 3/8" (9.5 mm) corner radius. Included control box frame reduces interior cabinet depth required for control box mounting from 4" (10.1) to 3" (7.6).

Receptacles

Outperform every day.™

www.vollrath.com

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CUSTOMER'S CHOICE FOR A HOT KITCHEN
Tested & Certified to Ambient Class of 100°F

3 Year Parts/Labor Warranty
Additional 2 Year Compressor Warranty

SM SERIES—SINGLE ACCESS, COLD WALL

Single access, cold wall milk coolers are designed to hold milk between 36°F and 38°F until ready to serve. Produced in three sizes to hold 8, 12, and 16 milk cases (13" x 13" x 11") per unit.

CABINET CONSTRUCTION

Standard SM models include lids, doors, adjustable hinges, and door latches made from stainless steel. Balance of exterior is white finish on steel. One-piece, reinforced stainless steel floor for maximum milk crate support. Balance of interior is galvanized steel. Heavy-duty, epoxy coated steel wire floor racks are provided for added floor protection. Floor drain is centrally located for easy cleaning, connecting to drain hose with hose adapter.

Exterior thermometer, cylinder lock, bottom drain, and 4" swivel casters (2 with locks) are provided as standard.

Foamed-in-place CFC and HCFC-free polyurethane insulation enhances the structural strength of the cabinet and helps increase energy efficiency. This insulation helps to prevent liquid penetration that results in foul odors. Overall depth of 31" allows easy mobility and clear passage through most doorways.

Models are also offered with stainless steel exterior in place of white finish on steel. A stainless steel interior is optionally available. Additional options include wrap around and corner bumpers.

REFRIGERATION

Refrigeration system uses R404A refrigerant, which is CFC and HCFC-free for compliance with environmental safety concerns.

ELECTRICAL

Units wired at factory and ready for connection to a 115/60/1 phase, 15 amp dedicated outlet. 8' long cord and plug set included.

SPECIAL FEATURES

- One-piece, reinforced stainless steel floor for maximum support of milk crates.
- SM models have earned the ENERGY STAR®.
- Stainless options available.

Item No. _____
Quantity _____

SCHOOL MILK COOLERS SM SERIES

MODELS:
SM34N
SM49N
SM58N



SM34N (white exterior shown)



SM49N (white exterior shown)

ELECTRICAL CONNECTION



115/60/1
NEMA-5-15P

Units pre-wired at factory and include 8' long cord and plug set.



*Note: Not all markings

may apply to all

Available From:

Model Specified _____

Store# _____

Location _____

Quantity _____


BEVERAGE-AIR

SM SERIES School Milk Coolers

Models: SM34N, SM49N, SM58N

MODEL	SM34N	SM49N	SM58N
EXTERNAL DIMENSIONAL DATA			
Length Overall (inches)	34 1/2"	49 1/2"	58 1/2"
Length Overall (mm)	876	1257	1486
Depth Overall (inches)	31"	31"	31"
Depth Overall (mm)	787	787	787
Height Overall— (inches)	39 1/2"	39 1/2"	39 1/2"
Height Overall—(mm)	1003	1003	1003
Number of doors/lids	Single/Access	Single/Access	Single/Access
INTERNAL DIMENSIONAL DATA			
NET Capacity (cubic ft.)	13.6	20	24
NET Capacity (Liters)	385	566	679
CASE CAPACITIES			
13" x 13" x 11"	8	12	16
19" x 13" x 11"	4	8	10
ELECTRICAL DATA			
Full Load Amperes 115/60/1	4	7.5	7.5
ENERGY CONSUMPTION (KWH)			
	2	1.8	2.25
REFRIGERATION DATA			
Horsepower	1/4	1/4	1/3
WEIGHT DATA			
Gross Weight (Crated lbs)	277	339	376
Gross Weight (Crated kg)	126	154	171



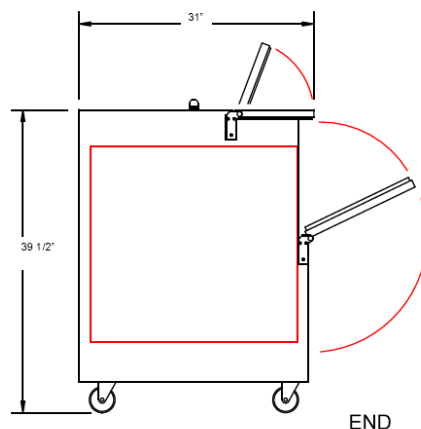
*Note: Not all markings may apply to all model variations.

ELECTRICAL CONNECTION

Units pre-wired at factory and include 8' long cord and plug set.

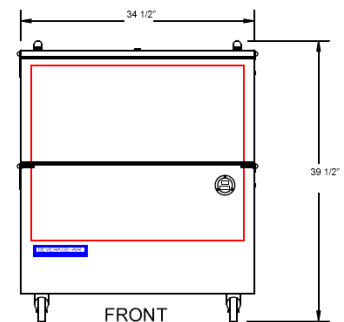


115/60/1
NEMA-5-15P



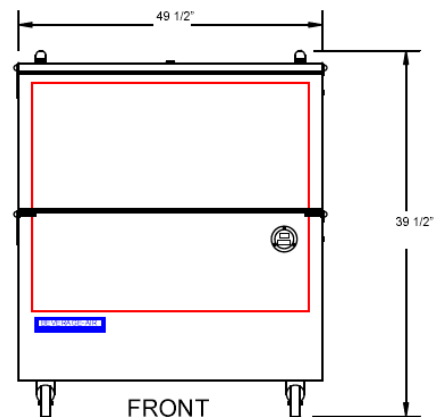
END

PLAN VIEWS



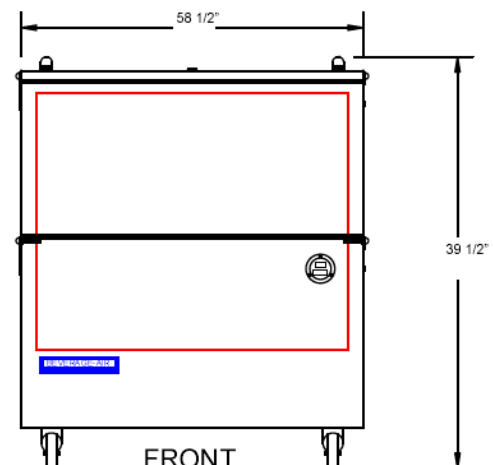
FRONT

SM34N



FRONT

SM49N



FRONT

SM58N

BEVERAGE-AIR® CORPORATION

3779 Champion Blvd. • Winston-Salem, NC 27105 USA • (336) 245-6400 • Fax (336) 245-6453 • (888) 845-9800 • www.beverage-air.com 760

Specifications are subject to change without prior notice. 08/13

CUSTOM FABRICATED	—
SPARE NUMBER	—
MILLWORK	—
EXISTING	—
NOT IN KITCHEN EQUIP. CONTRACT (NIKEC)	_X_
FURNISHED BY:	
OWNER	_X_
OPERATOR	—
SUPPLIER/ VENDOR	—
DIV. 15, PLUMB	—
DIV. 16, ELEC.	—
ARCHITECT	—
OTHER	—

NOTES:

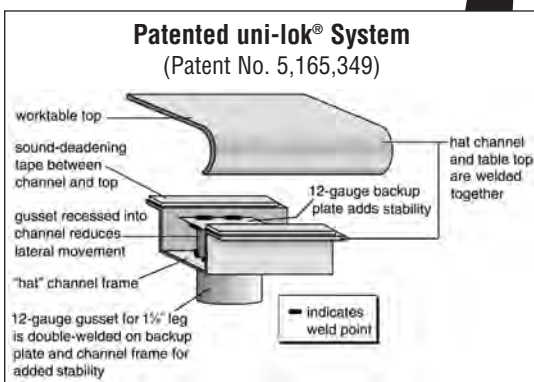


Profit from the Eagle Advantage®

Specification Sheet

Short Form Specifications

Eagle worktables, Spec-Master® series, model _____. Top to be constructed of 14/304 stainless steel, with 1½" roll on front and rear, and sides turned down 90°. Undershelf to be adjustable and constructed of 18/304 stainless steel with marine edge. Top reinforced with stainless steel hat channels and sound deadened. Constructed with uni-lok® patented gusset system with the gussets recessed into the hat channels to reduce lateral movement. Legs to be 1½" O.D., stainless steel, with stainless steel gussets and 1" stainless steel adjustable bullet feet.



EAGLE GROUP

100 Industrial Boulevard, Clayton, DE 19938-8903 USA

Phone: 302-653-3000 • Fax: 302-653-2065

www.eaglegrp.com

Foodservice Division: Phone 800-441-8440

MHC/Retail Display Divisions: Phone 800-637-5100

For custom configuration or fabrication needs, contact our SpecFAB® Division.

Phone: 302-653-3000 • Fax: 302-653-3091 • e-mail: specfab@eaglegrp.com

Spec sheets available for viewing, printing or downloading from our online literature library at www.eaglegrp.com

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Item No.: _____

Project No.: _____

S.I.S. No.: _____

Worktables with Flat Top and Stainless Steel Base with Undershelf—Spec-Master® Series

MODELS:

<input type="checkbox"/> T2424SE	<input type="checkbox"/> T24144SE	<input type="checkbox"/> T30132SE	<input type="checkbox"/> T36144SE
<input type="checkbox"/> T2430SE	<input type="checkbox"/> T3030SE	<input type="checkbox"/> T30144SE	<input type="checkbox"/> T4848SE
<input type="checkbox"/> T2436SE	<input type="checkbox"/> T3036SE	<input type="checkbox"/> T3648SE	<input type="checkbox"/> T4860SE
<input type="checkbox"/> T2448SE	<input type="checkbox"/> T3048SE	<input type="checkbox"/> T3660SE	<input type="checkbox"/> T4872SE
<input type="checkbox"/> T2460SE	<input type="checkbox"/> T3060SE	<input type="checkbox"/> T3672SE	<input type="checkbox"/> T4884SE
<input type="checkbox"/> T2472SE	<input type="checkbox"/> T3072SE	<input type="checkbox"/> T3684SE	<input type="checkbox"/> T4896SE
<input type="checkbox"/> T2484SE	<input type="checkbox"/> T3084SE	<input type="checkbox"/> T3696SE	<input type="checkbox"/> T48108SE
<input type="checkbox"/> T2496SE	<input type="checkbox"/> T3096SE	<input type="checkbox"/> T36108SE	<input type="checkbox"/> T48120SE
<input type="checkbox"/> T24108SE	<input type="checkbox"/> T30108SE	<input type="checkbox"/> T36120SE	<input type="checkbox"/> T48132SE
<input type="checkbox"/> T24120SE	<input type="checkbox"/> T30120SE	<input type="checkbox"/> T36132SE	<input type="checkbox"/> T48144SE
<input type="checkbox"/> T24132SE			

Tabletop

- Patented uni-lok® gusset system (patent #5,165,349): gussets are recessed into hat channel, reducing lateral movement.
- Top reinforced with welded-on hat channel.
- Sound-deadened between top and channels.
- 1½" (38mm)-diameter 180° rolled edges on front and rear. Ends are turned down 90° providing for flush installations when required.
- 14 gauge type 304 polished stainless steel.

Adjustable Undershelf

- 18 gauge type 304 stainless steel.
- Gusset welded to each corner.
- Heavy duty marine edge design.

Legs—1½" (41mm)-diameter

- 24" to 36" (610 to 914mm)-wide units that are 96" (2438mm) and longer come with six legs or more. 48" (1219mm)-wide units that are 72" (1829mm) and longer come with six legs or more.
- Heavy gauge stainless steel.
- 1" (25mm) adjustable stainless steel feet.

Options / Accessories

- | | |
|--|--|
| <input type="checkbox"/> Drawer | <input type="checkbox"/> Duplex receptacles |
| <input type="checkbox"/> Lock | <input type="checkbox"/> Pot rack |
| <input type="checkbox"/> Casters | <input type="checkbox"/> Sink |
| <input type="checkbox"/> Stainless steel bullet feet | <input type="checkbox"/> Additional undershelf |
| <input type="checkbox"/> Overshelves | <input type="checkbox"/> Stabilizer Bar (for 30"- and 36"-wide tables) |

Certifications / Approvals



AUTOQUOTES



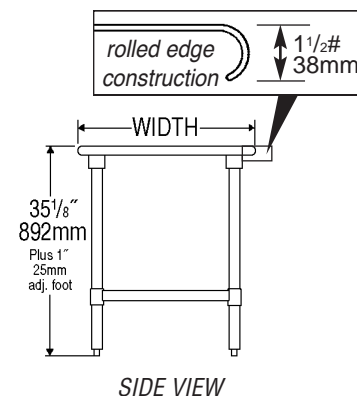
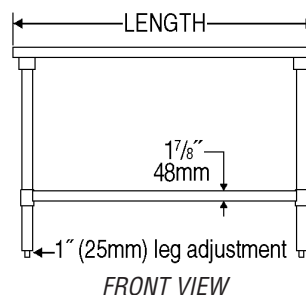
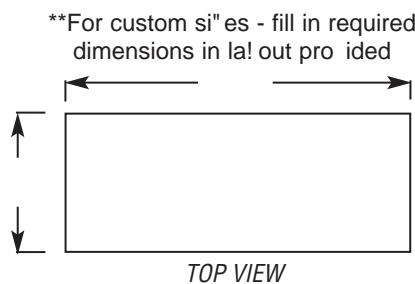
EG10.41C Rev. 08/12



Profit from the Eagle Advantage®

Item No.: _____
 Project No.: _____
 S.I.S. No.: _____

Worktables with Flat Top and Stainless Steel Base with Undershelf—Spec-Master® Series



model #	# of legs	width		length		weight	
		in.	mm	in.	mm	lbs.	kg
T2424SE	4	24#	610	24#	610	46	20.9
T2430SE	4	24#	610	30#	762	50	22.7
T2436SE	4	24#	610	36#	914	55	24.9
T2448SE	4	24#	610	48#	1219	67	30.4
T2460SE	4	24#	610	60#	1524	78	35.4
T2472SE	4	24#	610	72#	1829	90	40.8
T2484SE	4	24#	610	84#	2134	103	46.3
T2496SE	6	24#	610	96#	2438	125	56.7
T24108SE	6	24#	610	108#	2743	144	65.3
T24120SE	6	24#	610	120#	3048	163	73.9
T24132SE	8	24#	610	132#	3353	186	84.4
T24144SE	8	24#	610	144#	3658	200	90.7
T3030SE	4	30#	762	30#	762	54	24.5
T3036SE	4	30#	762	36#	914	57	25.9
T3048SE	4	30#	762	48#	1219	75	34.0
T3060SE	4	30#	762	60#	1524	87	39.5
T3072SE	4	30#	762	72#	1829	101	45.8
T3084SE	4	30#	762	84#	2134	116	52.6
T3096SE	6	30#	762	96#	2438	139	63.1
T30108SE	6	30#	762	108#	2743	161	73.0
T30120SE	6	30#	762	120#	3048	182	82.6
T30132SE	8	30#	762	132#	3353	204	92.5
T30144SE	8	30#	762	144#	3658	224	101.6
T3648SE	4	36#	914	48#	1219	83	37.6
T3660SE	4	36#	914	60#	1524	97	44.0
T3672SE	4	36#	914	72#	1829	114	51.7
T3684SE	4	36#	914	84#	2134	132	59.9
T3696SE	6	36#	914	96#	2438	153	69.4
T36108SE	6	36#	914	108#	2743	180	81.6
T36120SE	6	36#	914	120#	3048	207	93.9
T36132SE	8	36#	914	132#	3353	234	106.1
T36144SE	8	36#	914	144#	3658	261	118.4
T4848SE	4	48#	1219	48#	1219	136	61.7
T4860SE	4	48#	1219	60#	1524	161	73.0
T4872SE	6	48#	1219	72#	1829	188	85.3
T4884SE	8	48#	1219	84#	2134	217	98.4
T4896SE	8	48#	1219	96#	2438	265	120.2
T48108SE	8	48#	1219	108#	2743	306	138.8
T48120SE	8	48#	1219	120#	3048	348	157.9
T48132SE	8	48#	1219	132#	3353	388	176.0
T48144SE	8	48#	1219	144#	3658	430	195.0

EAGLE GROUP

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Rev. 08/12

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763



Product Specifications

 ITEM NO.: _____
 PROJECT: _____
 DATE: _____

Refrigerated Self-Service Case

Lengths include end panels

- | | |
|--------------------------------|--------------------------------|
| <input type="checkbox"/> CO35R | 36-1/4"L x 32-5/8"D x 61-5/8"H |
| <input type="checkbox"/> CO45R | 47-1/4"L x 32-5/8"D x 61-5/8"H |
| <input type="checkbox"/> CO55R | 59-1/4"L x 32-5/8"D x 61-5/8"H |
| <input type="checkbox"/> CO65R | 71-1/4"L x 32-5/8"D x 61-5/8"H |



MODEL SHOWN: CO45R



STANDARD FEATURES

- Breeze~E (Type-II) w/ EnergyWise s/c refrigeration
- 4"D removable rear wall spacer (not included in depth dimensions)
- Compressor air front intake, rear discharge. Front panel cannot be blocked. Must remain 4" from wall
- Condensate pan (self-contained refrig. only)
- Integrated average product temperature of 40°F or less
- One year parts & labor; 5 year compressor warranty
- Removable deck pans provide complete access to evaporator coil & refrigeration connections
- Shelving removable and adjustable on 1" centers
- T-8 top light(s)

Features	Standard	Options
EXTERIOR COLOR	<input type="checkbox"/> Laminated (non-premium) Confirm pattern/grain direction	<input type="checkbox"/> Laminated (premium) Confirm pattern/grain direction <input type="checkbox"/> Stainless steel (includes lower front panel)
INTERIOR COLOR	<input type="checkbox"/> Black	<input type="checkbox"/> Stainless steel
LWR LOUVERED FRNT PANEL COLOR	<input type="checkbox"/> Painted - Black	<input type="checkbox"/> Stainless steel (w/stainless ext. only)
BASE	<input type="checkbox"/> Casters (n/a with remote)	<input type="checkbox"/> Levelers <input type="checkbox"/> Seismic levelers (Q4695)
END PANEL LEFT	<input type="checkbox"/> Full end panel w/mirror interior	<input type="checkbox"/> Cutaway end panel <input type="checkbox"/> No end panel (for same case to case connect)
END PANEL RIGHT	<input type="checkbox"/> Full end panel w/mirror interior	<input type="checkbox"/> Case to case acrylic end (not required w/ sync defrost cycles) <input type="checkbox"/> Cutaway end panel <input type="checkbox"/> No end panel (for same case to case connect) (requires sync defrost cycles)
EXTERIOR BACK PANEL	<input type="checkbox"/> Solid back panel, black	<input type="checkbox"/> Rear loading hinged doors, locking <input type="checkbox"/> Solid back panel, stainless steel
SHELVING	<input type="checkbox"/> Metal shelves, non-lighted	<input type="checkbox"/> Metal shelves, lighted (LED 3500K) <input type="checkbox"/> Metal shelves, lighted (T-8)
ELECTRICAL CONNECT	<input type="checkbox"/> 6' power cord (base exit)	<input type="checkbox"/> 6' power cord (top exit)
REFRIGERATION	<input type="checkbox"/> Breeze~E (Type-II) w/ EnergyWise s/c refrigeration	<input type="checkbox"/> Note: Remote doesn't incl Conds unit. Floor drain reqd. <input type="checkbox"/> 1 Remote w/thermostat, solenoid & TXV
MISCELLANEOUS		<input type="checkbox"/> Case height wall spacer bracket (specify BL or SS) <input type="checkbox"/> Roll-down security cover, locking (Requires two end panels (full or cutaway) per case) <input type="checkbox"/> Second year parts & labor warranty (excludes compressor) <input type="checkbox"/> Synchronized defrost cycles (w/ connect of same case models w/o case to case acrylic panel)
ACCESSORIES		<input type="checkbox"/> Clean Sweep® coil cleaner (n/a w/remote) <input type="checkbox"/> Night curtain, retractable, non-locking <input type="checkbox"/> Price tag moulding (matches interior color) <input type="checkbox"/> Solid security cover, removable, locking

Option Notes: 1 - See tech spec for remote load reqmts

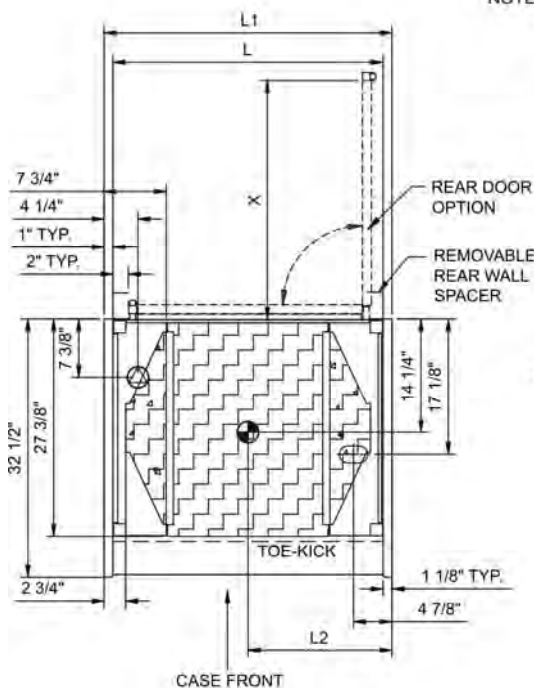


Product Specifications

Intended Environment: Type II - Designed to operate in ambient conditions of 80°F and 60% relative humidity unless noted otherwise in system information below.

Zone	Intended Product To Be Displayed	Integrated Prod Temp ° F
All	Packaged refrigerated products	40

PLAN VIEW

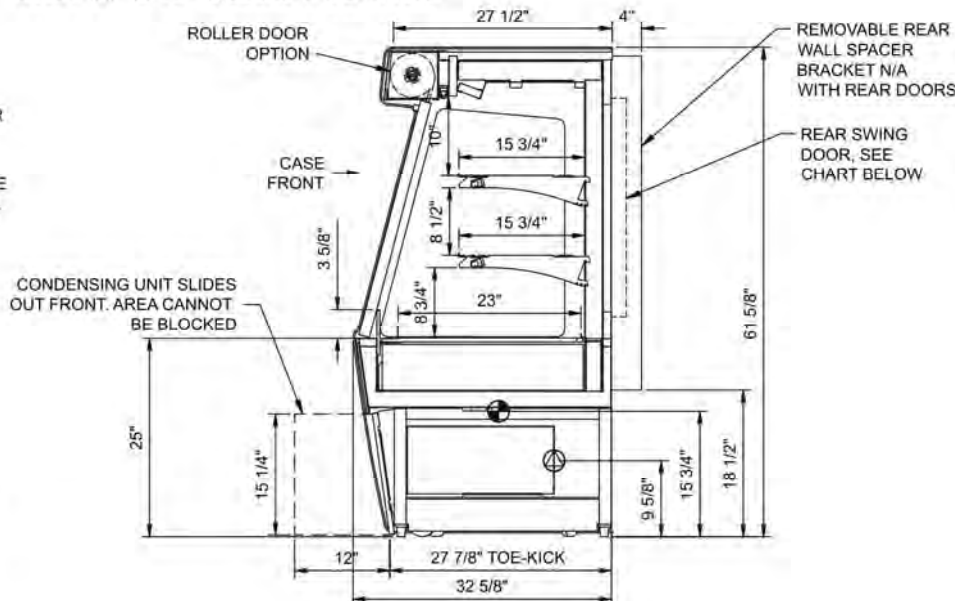


*SELF-CONTAINED
SERVICE ACCESS AREAS ONLY ACCESSIBLE
BY PULLING OUT COMPRESSOR UNIT

- ELECTRICAL JUNCTION BOX
(SUPPLIED WITH 6" LEADS OR POWER CORD).
- LOCATION OF DRAIN TUBE FOR REMOTE REF.
ONLY (SUPPLIED WITH 1/2" OR 1 1/2" PVC TUBE).

NOTE: CO35R - (X) = 30 1/8" - (1) DOOR LH HINGED
CO45R - (X) = 19 3/4" - (2) DOORS RH & LH HINGED
CO55R - (X) = 19 3/4" - (2) DOORS RH & LH HINGED
CO65R - (X) = 30 1/8" - (2) DOORS RH & LH HINGED

SIDE VIEW



CASE DEPTH	Solid Back	Rear Doors
Flat Front	32 5/8"	34 1/2"

NOTE: ALL DIMENSIONS APPROXIMATE

- REFRIGERATION LINE CONNECTION.
- REMOTE FLOOR SINK & UTILITIES
ACCESS AREA.

- SELF-CONTAINED CASE SERVICE ACCESS AREA.
- DRY CASE SERVICE ACCESS AREA.

Model Technical Specifications

Model	L"	L1"	L2"	System Circuit Volts			Phs	Freq	Amps ***	Watts	Wires	NEMA Plug	SST	BTUH	Ship Wt
CO35R	N/A	36.25	18.13	Remote(Type I)	Circuit #1	110-120	1	60	0.97	82	2+G	Leads Multiple	20.00	3125	800
				Remote(Type II)	Circuit #1	110-120	1	60	0.97	82	2+G	Leads Multiple	20.00	3800	
				Self-Contained	Circuit #1	110-120	1	60	13.33	1,252	2+G	5-20P or L5-20P	N/A	N/A	
CO45R	N/A	47.25	23.63	Remote(Type I)	Circuit #1	110-120	1	60	1.20	106	2+G	Leads Multiple	20.00	4050	900
				Remote(Type II)	Circuit #1	110-120	1	60	1.20	56	2+G	Leads Multiple	20.00	4950	
				Self-Contained	Circuit #1	110-120	1	60	15.46	1,433	2+G	5-20P or L5-20P	N/A	N/A	
CO55R	N/A	59.25	49.13	Remote(Type I)	Circuit #1	110-120	1	60	1.51	136	2+G	Leads Multiple	20.00	5050	1,000
				Remote(Type II)	Circuit #1	110-120	1	60	1.51	136	2+G	Leads Multiple	20.00	6175	
				Self-Contained	Circuit #1	110-120	1	60	16.00	1,597	2+G	5-20P or L5-20P	N/A	N/A	
CO65R	N/A	71.25	39.00	Remote(Type I)	Circuit #1	110-120	1	60	1.94	166	2+G	Leads Multiple	20.00	5975	1,100
				Remote(Type II)	Circuit #1	110-120	1	60	1.94	166	2+G	Leads Multiple	20.00	7325	
				Self-Contained	Circuit #1	208-240	1	60	10.27	1,917	2+G	6-20P	N/A	N/A	

*** Does not include electric defrost on freezer models.

Regulatory Approvals:

All Models
 Accordance with AHRI Std 1200
 ETL Listed to UL 471
 ETL Listed to CAN/CSA 22.2 No. 120
 ETL Sanitation to NSF 7



In Accordance with
AHRI Std 1200

DOE 2012
Energy Efficiency
Compliant

Important Notes:

- 1) ELECTRICAL NOTE: If GFCI is required, a GFCI breaker MUST be used in lieu of a GFCI receptacle
- 2) Performance issues (product temperatures, water on floor, etc.) caused by adverse conditions are not covered by warranty.
- 3) Keep unit at least 15' from exterior doors, overhead HVAC vents, or any air curtain disruption.
- 4) End panels must be tightly joined or kept at least 6" away from any structure to prevent condensation.
- 5) Do not expose unit to direct sunlight or any heat source (ovens, fryers, etc.).
- 6) Keep at least 8" of clearance above unit for air discharge (self-contained only).
- 7) Tile floors, low ceilings, or small rooms will increase noise level. Remote refrigeration recommended.

Note: Information is subject to change at any time.
 Visit www.structuralconcepts.com for the most current specs.

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SECTION 116623 - GYMNASIUM EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Basketball equipment.
2. Volleyball equipment.
3. Safety pads.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. If applicable, include assembly, disassembly, and storage instructions for removable equipment.
2. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.

B. Shop Drawings: For gymnasium equipment.

1. Include plans, elevations, sections, details, and attachments to other work.
2. Include details of field assembly for removable equipment, connections, installation, mountings, floor inserts, attachments to other work, and operational clearances.
3. Include transport and storage accessories for removable equipment.

C. Samples for Initial Selection: For each type of gymnasium equipment.

D. Sample for Verification: For the following products:

1. Basketball Net: Full size.
2. Volleyball Net: Minimum 12-inch (305-mm) length by full height, including one edge and net accessories.
3. Volleyball Floor Insert: Full-size unit.
4. Volleyball Post Standard: Full-size unit with net tensioner.
5. Pad Fabric: Wall padding not less than 3 inches (76mm) square, and corner and column samples not less than 3 inches (76mm) long, with specified treatments applied. Mark face of material.

1.3 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Court layout plans, drawn to scale, and coordinated with floor inserts, game lines, and markers applied to finished flooring.
- B. Product certificates: For each type of product.
- C. Sample warranty.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

1.6 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of gymnasium equipment that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Basketball backstops and anchors shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 BASKETBALL EQUIPMENT

- A. Subject to compliance with requirements, provide products by one of the following:
 - 1. ADP Lemco.
 - 2. Draper, Inc.
 - 3. Institutional Products, Inc.
 - 4. Jaypro Sports Construction Group.
 - 5. Porter Athletic, Inc.
 - 6. Spalding Equipment.
- B. General: Provide equipment complying with requirements in FIBA's "Basketball Rule Book."
- C. Provide manufacturer's recommended connections complying with Section 055000 "Metal Fabrications" of size and type required to transfer loads to building structure.
- D. Overhead-Supported Backstops:
 - 1. Folding Type: Provide manufacturer's standard assembly for forward-folding, rear-braced backstop, with hardware and fittings to permit folding.
 - 2. Framing: Steel pipe, tubing and shapes. Design framing to minimize vibration during play.
 - a. Center-Mast Frame: Welded and bolted or clamped with side sway bracing.
 - 3. Finish: Manufacturer's standard primer for field finishing.

4. Goal Height Adjuster: Adjustable from 8 to 10 feet (2.4 to 3 m) with gear-drive mechanism, locking in any position within adjustment range, with visible height scale attached to side of framing.
 - a. Operation: Manual with detachable crank handle.
- E. Winch: Hoist, consisting of heavy-duty, fully enclosed worm-gear; brake; cable drum; cable; and fittings, for mounting on wall with equipment mounting board; designed to move and hold backboard in any raised or lowered position.
- F. Backstop Electric Operator: Provide operating machine of size and capacity recommended by manufacturer for equipment specified, with electric motor and factory-prewired motor controls, starter, gear-reduction unit, and remote controls. Coordinate wiring requirements and electrical characteristics with building electrical system.
 1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Operator Type: Cable drum with grooved drum and cable tension device to automatically take up cable slack and retain cable in grooves.
 3. Operator Mounting: Wall-mounted board.
 4. Motor Electrical Characteristics:
 - a. Voltage: 208-220 V.
 - b. Horsepower: 3/4 hp.
 - c. Phase: Single.
 5. Remote-Control Station(s): NEMA ICS 6, Type 1 enclosure for recessed or flush mounting and momentary-contact, three-position, switch-operated control with up, down, and off functions.
 - a. Key Switch: Provide two keys per station.
 6. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop basketball equipment at fully retracted and fully lowered positions.
- G. Basketball Backboards:
 1. Shape and Size:
 - a. Rectangular, 72 by 42 inches (1800 by 1067 mm) width by height, with rounded corners.
 2. Backboard Material: With predrilled holes or preset inserts for mounting goals, and as follows:
 - a. Glass: 1/2 inch tempered plate glass with fired white border and target markings framed in 6063-T6 extruded aluminum frame. Equipped with key slotted steel corner brackets. Rubber gaskets separates all glass and metal parts.
 3. Target Area and Border Markings: Marked in black, with manufacturer's standard pattern and stripe width.
 4. Finish: Manufacturer's standard factory-applied, white background.
- H. Goal Mounting Assembly: Compatible with goal, backboard, and support framing; with hole pattern that is manufacturer's standard for goal attachment.
 1. Direct Mount: Designed for mounting goal directly and independently to center mast of backboard support framing so no force, transmitted by ring, is directly applied to backboard, and rigidity and stability of goal are maximized.

- I. Basketball Goals: Complete with flanges, braces, attachment plate, and evenly spaced loops welded around underside of ring.
 - 1. Single-Rim Basket Ring Competition Goal: Materials, dimensions, and fabrication per manufacturer's standard design.
 - 2. Type: Fixed, nonmovable.
 - 3. Type: Movable, breakaway design with manufacturer's standard breakaway mechanism and rebound characteristics identical to those of fixed, nonmovable ring.
 - 4. Breakaway Characteristics: Positive-lock movable breakaway design, with manufacturer's standard breakaway mechanism including preset pressure release, set to release at 230-lb. (105-kg) load, and automatic reset. Provide movable ring with rebound characteristics identical to those of fixed, nonmovable ring.
 - 5. Field Adjustment: Provide rim that is field-adjustable for rebound elasticity without being removed from the backboard.
 - 6. Mount: Front.
 - 7. Net Attachment: No-tie loops for attaching net to rim without tying.
 - 8. Finish: Manufacturer's standard finish.
- J. Basketball Nets: 12-loop-mesh net, between 15 and 18 inches (380 to 460 mm) long, sized to fit rim diameter, and as follows:
 - 1. Cord: Made from white nylon.
 - 2. Competition Cord: Antiwhip, made from white nylon cord not less than 120-gm thread and not more than 144-gm thread.

2.3 VOLLEYBALL EQUIPMENT

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Draper, Inc.
 - 2. Jaypro Sports Construction Group.
 - 3. Porter Athletic, Inc.
 - 4. Spalding Equipment.
 - 5. Sports Imports.
 - 6. AALCO Manufacturing.
- B. General: Provide equipment complying with requirements in FIVB's "Official Volleyball Rules."
- C. Floor Insert: Solid-brass floor plate; and steel pipe sleeve, concealed by floor plate, with capped bottom end, sized with ID to fit post standards, not less than 12 inches (305 mm) long to securely anchor pipe sleeve below finished floor in concrete footing; with anchors designed for securing floor insert to floor substrate indicated; one per post standard.
 - 1. Floor Plate: Self-locking, hinged access cover, designed to be flush with adjacent flooring. Provide two tools for unlocking access covers.
- D. Post Standards: Removable, paired volleyball post standards as indicated. Fixed height. Fabricated from extruded-aluminum pipe or tubing, with nonmarking plastic or rubber end cap or floor bumper to protect permanent flooring. Finished with manufacturer's standard factory-applied, polyester powder-coat finish complying with finish manufacturer's written instructions for surface preparation, including pretreatment, application, baking, and minimum dry film thickness or plated metal finish.

1. Nominal Pipe or Tubing Diameter: 3-inch (76-mm) OD at base.
 2. Net Height Adjuster: Track or rail system and lock mechanism designed for infinite height adjustment, complete with fittings; designed for positioning net at heights indicated.
 - a. Net Heights: For ages 12 and under net height and boys'/men's volleyball net height, 84 and 95-5/8 inches (2130 and 2430 mm) or more.
 3. Height Markers: Clearly marked at regulation play heights for elementary school.
- E. Net: 32 feet (9.75 m) long; one per pair of paired post standards; and as follows:
1. Width and Mesh: Competition volleyball net, 36 inches (910 mm) with 4-inch- (102-mm-) square mesh made of black nylon string.
 - a. Hem Band Edges: White 2-inch- (50-mm) wide top binding; black, 1-inch- (25mm-) wide bottom and side bindings; tie offs at top and bottom of each side end of net; and 1/4-inch- (6-mm-) diameter rope, at least 42 feet (12.8 m) long, threaded through top hem of binding.
 2. Dowels: Not less than 1/2-inch- (13-mm-) diameter fiberglass or 1-inch- (25-mm-) diameter wood. Provide two dowels per net threaded through each side hem sleeve for straightening net side edges.
 3. Net Antennas: 3/8-inch- (9.5-mm-) diameter, high-tensile-strength, extruded-fiberglass or plastic rods, 72 inches (1800 mm) long, extending above top hem band of net, with alternating white and red bands according to competition rules. Provide two antennas per net.
 - a. Clamps: Designed to secure antenna to top and bottom of net.
 4. Boundary Tape Markers: 2-inch- (50-mm-) wide white strip with sleeve for securing net antenna, secured to net top and bottom with hook-and-loop attachment. Provide two tape markers per net for marking court boundaries.
- F. Net-Tensioning System: Designed to adjust and hold tension of net. Fully enclosed, nonslip worm-gear-type winch with cable length and fittings for connecting to net lines, positive-release mechanism, and removable handle. Mount net tensioner on post standard at side away from court. Provide end post with post top pulley. Provide opposing post with welded-steel loops, hooks, pins, or other devices for net attachment and post top grooved line guide.
- G. Bottom Net Lock Tightener: Provide manufacturer's standard quick-release-type tension strap; a spring-loaded, self-locking tensioner; a turnbuckle; a pulley; or other device and linkage fittings designed to quickly and easily tighten bottom line or net.
- H. Judges' Stands: Provide manufacturer's standard units designed to be freestanding, folding for storage with wheels for transporting.
- I. Safety Pads: Comply with NCAA and NFHS requirements. Provide pads consisting of not less than 1-1/4-inch- (32-mm-) thick, multiple-impact-resistant manufacturer's standard foam filler covered by puncture- and tear-resistant fabric cover, not less than 14-oz./sq. yd. (475-g/sq. m) PVC-coated polyester, treated with fungicide for mildew resistance, not less than 14-oz./sq. yd. (475-g/sq. m) nylon-reinforced PVC, manufacturer's standard; with fire-test-response characteristics indicated, and lined with fire-retardant liner. Provide pads with hook-and-loop closure or attachments for the following components:
1. Post Standards: Wraparound style, designed to totally enclose each standard to a height of not less than 72 inches (1800 mm); one per post.
 2. Net Lines: Four per net.

3. Judges' Stands: Designed to totally enclose each unit.
 4. Fabric Cover Flame-Resistance Ratings: Complies with NFPA 701.
 5. Fabric Color: As selected by Architect from full range of industry standard colors and color densities.
 6. Graphics: Custom graphics as indicated.
- J. Post Standard Transporter: Manufacturer's standard wheeled unit designed for transporting a single post.
- K. Wall Storage Rack: Manufacturer's standard unit designed for mounting on walls and for storing post standards in vertical position with retaining arms, fittings for padlock, and mounting hardware; number of units as required to provide storage for specified equipment.
- L. Storage Cart: Manufacturer's standard wheeled unit designed for transporting and storing volleyball equipment and passing through 36-inch- (910-mm-) wide door openings. Fabricate welded-steel tubing units with heavy-duty casters, including no fewer than two swivel casters. Fabricate wheels from materials that do not damage or mark floors; number of units as required to provide transport and storage for specified equipment.

2.4 SAFETY PADS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. AALCO Manufacturing.
 2. ADP Lemco.
 3. Institutional Products, Inc.
 4. Jaypro Sports Construction Group.
 5. Performance Sports Systems; a Gared Holdings company.
 6. Porter Athletic, Inc.
 7. Spalding Equipment.
- B. Safety Pad Surface-Burning Characteristics: ASTM E 84 by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
1. Flame-Spread Index: 25 or less.
 2. Smoke-Developed Index: 450 or less.
- C. Pad Coverings: Provide safety pad fabric covering that is fabricated from puncture- and tear-resistant, PVC-coated polyester or nylon-reinforced PVC fabric, not less than 14-oz./sq. yd (475-g/sq. m) and treated with fungicide for mildew resistance; with surface-burning characteristics indicated, and lined with fire-retardant liner.
- D. Wall Safety Pads: Padded wall wainscot panels designed to be attached in a continuous row; each panel section consisting of fill laminated to backer board with visible surfaces fully covered by seamless fabric covering, free of sag and wrinkles and firmly attached to back of backer board.
1. Backer Board: Not less than 3/8-inch- (9.5-mm-) thick plywood, mat formed, or composite panel.
 2. Fill: Multiple-impact-resistance foam not less than 2-inch- (50-mm-) thick polyurethane, 3.5-lb/cu. ft. (56-kg/cu. m) density.

3. Fire-Resistive Fill: Multiple-impact-resistant foam not less than 2-inch- (50-mm-) thick, fire-resistive neoprene; 6.0-lb/cu. ft. (96-kg/cu. m) density.
 4. Size: Each panel section, 24 inches (600 mm) wide by not less than 72 inches (1800 mm) long.
 5. Number of Modular Panel Sections: As indicated.
 6. Installation Method: Concealed mounting, 2-clips.
 7. Fabric Covering Color(s): As selected by Architect from manufacturer's full range for one color.
- E. Corner Wall Safety Pads: Wall corner pad consisting of not less than 1-1/4-inch- (32-mm-) thick, multiple-impact-resistant, closed-cell, polyethylene-foam filler, covered on both sides and all edges by fabric covering with backer board and manufacturer's standard anchorage to wall.
1. Length: Each pad not less than 72 inches (1800 mm), matching length of wall safety pads.
 2. Fabric Covering Color: As selected by Architect from manufacturer's full range for one color.
- F. Cut-out Trim: Provide manufacturer's standard flanged cut-out trim kits for fitting pads around switches, receptacles, and other obstructions.
1. Color: Gray.

2.5 MATERIALS

- A. Aluminum: Alloy and temper recommended by manufacturer for use and finish type indicated.
1. Extruded Bars, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
 2. Cast Aluminum: ASTM B 179.
 3. Flat Sheet: ASTM B 209 (ASTM B 209M).
- B. Steel: Comply with the following:
1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
 2. Steel Tubing: ASTM A 500/A 500M or ASTM A 513, cold formed.
 3. Steel Sheet: ASTM A 1011/A 1011M.
- C. Support Cable: Manufacturer's standard galvanized-stranded-steel wire rope with a breaking strength of 7,000 lb (3,175 kg). Provide fittings complying with wire rope manufacturer's written instructions for size, number, and installation method.
- D. Support Chain and Fittings: For chains used for overhead lifting, provide Grade 80 heat-treated alloy steel chains, complying with ASTM A 391/A 391M, with commercial-quality, hot-dip galvanized or zinc-plated steel connectors and hangars.
- E. General-Purpose Chain: For chains not used for overhead lifting, provide carbon steel chain, complying with ASTM A 413/A 413M, Grade 30 proof coil chain or other grade recommended by gymnasium equipment manufacturer. Provide coating type, chain size, number, and installation method complying with manufacturer's written instructions.
- F. Castings and Hangers: Malleable iron, complying with ASTM A 47/A 47M; grade required for structural loading.

- G. Composite Wood Products: Products shall comply with the testing and product requirements of the California Department of Health Services "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- H. Softwood Plywood: DOC PS 1, exterior.
- I. Particleboard: ANSI A208.1; made with binder containing no urea formaldehyde.
- J. Equipment Wall-Mounted Board: Manufacturer's standard.
- K. Anchors, Fasteners, Fittings, and Hardware: Manufacturer's standard corrosion-resistant or noncorrodible units; concealed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for play court layout, alignment of mounting substrates, installation tolerances, operational clearances, accurate locations of connections to building electrical system, and other conditions affecting performance of the Work.
 - 1. Verify critical dimensions.
 - 2. Examine supporting structure, subfloors, and footings below finished floor.
 - 3. Examine wall assemblies, where reinforced to receive anchors and fasteners, to verify that locations of concealed reinforcements are clearly marked. Locate reinforcements and mark locations.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions and competition rules indicated for each type of gymnasium equipment. Complete equipment field assembly where required.
- B. Permanently Placed Gymnasium Equipment and Components: Install rigid, level, plumb, square, and true; anchored securely to supporting structure; positioned at locations and elevations indicated; in proper relation to adjacent construction; and aligned with court layout.
 - 1. Floor Insert Elevation: Coordinate installed heights of floor insert with installation and field finishing of finish flooring and floor-plate type.
 - 2. Operating Gymnasium Equipment: Verify clearances for movable components of gymnasium equipment throughout entire range of operation and for access to operating components.
- C. Cut-Out Trim: Limit cuts in face of padding from trim unit's corner-to-corner outside dimensions. Install with ends of cuts concealed behind trim flange.
- D. Anchoring to In-Place Construction: Use anchors and fasteners where necessary to secure built-in and permanently placed gymnasium equipment to structural support and to properly transfer load to in-place construction.

- E. Connections: Connect electric operators to building electrical system.
- F. Removable Gymnasium Equipment and Components: Assemble in place to verify that equipment and components are complete and in proper working order. Instruct Owner's designated personnel in properly handling, assembling, adjusting, disassembling, transporting, storing, and maintaining units. Disassemble removable gymnasium equipment after assembled configuration is approved by Owner, and store units in location indicated on Drawings.
- G. Adjust movable components of gymnasium equipment to operate safely, smoothly, easily, and quietly, free from binding, warp, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Lubricate hardware and moving parts.

3.3 CLEANING

- A. After completing gymnasium equipment installation, inspect components. Remove spots, dirt, and debris and touch up damaged shop-applied finishes according to manufacturer's written instructions.
- B. Replace gymnasium equipment and finishes that cannot be cleaned and repaired, in a manner approved by Architect, before time of Substantial Completion.

3.4 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain gymnasium equipment.

END OF SECTION 116623

SECTION 122413 -ROLLER WINDOW SHADES

PART 1 -GENERAL

1.1 SUMMARY

- A. Section includes manually operated sunscreen roller shades.
- B. Related Work:
 - 1. Section 084113 - Aluminum Framed Storefronts.
 - 2. Section 085113 - Aluminum Windows.
 - 3. Section 088000 - Glazing.

1.2 REFERENCES

- A. ASTM G 21 -Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- B. NFPA 70 -National Electrical Code.
- C. NFPA 701 -Fire Tests for Flame-Resistant Textiles and Films.

1.3 SUBMITTALS

- A. Submit under provisions of Section 013300.
- B. Manufacturer's data sheets on each product to be used, including:
 - 1 Preparation instructions and recommendations.
 - 2 Styles, material descriptions, dimensions of individual components, profiles, features, finishes and operating instructions.
 - 3 Storage and handling requirements and recommendations.
 - 4 Mounting details and installation methods.
- C. Shop Drawings: Plans, elevations, sections, product details, installation details, operational clearances, and relationship to adjacent work.
 - 1. Prepare shop drawings on AutoCAD.
- D. Window Treatment Schedule: For all roller shades. Use same room designations as indicated.
- E. Selection Samples: For each finish product specified, one set of shade cloth options and aluminum finish color samples representing manufacturer's full range of available colors and

patterns.

- F. Maintenance Data: Methods for maintaining roller shades, precautions regarding cleaning materials and methods, instructions for operating hardware and controls.

1.4 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Obtain roller shades through one source from a single manufacturer with a minimum of twenty years experience in manufacturing products comparable to those specified in this section.
- B. Installer Qualifications: Installer trained and certified by the manufacturer with a minimum of ten years experience in installing products comparable to those specified in this section.
- C. Fire-Test-Response Characteristics: Passes NFPA 701 small and large-scale vertical burn. Materials tested shall be identical to products proposed for use.
- D. Anti-Microbial Characteristics: 'No Growth' per ASTM G 21 results for fungi ATCC9642, ATCC 9644, ATCC9645.
- E. Mock-Up: Provide a mock-up (manual shades only) of one roller shade assembly for evaluation of mounting, appearance and accessories.
 - 1. Locate mock-up in window designated by Architect.
 - 2. Do not proceed with remaining work until mock-up is accepted by Architect.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver shades in factory-labeled packages, marked with manufacturer and product name, fire-test-response characteristics, and location of installation using same room designations indicated on Drawings and in the Window Treatment Schedule.

1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Install roller shades after finish work including painting is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.7 WARRANTY

- A. Roller Shade Hardware and Chain Warranty: Manufacturer's standard non-depreciating twenty-five year limited warranty.
- B. Standard Shadecloth: Manufacturer's standard twenty-five year warranty.
- C. Roller Shade Installation: One year from date of Substantial Completion, not including scaffolding, lifts or other means to reach inaccessible areas.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, available manufacturer's products that may be incorporated into the work include, but are not limited to, the following: MechoShade Systems, Inc., located at: 42-03 -35th St.; Long Island City, NY 11101; Tel: 718-7292020; Web: www.mechoshade.com. Local Chicago-area manufacturer's representatives: Nathan Chapin, Ltd.; Tel: 773-506-8008; Email: ncltd1@ameritech.net or karenl@mechoshade.com

2.2 ROLLER SHADE TYPES

- A. Manually Operated Shades:
- 1 Mounting: Surface mounted with fascia.
 - 2 Configuration: Single solar shade cloth.
 - 3 Solar Shade cloths:
 - a. Fabric: ThermoVeil 3000 satin texture, visually translucent, dense twill-weave pattern at 2 percent open.

2.3 SHADE CLOTH

- A. Visually Transparent Shade cloth: MechoShade Systems, Inc., ThermoVeil series, single thickness non-raveling 0.030-inch (0.762 mm) thick vinyl fabric, woven from 0.018-inch (0.457 mm) diameter extruded vinyl yarn comprising of 21 percent polyester and 79 percent reinforced vinyl.

2.4 SHADE BAND

- A. Shade Bands: Construction of shade band includes the fabric, the hem weight, hem-pocket, shade roller tube, and the attachment of the shade band to the roller tube. Sewn hems and open hem pockets are not acceptable.
1. Hem Pockets and Hem Weights: Fabric hem pocket with RF-welded seams (including welded ends) and concealed hem weights. Hem weights shall be of appropriate size and weight for shade band. Hem weight shall be continuous inside a sealed hem pocket. Hem pocket construction and hem weights shall be similar, for all shades within one room.
 2. Shade Band and Shade Roller Attachment:
 - a. Use extruded aluminum shade roller tube of a diameter and wall thickness required to support shade fabric without excessive deflection. Provide for positive mechanical engagement with drive / brake mechanism.
 - b. Provide for positive mechanical attachment of shade band to roller tube; shade band shall be made removable / replaceable with a "snap-on" snap-off" spline mounting, without having to remove shade roller from shade brackets.
 - c. Mounting spline shall not require use of adhesives, adhesive tapes, staples, and/or rivets.
 - d. Any method of attaching shade band to roller tube that requires the use of: adhesive, adhesive tapes, staples, and/or rivets are not acceptable.

2.5 SHADE FABRICATION

- A. Fabricate units to completely fill existing openings from head to sill and jamb-to-jamb, unless specifically indicated otherwise.

- B. Provide battens in standard shades as required to assure proper tracking and uniform rolling of the shadebands. Contractor shall be responsible for assuring the width-to-height (W:H) ratios shall not exceed manufacturer's standards or, in absence of such standards, shall be responsible for establishing appropriate standards to assure proper tracking and rolling of the shadecloth within specified standards. Battens shall be roll-formed stainless steel or tempered steel, as required.

2.6 COMPONENTS

A. Access and Material Requirements:

1. Provide shade hardware allowing for the removal of shade roller tube from brackets without removing hardware from opening and without requiring end or center supports to be removed.
2. Provide shade hardware that allows for removal and re-mounting of the shade bands without having to remove the shade tube, drive or operating support brackets.
3. Use only Delrin engineered plastics by DuPont for all plastic components of shade hardware. Styrene based plastics, and /or polyester, or reinforced polyester will not be acceptable.

B. Manual Operated Chain Drive Hardware and Brackets:

1. Provide for universal, regular and offset drive capacity, allowing drive chain to fall at front, rear or non-offset for all shade drive end brackets. Universal offset shall be adjustable for future change.
2. Provide hardware capable for installation of a removable fascia, for both regular and/or reverse roll, which shall be installed without exposed fastening devices of any kind.
3. Provide shade hardware system that allows for removable regular and/or reverse roll fascias to be mounted continuously across two or more shade bands without requiring exposed fasteners of any kind.
4. Provide shade hardware system that allows for operation of multiple shade bands (multi-banded shades) by a single chain operator, subject to manufacturer's design criteria. Connectors shall be offset to assure alignment from the first to the last shade band.
5. Provide positive mechanical engagement of drive mechanism to shade roller tube. Friction fit connectors for drive mechanism connection to shade roller tube are not acceptable
6. Provide shade hardware constructed of minimum 1/8-inch (3.18 mm) thick plated steel or heavier as required to support 150 percent of the full weight of each shade.
7. Drive Bracket / Brake Assembly:
 - a. MechoShade Drive Bracket model M5 shall be fully integrated with all MechoShade accessories, including, but not limited to: SnapLoc fascia, center supports and connectors for multi-banded shades.
 - b. M5 drive sprocket and brake assembly shall rotate and be supported on a welded 3/8 inch (9.525 mm) steel pin.
 - c. The brake shall be an over-running clutch design which disengages to 90 percent during the raising and lowering of a shade. The brake shall withstand a pull force of 50 lbs. (22 kg) in the stopped position.
 - d. The braking mechanism shall be applied to an oil-impregnated hub on to which the brake system is mounted. The oil impregnated hub design includes an articulated brake assembly, which assures a smooth, non-jerky operation in raising and lowering the shades. The assembly shall be permanently lubricated. Products that require externally applied lubrication and or not permanently

lubricated are not acceptable.

e. The entire M5 assembly shall be fully mounted on the steel support bracket, and fully independent of the shade tube assembly, which may be removed and reinstalled without effecting the roller shade limit adjustments.

f. Drive Chain: #10 qualified stainless steel chain rated to 90 lb. (41 kg) minimum breaking strength. Nickel plate chain shall not be accepted.

2.7 ACCESSORIES

A. Fascia:

1. Continuous removable extruded aluminum fascia that attaches to shade mounting brackets without the use of adhesives, magnetic strips, or exposed fasteners.
2. Fascia shall be able to be installed across two or more shade bands in one piece.
3. Fascia shall fully conceal brackets, shade roller and fabric on the tube.
4. Provide bracket / fascia end caps where mounting conditions expose outside of roller shade brackets.
5. Notching of Fascia for manual chain shall not be acceptable.

B. Chain Retainer:

1. Provide and install chain retainer on manually operated shades.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. Install roller shades level, plumb, square, and true according to manufacturers written instructions, and located so shade band is not closer than 2 inches (50 mm) to interior face of glass. Allow proper clearances for window operation hardware.
- B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- C. Clean roller shade surfaces after installation, according to manufacturer's written instructions.
- D. Engage Installer to train Owner's maintenance personnel to adjust, operate and maintain roller shade systems.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 122413

SECTION 142020 - ELEVATORS AND LIFTS

PART 1. GENERAL

1.1 SECTION INCLUDES

- A. Commercial wheelchair lift.

1.2 RELATED SECTIONS

- A. Division 16 Sections for electrical service for elevators to and including disconnect and fused switches at machine room.
- B. Division 16 Sections for standby power source, transfer switch, and connection from auxiliary contacts in transfer switch to controller.
- C. Section 03300 - Cast-in-Place Concrete: Concrete for elevator machine foundation, and pit.
- D. Section 06100 - Rough Carpentry: Hoistway framing, building-in hoistway door frames and overhead hoist beams.
- E. Section 09650 - Resilient Flooring: Floor finish in cab.
- F. Section 09900 - Paints and Coatings: Interior transparent wood finish in cab.
- G. Section 13850 - Detection and Alarm: Fire and smoke detectors and interconnecting devices.

1.3 REFERENCES

- A. American National Standards Institute (ANSI) B-29.2 - Chain Standards for Inverted Tooth (Silent) Chains and Sprockets.
- B. American Society of Mechanical Engineers (ASME) A17.1 - Safety Code for Elevators and Escalators.
- C. American Society of Mechanical Engineers (ASME) A18.1 - Safety Standard for Platform and Stairway Chair Lifts.
- D. CSA B44.1 - Elevator and Escalator Electrical Equipment.
- E. CSA B355 - Lifts for Persons with Physical Disabilities.
- F. CSA B613 - Private Residence Lifts for Persons with Physical Disabilities.
- G. U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)".
- H. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- I. NFPA 70 - National Electric Code.
- J. CSA - National Electric Code.

1.4 REQUIREMENTS OF REGULATORY AGENCIES:

- A. Fabricate and install work in compliance with applicable jurisdictional authorities.
- B. File shop drawings and submissions with local authorities as the information is made available. Company pre-inspection and jurisdictional authority inspections and permits are to be made on timely basis as required.

1.5 SUBMITTALS

- A. Submit under provisions of Section 013000.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Provide a complete layout of lift equipment detailing dimensions and clearances as required.
- D. Selection Samples: For each finish product specified requiring selection of color or finish, two complete sets of color charts representing manufacturer's full range of available colors and patterns.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications:
 - 1. Skilled tradesmen shall be employees of the installing contractor approved by the manufacturer, with demonstrated ability to perform the work on a timely basis.
 - 2. Execute work of this section only by a company that has adequate product liability insurance.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.8 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install systems under environmental conditions outside manufacturer's absolute limits.

1.9 WARRANTY

- A. Coverage - this warranty applies to the repair or replacement, at Manufacturer's option, of parts that fail due to defective material or workmanship. Manufacturer may, at its option, provide factory reconditioned parts. This warranty is provided to the Authorized Dealer on behalf of the final purchaser of the product and is not transferable. The Manufacturer's warranty does not cover labor charges for the removal, repair or replacement of warranty parts but such costs may be covered for a period of time by Authorized Dealer's warranty, which is provided to purchaser separately.

1. The manufacturer shall offer a 36-month limited warranty on parts from date of shipment.

PART 2. PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Manufacture: Subject to compliance with requirements, provide products by Savaria, which is located at 2 Walker Drive, Brampton, ON, Canada, L6T 5E1; Toll Free Tel: 800-661-5112; Tel: 905-791-5555; Fax: 905-791-2222; Web: www.savaria.com.
 1. All other manufacturers: Submit formal substitution request prior to bid in accordance with Section 012500 - "Substitution Procedures".
- B. Approval by Architect of other manufacturers does not relieve Contractor of responsibility to provide products which comply with all requirements of the specification.

2.2 COMMERCIAL WHEELCHAIR LIFT

- A. Hydraulic Vertical Platform Lifts: Savaria V1504:
- B. Hydraulic Vertical Platform Lift: The lift described here, manufactured by Savaria Lifts Inc, is a vertical platform lift consisting of a hydraulic tower with a lifting platform. The platform is made to accommodate a wheelchair user or a person with impaired mobility. The lift can be used indoor and in commercial applications.
- C. Work described in this section includes providing equipment, incidental material and labor required for complete, operable roped hydraulic wheelchair lift installation. Lifts shall be erected, installed, adjusted, tested and placed in operation by lift system manufacturer, or manufacturer's authorized installer.
 1. Lifts shall be in accordance:
 - a. ASME A18.1 and ADAAG compliant (USA)
 - b. ASME A18.1 and A117.1 compliant (USA)
 - c. ASME 18.1 only (USA)
- D. The following preparatory work to receive the lifts specified in this section is part of the work of other sections:
 1. Permanent 120 VAC, 20 amp single phase power to operate lift to be provided from a lockable fused/cartridge type disconnect switch with auxiliary contacts for battery operation. Refer to drawings for permanent power specifications and location of disconnects. Temporary power may be provided to expedite installation of lift.
 2. Provide rough openings per lift contractor's shop drawings.
 3. Provide substantial, level pit floor slab as indicated on the lift contractor's shop drawings.
- E. Characteristics:
 1. Rated Load: 750 lb (340 kg).
 2. Rated Speed: 20 fpm (0.10 m/s).
 3. Car Dimensions:
 - a. 42 inches W by 60 inches D (1067 mm by 1524 mm)

4. Levels Serviced:
 - a. 2.
 5. Car Configuration:
 - a. (1) Enter/Exit same side; West lift 131.
 6. Travel: Field Verify Final Travel Distance.
 - a. West Lift Travel: 10'-9".
 7. Pit Depth:
 - a. 3" – Standard
 8. Installation Environment
 - a. Indoor (interior install)
 9. Powder Coat Finish
 - a. Optional Color – From manufactures color chart
 10. Operation: Constant pressure.
 11. Power Supply: 110 volt, 20 amp, 1 phase, 60 Hz.
 12. Drive System: 2:1 Roller chain hydraulic.
 13. Emergency Power:
 - a. 24VDC Battery raising and lowering
 14. Controller: Relay logic based controller.
 15. Motor/Pump: 1HP (112 kw), gear type
- F. Car Enclosure:
1. West Lift 131: Side Guards of platform shall have a steel frame with a powder coat finish and steel panel inserts to a minimum of 80 inches (2032 mm) above the upper landing. A steel ceiling with an egg crate insert and 4 x LED lights shall be provided.
- G. Doors and Gates:
1. First landing door:
 - a. Door type: 80" low profile aluminum door with a concealed electro/mechanical interlock for both West and South Lift.
 - b. Flush closing operation with hoistway side.
 - c. Operation
 - 1) Automatic - Concealed 24 volt door opener with battery back-up for fire-rated door.
 - d. Door Width
 - 1) 36 inches (889 mm) clear opening.
 2. Upper landing door/gate:
 - a. Door/gate type:
 - 1) West Lift: 80" High 1-1/2 hour UL/ULC fire-rated Prodoor with concealed hinges and a concealed electro/mechanical interlock..
 - b. Flush closing operation with enclosure side.
 - c. Operation
 - 1) West Lift: Automatic - Concealed 24 volt door opener with battery back-up for fire-rated door.
 - d. Door/Gate Width
 - 1) 36 inches (889 mm)
- H. Finish enclosed lift doors opening from door frame to rough opening CMU. Refer to note on Lift Sections regarding finish closure cap at both inside and outside of jambs and head conditions.
- I. Call Stations: Provide flush, surface or door frame mounted landing call/send stations.
1. Call stations will be:

- a. Keyed (removable in on/off position)
- J. Car Operation:
 - 1. Car Operating Panel shall consist of constant pressure buttons, emergency stop/alarm button, on/off key switch and emergency LED light mounted on a removable stainless steel panel (Type 304 #4 Stainless Steel Finish).
 - 2. Auxiliary lighting: The car shall be equipped with a battery operated LED light fixture. The battery shall be the rechargeable type with an automatic recharging system.
- K. Pumping Unit and Control:
 - 1. The pumping unit and control shall be enclosed in the tower. The controller and pump unit shall be pre-wired and tested prior to shipment. The controller is to be relay logic based operation for ease of maintenance and service. Pump unit shall incorporate the following features:
 - 2. Adjustable pressure relief valve.
 - 3. Manually operable down valve to lower lift in the event of an emergency. This valve shall be activated from outside of the hoistway through a keyed box.
 - 4. Pressure gauge isolating valve, manually operable.
 - 5. Gate valve to isolate cylinder from pump unit.
 - 6. Electrical solenoid for down direction control.
 - 7. Emergency Operation - A manual lowering device shall be located outside the hoistway in a lockable box positioned at a lower landing.
- L. Cylinder And Plunger:
 - 1. The cylinder shall be constructed of steel pipe of sufficient thickness and suitable safety margin. The top of the cylinder shall be equipped with a cylinder head with an internal guide ring and self-adjusting packing.
 - 2. The plunger shall be constructed of a steel shaft of proper diameter machined true and smooth. The plunger shall be provided with a stop electrically welded to the bottom to prevent the plunger from leaving the cylinder.
- M. Roller Chains: Two No.50 roller chains with 5/8 inch (16 mm) pitch. Minimum breaking strength 6100 lb (2773 kg) each.
- N. Leveling Device:
 - 1. The lift shall be provided with an anti-creep device which will maintain the carriage level within 1/2 inch (12 mm) of each landing.
 - 2. All limit switch and leveling device switches shall be located in a position to be inaccessible to unauthorized persons. They shall be located behind the mast wall and be accessible through removable panels.
- O. Guide Yoke: The 2:1 guide yoke/sprocket assembly shall be supplied with idler sheaves, roller guide shoes, bearings and guards.
- P. Terminal Stopping Devices: Normal terminal stopping devices shall be provided at top and bottom of runway to stop the car positively and automatically.
- Q. Guide Rails and Brackets: Steel 'C' guide rails and brackets shall be used to guide the platform and sling. Guide rails shall form part of the structural integrity of the unit and be integral to the mast enclosure, ensuring stability and minimum platform deflection when loaded.
- R. Car Sling: Car sling shall be fabricated from steel tubing 44 inches (1116 mm) high with adequate bracing to support the platform and car enclosure. Roller guide shoes shall be mounted on the top and bottom of the car sling to engage the guide rails. Guide shoes shall be roller type with 3 inches (76 mm) diameter wheels. Nylon guide shoes shall not be used for better ride quality and durability.

- S. Wiring: All wiring and electrical connections shall comply with applicable codes. Insulated wiring shall have flame-retardant and moisture-proof outer covering and shall be run in conduit or electrical wire ways if located outside the unit enclosure. Quick disconnect harnesses shall be used when possible.

PART 3. EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until hoistway and machine room has been properly prepared.
- B. Site dimensions shall be taken to verify that tolerances and clearances have been maintained and meet local regulations.
- C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
- D. Clean surfaces thoroughly prior to installation.
- E. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 ELEVATOR INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install the components of the elevator system that are required and that are required by jurisdictional authorities to license the elevator.
- C. Trained employees of the elevator contractor shall perform installation work.
- D. Adjust elevator for proper operation and clean unit thoroughly.
- E. Instruct users in operating procedures and owner's maintenance person in trouble-shooting and maintenance procedures.

3.4 LIFT INSTALLATION

- A. Install all the components of the lift system that are specified in this section to be provided, and that are required by jurisdictional authorities to license the lift.
- B. Trained employees of the lift contractor shall perform all installation work of this section.
- C. Adjust lift for proper operation and clean unit thoroughly.
- D. Instruct users in operation procedures and Owner's maintenance person in trouble-shooting and maintenance procedures.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 144233 - CURVE INCLINE WHEELCHAIR LIFT: OMEGA

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Indoor inclined platform wheelchair lifts.

1.2 RELATED SECTIONS

- A. Section 033000 - Cast-In-Place Concrete: Anchor placement in concrete.
- B. Section 042000 - Unit Masonry.
- C. Division 26 - Electrical: Electrical power service and wiring connections.
- D. Division 26 - Electrical: Concealed low voltage control wiring.

1.3 REFERENCES

- A. ASME A17.5 - Elevator and Escalator Electrical Equipment.
- B. ASME A18.1a 2001 - Safety Standard for Platform Lifts and Stairway Chairlifts.
- C. CSA B355 - Lifts for Persons with Physical Disabilities.
- D. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- E. NFPA 70 - National Electric Code.
- F. CSA - National Electric Code.

1.4 SUBMITTALS

- A. Submit under provisions of Section 013000.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Submit manufacturer's installation instructions, including preparation, storage and handling requirements.
 - 2. Include complete description of performance and operating characteristics.
 - 3. Show maximum and average power demands.
- C. Shop Drawings:
 - 1. Show typical details of assembly, erection and anchorage.
 - 2. Include wiring diagrams for power, control, and signal systems.
 - 3. Show complete layout and location of equipment, including required clearances.
- D. Selection Samples: For each finished product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finished product specified, two samples, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Firm with minimum 5 years documented experience in

manufacturing of inclined wheelchair platform lifts.

- B. Installer Qualifications: Firm licensed to install equipment of this scope, with evidence of experience with specified equipment. Installer shall maintain an adequate stock of replacement parts and have qualified people available to ensure timely maintenance and callback service at the project site.

1.6 REGULATORY REQUIREMENTS

- A. Provide platform lifts in compliance with:
 - 1. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
 - 2. ASME A17.5 - Elevator and Escalator Electrical Equipment.
 - 3. NFPA 70 - National Electric Code.
- B. Seismic Design: In accordance with seismic risk zone rating in accordance with local code, if required.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store components off the ground in a dry covered area, protected from adverse weather conditions.

1.8 PROJECT CONDITIONS

- A. Do not use wheelchair lift for hoisting materials or personnel during construction period.

1.9 WARRANTY

- A. Warranty: Provide a three (3) year limited warranty covering replacement of defective parts and excluding labor. Preventive maintenance agreement required.

1.10 MAINTENANCE SERVICE

- A. Furnish service and maintenance for elevator system and components for the following period from Date of Substantial Completion.
 - 1. Three years.
- B. Include systematic examination, adjustment, and lubrication of elevator equipment. Repair or replace parts whenever required. Use parts produced by manufacturer of original equipment. Replace wire ropes when necessary to maintain required factor of safety.
- C. Provide emergency call back service for this maintenance period.
- D. Perform maintenance work using competent and qualified personnel approved by elevator manufacturer or original installer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product by Savaria Concord Lifts Inc.: 107 Alfred Kuehne Blvd, Brampton, Ontario, L6T 4K3 Toll Free:

800-661-5112. Tel: (905) 791-5555. Fax: (905) 791-2222 Email: info@savaria.com; Web
www.savaria.com, or comparable product acceptable to Owner.

2.2 STAIR LIFT FOR STRAIGHT OR TURNING STAIRWAYS

- A. Inclined Platform Lift: Savaria Stair-Lift, Model Omega inclined platform lift for straight and turning stairways. Lift consists of a tubular guide rail system, a folding platform that is moved along the guide rails by a rope sprocket drive system, overspeed safety system and call stations at each landing. Conform to the following design requirements:
1. Application:
 - a. Indoor.
 2. Platform Load Rating: 550 lb (250 kg) with minimum safety factor of 5.
 3. Travel Speed: 14 fpm (0.07 m/s) nominal
 4. Platform Deck: 16 gauge (1.6 mm) sheet metal coated with electrostatically applied and baked anti-skid paint.
 - a. Platform Size A (ADA Compliant): 30.50 in (775 mm) wide by 49.20 in (1250 mm) long.
 5. Platform Operation:
 - a. Automatic Fold: Folded and unfolded electrically from the call station.
 - b. Emergency Manual Fold: When unit is left in the open position, platform may be manually folded and retained in closed position.
 6. Under Platform Obstruction Sensing:
 - a. Provide an under platform sensing device to stop the platform from traveling in the downward direction when encountering 4 lb (1.8 kg) of pressure.
 - b. Platform is permitted to travel in the opposite direction of obstruction to allow clearing.
 7. Passenger Restraining Arms:
 - a. Platform equipped with retractable passenger restraining arms in compliance with ASME A18.1a.
 - b. Arms stop moving when an obstruction is encountered and will immediately retract when the signal is removed.
 - c. Provide with means to manually unlock and open the restraining arms for passenger emergency evacuation.
 - d. Arms are folded and unfolded electrically from the call stations or platform controls.
 - e. Arms mounted 39 in (990 mm) above the platform deck. When in guarding position the arms are located above the perimeter of the platform.
 - f. The gaps between ends of arms shall not exceed 4 in (100 mm).
 8. Boarding Ramps:
 - a. Provide boarding sides of platform with retractable ramps positioned for travel at a height of 6 in (152 mm) measured vertically above the platform deck.
 - b. Lock ramps in their guarding positions during travel. When the platform is at the landing, only the retractable ramp servicing the landing shall be operable.
 - c. Ramps shall be folded and unfolded electrically.
 - d. Retractable ramps, in the guarded position, shall withstand a force of 125 lb (556 N) applied on any 4 in (100 mm) by 4 in (100 mm) area. This force shall not cause the height of the ramp, at any point in its length, to be less than 6 in (152 mm) measured vertically above the platform deck.
 - e. Provide a means to manually unlock the ramps for emergency evacuation when platform is located at a landing.
 - f. Provide with a directional obstruction sensitive device on the travel direction side end of the platform to stop lift when an obstacle of 15 lbf (70 N) is encountered. Platform is permitted to travel in the opposite direction of obstruction to allow clearing.
 - g. When platform folds, passenger restraining arms shall fold down and be covered by the folded platform.
 9. Platform Side Wall:

- a. Provide non-boarding and non-guide-rail side of the platform with a sidewall of not less than 6 in (152 mm) in height, measured vertically from the platform deck.
10. Hand Grips:
 - a. Equip platform with one handgrip centered on the platform at 36.50 in (925mm) and 12 in (305mm) long
11. Clearance Dimensions:
 - a. When folded platform shall not protrude more than 17.50 in (445 mm) from mounting surface.
 - b. When unfolded and in use platform shall not protrude more than 41.50 in (1050 mm) from wall.
12. Controls:
 - a. Platform Controls: 24 V Low Voltage type.
 - b. Platform equipped with emergency stop switch located within reach of the passenger 43 in (1090 mm) above platform deck. When activated emergency stop button shall cause electric power to be removed from the drive system stopping lift immediately.
 - c. Operating controls shall be two separate constant pressure buttons with directional arrows on a removable hand pendant device with emergency stop button.
 - d. When platform arrives at landing the user keeps pressing the directional button and the passenger restraining arms and boarding ramp shall unfold automatically allowing passenger to disembark.
 - e. Platform shall be equipped for:
 - 1) Keyed operation.
13. Passenger Seat: Fold-down type with safety belt. Minimum rated load of 250 lb (115 kg).
14. Side Loading Platform: Provide with automatic folding ramps and kickplates at boarding sides of platform.
15. Platform Security Lock: Provide mechanical locking system to prevent unauthorized unfolding of the platform.
16. Attendant Hand Held Pendant Control: Provide with plug-in socket on platform control panel.
17. Pedestrian Audio Alert: Provide chime mounted on platform to indicate platform is folded up and in motion, traveling on stairway.
18. Platform On Board Emergency Alarm: Provide platform with on board alarm that sounds when emergency stop button is pushed.
19. Remote Platform Boarding: Platform shall travel beyond standard boarding position to remote boarding location away from stairs. Provide with ramp extensions 3 inch (76 mm) extruded aluminum added to the boarding ramps.
20. Under Carriage Sensing: Provide bottom of platform hanger with a sensing plate to stop the platform from traveling in the downward direction when encountered with 4 lb (1.8Kg) of pressure. It shall be possible to drive the platform away from the obstruction.
21. Side of Carriage Obstruction Device: Provide a sensor that detects obstructions in the path of the side of the hanger. Lift shall stop immediately and not travel until the obstruction is removed. It shall be possible to drive the platform away from the obstruction.

B. Drive and Guide Rail System

1. Operation:
 - a. Motor: 1.0 hp (0.75kW) electric motor with an integrated brake (Up to 3.0 hp (2.2 kW) over 100 ft (30m) of travel).
 - b. Required power: 208-240 VAC, single phase, 60 hz. on a dedicated 20 amp circuit. Rated current shall be up to 9 amps (for 2.2kW motor) for operation with rated load.
 - c. Locate roped sprocket drive system consisting of a motor, gearbox and controller (AC Drive) at the upper end of the tubes.
 - d. Equip drive with an emergency manual lowering system with kill switch when emergency manual lowering system is engaged.

2. Full enclosed Drive Cabinet:
 - a. Cabinet: 22 in (560 mm) wide by 55 in (1400 mm) high by 11.50 in (290 mm) deep located at top landing.
 - b. Cabinet door is key locked and monitored with an electrical cutout safety switch.
 - c. Provide an integrated lockable main disconnect switch and breaker remotely located and separate from the drive cabinet.
 3. Compact Drive Cabinet with Separate Control Box:
 - a. Compact drive cabinet will house all mechanical drive system components and shall be located at the end of the tube system at top landing.
 - b. Controller box will contain all the electrical components of the drive system and be located up to 50 feet (15 m) linear away from the compact drive. Control box dimensions are 20 in (510 mm) wide by 20 in (510 mm) high by 11.50 in (290 mm) deep.
 - c. Provide an integrated lockable main disconnect and breaker in the compact drive control box.
 4. Guide Rail:
 - a. Construct of two 2 in (51 mm) diameter steel tubes spaced 22 in (560 mm) apart vertically at right angle from rail. Tubes will run parallel to the stairs and horizontal to landings throughout the length of travel.
 - b. When negotiating a horizontal landing a third 2 in (51 mm) diameter steel tube shall be added to the tube system to guide and stabilize platform.
 - c. Tube system shall not protrude more than 7.50 in (190 mm) from the wall with support posts.
 - d. Suspension means contained in the tubes shall be a 3/8 in (9 mm) diameter galvanized steel core wire rope with a minimum breaking strength of 12 540 lb (5700 kg).
 - e. Locate overspeed safety at the bottom of the tube assembly and shall consist of a mechanical overspeed sensor and brake with electrical drive cut-out protection.
 - f. Provide a final limit switch at the upper and lower end of the tubes to stop the platform if it travels past the normal terminal stopping device.
 5. Auxiliary Power: Provide battery back-up system (UPS) for normal up / down lift operation during power failure for a minimum of five (5) trips with rated load.
 6. Buck Boost Transformer:
 - a. Input Voltage: 120/240VAC
 - b. Output Voltage: 16/32VAC
 - c. VA Rating: 1kVA
 - d. Phase: 1
 - e. Hz: 60
 - f. Temp. Rise: 115 Degrees C.
 - g. Mounting: Wall
 - h. Enclosure Type: Indoor/Outdoor
 - i. Mfr. Warranty: 10 Years
 7. Platform Storage Beyond Upper/Lower Landings:
 - a. Platform shall travel in the folded position beyond the upper landing at the top stair nose to a remote parking position away from the stairs.
 - b. Platform shall travel in the folded position beyond the lower landing to a remote parking position. Provide with a ramp extension for this configuration.
 8. Final Limit Switch at Lower Landing: Platform will land over a flight of stairs and will have a final lower limit switch.
 9. Rail Mounting:
 - a. Direct Mount Solid Walls: Rails directly mounted to the stairway wall; and Tower Mount Struts: Provide with 2.50 in (65 mm) by 2.50 in (65 mm) hollow structural steel tubular posts to support the guide rails (see plan layout).
- C. Pedestrian Handrail Integrated with Guide Rail:
1. A third rail acting as a handrail shall be added where existing handrails are either removed or blocked by the lifting equipment (when possible).
 2. The handrail gripping surface shall have a smooth gripping surface 1.50 in (38 mm) in

- diameter.
- 3. Handrail shall be in the same vertical plane as the guide rail system.
- 4. Handrails shall be mounted to the tube assembly.
- D. Call Stations:
 - 1. Provide a call station at each serviced landing.
 - 2. Call stations, 24 V low voltage with four control buttons: one touch platform fold, one touch platform unfold and two directional call and send buttons.
 - 3. Call stations shall be equipped for:
 - a. Keyed operation.
 - 4. Provide Attendant Call buttons on each call station when required.
 - 5. Call Station Mounting:
 - a. Lower landing call station.
 - 1) Provide surface mounted call station.
 - b. Upper landing call station.
 - 1) Provide surface mounted call station on guide rail drive box.
- E. Additional Safety or Code Requirements
 - 1. Wall Mounted Audio Visual Alerts: Provide with adjustable volume control that sound while the lift is in operation and are visible by pedestrian traffic from all flights and landings.
 - 2. Building Fire Alarm Integration: Coordinate to connect the lift control system with the building fire alarm system. If the lift is not in operation when the building fire alarm system is activated power will be cut to the lift preventing use during fire evacuation. If the lift is in use when the building fire alarm system is activated, the lift shall only allow the passenger to travel to the designated landing with the emergency exit.
- F. Finish Environment Requirements:
 - 1. Design and fabricate lift to manufacturer's standard design for indoor location.
 - 2. Stainless Steel Components (optional): Design and fabricate lift using the following:
 - a. Guide rails shall be supplied in stainless steel.
 - b. Handrails shall be supplied in stainless steel.
 - c. Support towers shall be supplied in stainless steel.
 - d. Drive box shall be supplied in stainless steel.
 - e. Wall mounted audio visuals shall be supplied in stainless steel.
 - f. Platform sensing plate shall be supplied in stainless steel.
 - g. Fasteners for rail assembly and anchoring shall be supplied in stainless steel.

END OF SECTION
Revision 001, jan 2012

SECTION 220503 - PLUMBING PIPING

PART 1 – GENERAL

1.1 WORK INCLUDES

- A. Section includes piping, valves, fittings, and connections for the following piping systems:
 - 1. Sanitary Sewer.
 - 2. Domestic Water.

1.2 RELATED WORK

- A. Section 224001 - Plumbing Specialties.
- B. Section 230529 - Supports and Anchors.
- C. Section 230553 - Mechanical Identification.
- D. Section 230701 - Piping Insulation.

1.3 REFERENCES

- A. ASME B13 - Malleable Iron Threaded Fittings.
- B. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings Class 25, 125, 250 and 800.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
- D. ASME B16.22 - Wrought Copper and Bronze Solder Joint Pressure Fittings.
- E. ASME B16.26 - Cast Bronze Fittings for Flared Copper Tubes.
- F. ASME B31.9 - Building Service Piping.
- G. ASME B123 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- H. ASME B129 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- I. ASTM A53 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- J. ASTM A518-92e1 Standard Specification for Corrosion-Resistant High Silicon Iron Castings.
- K. ASTM A861-94e1 Standard Specification for Corrosion-Resistant High Silicon Iron Castings.

- L. ASTM B32 - Solder Metal.
- M. ASTM B42 - Seamless Copper Pipe.
- N. ASTM B88 - Seamless Copper Tube.
- O. ASTM B306 - Copper Drainage Tube (DWV).
- P. ASTM C564 - Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- Q. ASTM C1053-95e1 - Standard Specification for Borosilicate Glass Pipe and fittings for Drain, Waste, and Vent (DWV) Applications.
- R. ASTM D2000-96 - Standard Classification System for Rubber Products in Automotive Applications (Grade 'E' EPDM Gasket Materials).
- S. ASTM E814 - Fire Tests of Through-Penetration Fire Stops.
- T. ASTM F477 - Elastomeric Seals (Gaskets) for Joining Plastic Pipe.
- U. ASTM F708 - Design and Installation of Rigid Pipe Hangers.
- V. AWS A5.8 - Brazing Filler Metal.
- W. AWWA C105 - Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids.
- X. AWWA C110 - Ductile - Iron and Gray - Iron Fittings 3 in. through 48 in., for Water and Other Liquids.
- Y. AWWA C111 - Rubber-Gasket Joints for Ductile Iron and Gray-Iron Pressure Pipe and Fittings.
- Z. AWWA C151 - Ductile-Iron Pipe, Centrifugally Cast in Metal Molds or Sand-Lined Molds, for Water or Other Liquids.
- AA.AWWA C651 - Disinfecting Water Mains.
- BB.CISPI 301 - Cast Iron Soil Pipe and Fittings for Hubless Cast Iron Sanitary Systems.
- CC.CISPI 310 - Joints for Hubless Cast Iron Sanitary Systems.
- DD.MSS SP58 (Manufacturers Standardization Society of the Valve and Fittings Industry) - Pipe Hangers and Supports - Materials, Design and Manufacturer.
- EE. MSS SP69 - Pipe Hangers and Supports - Selection and Application.

FF. MSS SP89 - Pipe Hangers and Supports - Fabrication and Installation Practices.

GG.UL 1479 - Fire Tests of Through-Penetration Firestops.

HH.ASHRAE 90A - Energy Conservation in New Building.

1.4 SUBMITTALS

- A. Submit product data under provisions of Division 01 Specification Sections.
- B. Product Data: Provide data on pipe materials; pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- C. Manufacturer's Installation Instructions: Submit installation instructions for pumps, valves and accessories.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Submit preliminary valve chart indicating naming/location conventions along with piping shop drawings for preliminary approval.
- F. Piping Shop Drawings:
 - 1. Submit 1/8 inch scale drawings for the piping systems, showing the pipe sizes, pipe material, location, elevations, invert elevations, slopes of horizontal runs, ejector basins, manholes, cleanouts, fittings, accessories, piping expansion devices, valves, meters, gauges, offsets, rises, drops, coordination amongst other trade contractors and connections.
 - 2. Piping Shop drawings shall be prepared with building architectural layout in the background.
 - 3. REPRODUCTIONS OF THE CONTRACT DOCUMENTS BY ANY MEANS (ELECTRONIC, MAGNETIC STORAGE MEDIA, PHOTOGRAPHIC, ETC.) WILL NOT BE ACCEPTED FOR REVIEW.
 - 4. CAD (Computer Aided Design) drawing files in AutoCAD Release 2002 *.DWG file format, will be made available to the Awarded Plumbing Contractor for a nominal processing fee of \$250.00. This is to cover Metro Design Associates, Inc.'s administrative processing costs of making such files available to the Plumbing Contractor. The Contractor must agree to sign an indemnity waiver eliminating Metro Design Associates, Inc. from any inaccuracies or harm caused by using these files. This service does not fall under the restrictions of Paragraph No. 3, above.
 - 5. CONTRACTOR SHALL REVIEW ALL SUBMITTALS PRIOR TO SUBMITTING THEM FOR THE ARCHITECT/ENGINEER'S REVIEW. CONTRACTOR SHALL STAMP EACH DRAWING AND EACH PIECE OF PRODUCT DATA TO CERTIFY THAT HE HAS REVIEWED IT. ARCHITECT/ENGINEER WILL NOT REVIEW ANY SUBMITTAL THAT CONTRACTOR HAS NOT STAMPED WITH HIS REVIEW CERTIFICATION.
 - 6. Submit preliminary valve chart indicating naming/location conventions along with piping shop drawings for preliminary approval.

1.5 CLOSEOUT SUBMITTALS

- A. Division 01 Specification Sections - Execution Requirements, Closeout procedures.
- B. Project Record Documents: Record actual locations and sizes of piping, valves, equipment, cleanouts, backflow preventers, drains, wall hydrants etc. Submit final valve chart. Comply with Section 230553: Mechanical Identification and identification details on the drawings.
- C. Operation and Maintenance Data: Submit spare parts list, exploded assembly views and recommended maintenance intervals.

1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with State of Illinois Plumbing Code (2014).
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Conform to ASME SEC IX and applicable state labor regulations.
- D. Welders Certification: In accordance with ASME SEC IX or ANSI/AWS D1.1
- E. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification and water pressure rating.
- F. Maintain one copy of each document on site

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five (5) years of documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five (5) years documented experience.

1.8 PRE-INSTALLATION MEETING

- A. Division 01 Specification Sections - Administrative Requirements, Pre-installation meetings.
- B. Convene minimum one week prior to commencing Work of this section or as required by Construction Manager.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Division 01 Specification Sections - Product Requirements, Product storage and handling requirements.
- B. Accept valves and equipment on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Division 01 Specification Sections - Product Requirements.
- B. Do not install underground piping when bedding is wet or frozen.

1.11 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.12 WARRANTY

- A. Division 01 Specification Sections - Execution Requirements: Product warranties and product bonds.
- B. Provide three (3) year manufacturer warranty for domestic water piping.

PART 2 - PRODUCTS

2.1 SANITARY SEWER AND VENT PIPING, BURIED

- A. Cast Iron Pipe: ASTM A74 service weight.
 - 1. Fittings: Cast iron.
 - 2. Joints: Hub-and-spigot with ASTM C564 neoprene gaskets or lead and oakum.

B. Copper Tube: ASTM B306, DWV.

1. Fittings: ASME B123, cast bronze, or ASME B129 wrought copper.
2. Joints: ASTM B32, solder, Grade 50B.

2.2 SANITARY SEWER AND VENT PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74, service weight.

1. Fittings: Cast iron.
2. Joints: Hub-and-Spigot, with ASTM C564, neoprene gasket system or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hub-less, service weight.

1. Fittings: Cast iron.
2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

C. Copper Tube: ASTM B306, DWV.

1. Fittings: ASME B123, cast bronze, or ASME B129, wrought copper.
2. Joints: ASTM B32, solder, Grade 50B.

D. Steel Pipe: ASTM A53 Schedule 40, galvanized.

1. Malleable Iron Fittings: ASME B13, screwed type.

E. Polyvinyl Chloride (PVC) Pipe: ASTM D2665, Schedule 40.

1. Fittings: Schedule 40, PVC to match pipe.
2. Joints: Solvent weld with colored primer.

2.3 WATER PIPING, BURIED

A. Pipe Sizes Under 3 Inches: Copper Tubing: ASTM B42, Type K, annealed.

1. Fittings: ASME B16.18 cast copper alloy or ASME B16.22 wrought copper and bronze.
2. Joints: AWS A5.8, BCuP silver braze.

B. Pipe Sizes 3 Inches & Larger: Ductile Iron Pipe: AWWA C151, Class 52 with AWWA C105 polyethylene encasement.

1. Fittings: AWWA C110, Class 250 ductile iron, standard thickness.
2. Joints: AWWA C111, Class 250 mechanical joints (MJ) with rubber gasket, retainer gland, bolts and $\frac{3}{4}$ inch diameter rods.

2.4 WATER PIPING, ABOVE GRADE

A. Copper Tubing: ASTM B88, Type L, hard drawn.

1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
2. Contractor may utilize mechanically formed tee and coupling.
3. Joints: ASTM B32, solder, Grade 95TA, or AWS 5.8, BCuP silver braze for mechanically formed tee connections.

B. Copper Tubing: ASTM B88, L, hard drawn.

1. Fittings: ASME B16.22, grooved wrought copper/
2. Joints: Rigid (0-deflection) grooved mechanical couplings with ASTM D-2000, Grade 'E' - EPDM gaskets approved for potable water service.
3. Flanges: Ductile iron grooved type with ANSI bolt pattern for Class 125 or Class 150 flanged components. Provide metal adapter inserts to accept rubber faced surfaces, and wafer/lug design valves.

2.5 STORM WATER PIPING, BURIED

A. Cast Iron Pipe: ASTM A74 service weight.

1. Fittings: Cast iron.
2. Joints: ASTM C564, neoprene gasket system or lead and oakum.

B. Polyvinyl Chloride (PVC) Pipe: ASTM D2665, Schedule 40.

1. Fittings: Schedule 40, PVC to match pipe.
2. Joints: Solvent weld with colored primer.

2.6 STORM WATER PIPING, ABOVE GRADE

A. Cast Iron Pipe: ASTM A74 service weight.

1. Fittings: Cast iron.
2. Joints: ASTM C564, neoprene gasket system or lead and oakum.

B. Cast Iron Pipe: CISPI 301, hubless, service weight.

1. Fittings: Cast iron.
2. Joints: Neoprene gaskets and stainless steel clamp-and-shield assemblies.

2.7 FLANGES, UNIONS, AND COUPLINGS

A. Pipe Size 3 inches and Under:

1. Ferrous pipe: Class 150 malleable iron threaded unions.
2. Copper tube and pipe: Class 150 bronze unions with soldered joints.

B. Pipe Size Over 3 inches:

1. Ferrous pipe: Class 150 forged steel slip-on flanges.
2. Copper tube and pipe: Rigid (0-deflection) Class 150 ductile iron mechanical couplings and flanges for copper piping. Gaskets, ASTM D-2000, Grade 'E' - EPDM gaskets approved for potable water service.

C. Pipe Size Over 1 inch:

1. Ferrous pipe: Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
2. Copper tube and pipe: Class 150 slip-on bronze flanges; preformed neoprene gaskets.

D. Grooved and Shouldered Pipe End Couplings:

1. Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
2. Sealing gasket: "C" shape composition sealing- gasket.

E. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.8 PIPE HANGERS AND SUPPORTS

A. Refer to Section 230529: Pipe Hangers & Supports.

2.9 GATE VALVES (GV)

A. Manufacturers - (2-1/2 Inches and Larger):

1. Hammond Valve - Model IR-1140.
2. Milwaukee Valve - Model F-2885.
3. Nibco Valve – Model F-617-0
4. Stockham - Model G-623.
5. Kitz Corporation – Model 72.
6. Substitutions: Not Permitted.

B. Construction:

1. MSS SP-70, Class 150, 200 PSI WOG, iron body, bronze trim, outside screw and yoke, hand wheel, solid wedge disc, flanged ends.

2.10 BALL VALVES (BV)

A. Manufacturers (Up to and including 2 Inches):

1. Hammond Valve - Model 8513.
2. Milwaukee Valve - Model BA-150S.
3. Nibco Valve - Model S-585-70-66.
4. Kitz Corporation – Model 68.
5. Jomar – Model T100NE
6. Substitutions: Not Permitted.

B. Construction:

1. MSS SP-110, Class 150, 600 PSI WOG, bronze, two piece body, stainless steel ball, full port, teflon seats and stuffing box ring, blow-out proof stem, lever handle with soldered ends.

2.11 BALANCING FITTINGS (BF)

A. Up to and Including 2 Inches:

1. Manufacturers:

- a. Armstrong Pump Co - Model CBV-I.
- b. Bell & Gossett/ITT - Model CB.
- c. Flow Design, Inc. - Model Flowset.

B. Construction: 125 psi WOG (minimum), bronze body with bronze disc calibrated and readable balance fittings with readout ports fitted with integral check valves to prevent loss of fluid when attaching monitoring kit.

C. Calibration: Integral pointer indicating degree of valve opening with positive shut-off and memory stop.

D. Accessories: Preformed polyurethane insulation.

2.12 SEALANTS: FIRE STOPPING SYSTEMS, WATER AND THERMAL SEALS

A. Manufacturers:

1. Dow Corning - Model Fire Stop.
2. Nelson - Model Flameseal.
3. T & B - Model Flamesafe.
4. 3M Co. - Model Fire Barrier.
5. Substitutions: Refer to Division 01 Specification Sections.

B. General Purpose Fire Stopping Sealant: Water based, non-slumping, premixed sealant with intumescent properties, rated for 3 hours per ASTM E814 and UL 1479.

C. General Purpose Vibration Resistant Fire Stopping Sealant: Silicone based, non-slumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for 3 hours per ASTM E814 and UL 1479.

D. Fire Seal:

1. Seal Penetrations of fire-rated walls, floors or ceilings at piping penetrations for compliance with NEC 300-21.
2. Fill void around exterior of pipe between sleeve with fiberglass or other fire-proof material approved by Architect/Engineer.
3. Sleeves: Schedule 40 steel pipe sleeve, anchored to building construction and finished plumb with wall, ceiling to floor line.
4. Seal remaining void at each end of the pipe penetration through sleeve between pipe and sleeve with fire sealant compound. Seal flush with wall or partition.
5. Provide chrome plated escutcheon plate at all exposed pipe penetrations.

E. Thermal Seal:

1. Seal penetrations of thermally insulated equipment or rooms to prevent heat transfer.
2. Fill void around exterior of raceway between sleeve with fiberglass or other material approved by Architect/Engineer.
3. Seal interior of raceway with duct sealing compound at entry to equipment or room
4. Provide chrome plated escutcheon plate at all exposed pipe penetrations

F. Water Seal

1. Seal penetrations of perimeter walls or floor below grade to prevent entry of water; use materials compatible with wall or floor construction and approved by Architect/Engineer.
2. Seal Penetrations of Room: Sealed with flashings compatible with roof design and approved by roofing system manufacturer and Architect/Engineer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Division 01 Specification Sections - Administrative Requirements, Coordination and project conditions.
- B. Verify that excavations are to required grade, dry, and do not over-excavate.

3.2 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

- A. Install Work in accordance with State of Illinois Plumbing Code (2014).
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals (i.e. copper to steel/iron pipe or flange connections).
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom and to conserve ceiling space without interfering with use of spaces.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed. Coordinate size and location of access doors.
- I. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- J. Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.

- K. Install bell and spigot pipe with bell end upstream
- L. Refer to Section 224001 - Plumbing Specialties for product requirements, placement and size requirements for cleanouts.
- M. Install valves with stems upright or horizontal, not inverted.
- N. Install water piping to ASME B31.9.
- O. Sleeve pipes passing through partitions, walls and floors. Provide chrome plated escutcheon plates at all exposed pipe penetrations.
- P. Sizing:
 - 1. Unless otherwise indicated, install all supply piping, including shut-off valves, strainers and accessory fixtures to pumps, fixtures and other equipment at line size with reduction in size being made only at inlet to control valve, fixture or pump.
- Q. Install supply piping from outlet of control valve at full size connection to equipment served.
- R. Make reduction in water pipes with eccentric reducing fittings installed to provide drainage and venting
- S. Branch Take-Offs:
 - 1. Liquids: From top, bottom or side of mains or headers at either 45 degrees or 90 degrees from horizontal plane.
 - 2. Do not project branch pipes inside main pipe.
- T. Pipe Drainage Provision:
 - 1. Slope water piping 1 inch in 40 feet and arrange to drain at low points.
- U. Underground Pipe:
 - 1. Lay in dry trenches maintained free of accumulated water.
 - 2. Provide and operate sufficient pumping equipment to maintain excavations, trenches and pits free of water.
 - 3. Dispose of pumped water so operation areas and other facilities are not flooded.
 - 4. Pipe laying follows excavating close as possible
- V. Interior Sanitary Soil Waste and Vent:
 - 1. Connect underground sewers to site utilities at point 5 feet outside building walls.
 - 2. Pitch sewers and branches as follows, unless otherwise indicated on drawings.
 - a. Pipe, 3 Inches and smaller: Minimum 1/4 inch per foot.
 - b. Pipe, 4 Inches and larger: Minimum 1/8 inch per foot, but no less than 1%.

3. Continuously bed underground or on-ground piping on minimum 3 inch compacted sand or gravel, with depressions for hubs.
4. Compact backfilling for 6 inches, sides and tops; and 3 inches under pipe to 95% proctor.
5. Complete backfilling to existing grade or to elevation indicated on Drawings, compacted to 95% proctor.

W. Mechanically Formed Tee Connections:

1. Mechanically extracted collars formed in continuous operation, consisting of drilling a pilot hole and drawing out tube surface to form a branch pipe collar having height of not less than a minimum of three (3) times the tube wall thickness.
 - a. Collaring Device: Fully adjustable to ensure proper tolerance and complete uniformity of joint.
2. Branch: Double notched to conform with inner curve of run tube and mechanically dimpled to ensure penetration of branch tube into collar is of sufficient depth for brazing and that branch tube does not obstruct flow in main tube run.
3. All joints brazed in accordance with Copper Development Association Copper Tube Handbook using BCuP Series filler material.
 - a. Soft soldered joints will not be permitted.

X. Mechanically Formed Couplings:

1. Form couplings be first annealing area at end of tube where expansion will occur.
 - a. Insert tube expander to die size required and expand tube end to accept tubing of same size.
 - b. Resulting joint is minimum three times as long as thickness of tube.
2. All joints brazed in accordance with Copper Development Association Copper Tube Handbook using BCuP Series filler metal.

Y. Contractor to clean and flush all faucet aerators and strainers at final completion of project.

Z. Pipe Hangers and Supports:

1. Install in accordance with ASTM B31.9 and MSS SP89. Refer to Section 230529: Supports and Anchors for additional requirements.
2. Support horizontal piping as schedule
3. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
4. Place hangers within 12 inches of each horizontal elbow.
5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
6. Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.

7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
8. Prime coat exposed steel hangers and supports. Refer to Painting Section.
9. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered expose
10. Provide hangers adjacent to motor driven equipment with vibration isolation.

AA. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or $\frac{3}{4}$ -inch minimum, and minimum 18 inches long. Air chambers are to be fully insulated per piping insulation specifications.

BB. Install heat traps on hot water heater installation as required by IECC 2012.

3.4 INTERFACE WITH OTHER PRODUCTS(APPLICATION)

- A. Install unions downstream of valves and at equipment or apparatus connections.
- B. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C. Install valve types as designated on plans for shut-off and to isolate equipment, part of systems, or vertical risers. All valves to be full line size of piping.

3.5 FIELD TOLERANCES

- A. Division 01 Specification Sections - Quality Requirements: Tolerances.
- B. Slope water piping minimum 0.25 percent and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Division 01 Specification Sections - Execution Requirements: Final cleaning.
- B. Prior to starting work, verify system is complete, flushed and clean.
- C. Ensure pH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder and tablet or gas form, throughout system to obtain a residual from 50 to 80 mg/L.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.

- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.

3.7 PIPE TESTING

- A. Before final acceptance of piping, test all systems scheduled and prove to be free of leaks.
 - 1. Perform tests under observation of Architect/Engineer.
 - 2. Remove, replace or satisfactorily repair defective work revealed by tests.
 - 3. Make piping repairs with new materials; caulking of screwed joints or pin holes not permitted.
 - 4. Underground systems tested before backfilling.
 - 5. Furnish test equipment and material for tests.
 - 6. Owner furnished water for testing and flushing.
- B. Testing Medium:
 - 1. Hydrostatic Testing Medium: Clean pure water.
 - 2. Pressure Testing Gauges: ANSI B40.1; Grade AA; minimum 6 inch -diameter dial with scale divisions equal or less than maximum allowable pressure drop.
- C. Waste and Vent System Piping: Test with water and air before fixtures are set. TESTS SHALL TAKE PLACE PRIOR TO POURING CONCRETE FLOOR.
 - 1. After plumbing fixtures have been set and traps filled with water, subject entire waste and vent systems to final test with smoke or peppermint.
- D. Water Test:
 - 1. Apply to drainage and vent system in accordance or in entirety.
 - 2. When entire system is tested, tightly close all openings in pipes except highest opening and fill system with water to overflow point.
 - 3. When system is tested in sections, tightly plug each opening except highest open, fill each section with water and test each section with minimum 10 foot head of water; test each preceding section until entire system has been tested with minimum 10 foot of water, except uppermost 10 feet of system.
 - 4. Keep water in system, or in portion under test, for minimum 30 minutes before inspection.
 - 5. System must be tight at all joints.
- E. Air Test:
 - 1. When tests are made with air, apply minimum 5 psi with force pump and maintain minimum 1 hour with no leakage apparent.
 - 2. Use mercury-column gauge in making test.

F. Domestic Water System:

1. When rough-in is complete and before fixtures are set, test entire hot and cold water piping systems as scheduled and prove tight.
2. Where portion of water piping system is concealed before completion, test that portion separately as specified for entire system.

G. Testing Requirements:

1. Hydrostatic tests apply to piping indicated in Schedule in Paragraph G. below.
2. Raise pressure gradually to given value; then block off source.
3. Allowable Pressure Drop: Maximum amount scheduled during corresponding minimum time interval.
4. Visually examine all joints during test.
5. Upon successful completion and test approval, relieve piping of pressure, drain, put into normal operation except for potable water to be sterilized before placing in service.

H. Hydrostatic Testing Schedule:

Service	Normal Work Pres. psig	Hydrostatic Test Pressure psig	Max. Pressure Drop psi	Min. Time Hours
1. Domestic Water				
Potable Water	To 125	175	2	2

END OF SECTION 220503

SECTION 223400 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 SECTION INCLUDED

- A. Domestic gas hot water heaters.
- B. Expansion tanks.
- C. Circulator pumps.

1.2 RELATED SECTIONS

- A. Section 220503 - Plumbing Piping.
- B. Section 230529- Anchors and Supports.
- C. Section 230553 - Mechanical Identification.
- D. Section 230701 - Piping Insulation.
- E. Section 260925 - Equipment Wiring Systems: Electrical characteristics and wiring connections.

1.3 REFERENCES

- A. IECC - 2012
- B. ASHRAE 90A - Energy Conservation in New Building Design.
- C. ASME Section 8D - Pressure Vessels.
- D. NFPA 54 - National Fuel Gas Code.
- E. NFPA 70 – National Electric Code.

1.4 SUBMITTALS

- A. Submit under provisions of Division 01 Specification Sections.
- B. Product Data:
 - 1. Provide dimension drawings of water heaters, pumps, storage tanks, etc. indicating components and connections to other equipment and piping.
 - 2. Indicate equipment's capacity, connection sizes and power requirements.

3. Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
4. Provide manufacturer piping diagrams for review and/or modification by the Engineer. Compensate other trades due to system deviations from equipment scheduled.
5. Provide electrical characteristics, connection requirements and wiring diagrams.

C. Shop Drawings:

1. Indicate location and dimensions of saddles, manways, lining methods, anchors, attachments, lifting points, tappings, and drains.
2. CONTRACTOR SHALL REVIEW ALL SUBMITTALS PRIOR TO SUBMITTING THEM FOR THE ARCHITECT/ENGINEER'S REVIEW. CONTRACTOR SHALL STAMP EACH DRAWING AND EACH PIECE OF PRODUCT DATA TO CERTIFY THAT HE HAS REVIEWED IT. ARCHITECT/ENGINEER WILL NOT REVIEW ANY SUBMITTAL THAT CONTRACTOR HAS NOT STAMPED WITH HIS REVIEW CERTIFICATION.

D. Submit manufacturer's installation instructions in accordance with Division 01 Specification Sections.

E. Submit manufacturer's certificate that pressure vessels meet or exceed specified requirements in accordance with Division 01 Specification Sections.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit project record documents under provisions of Division 01 Specification Sections.
- B. Project Record Documents: Record actual locations of components and equipment.
- C. Submit under provisions of Division 01 Specification Sections - Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- D. Submit under provisions of Division 01 Specification Sections - Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- E. Submit ASME certifications for all pressure vessels completed and registered in Owners name.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.
- B. Provide pumps with manufacturer's name, model number, and rating/capacity identified.

- C. Ensure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
 - 1. American Gas Association (AGA).
 - 2. National Sanitation Foundation (NSF).
 - 3. American Society of Mechanical Engineers (ASME).
 - 4. National Electrical Manufacturers' Association (NEMA).
 - 5. Underwriters Laboratories (UL).
- D. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, operate within 25 percent of midpoint of published maximum efficiency curve.
- E. Submit certification of start-up of systems by manufacturer's authorized agent in accordance with Division 01 Specification Sections.

1.7 REGULATORY REQUIREMENTS

- A. Conform to AGA and NFPA 54 requirements for water heaters.
- B. Conform to ASME Section 8D for tanks.
- C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND PROTECTION

- A. Transport, handle, store and protect products to site under provisions of Division 01 Specification Sections.
- B. Provide temporary inlet and outlet caps. Maintain caps in place until installation.
- C. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building, it must be stored off the ground a minimum of six inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visquin. All piping and duct openings will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is setting on wood planks and is completely protected with weatherproof covers.

1.9 WARRANTY

- A. Submit under provisions of Division 01 Specification Sections.
- B. Provide five year manufacturer warranty against leakage for all ASME constructed domestic water tanks and expansion tanks.
- C. Provide manufacturer's standard warranty on all other equipment.

PART 2 - PRODUCTS

2.1 DOMESTIC GAS HOT WATER HEATERS

A. Acceptable Manufacturer:

1. A.O. Smith
2. Lochinvar Co.
3. Laars Co.
4. Approved Equal.

B. Direct spark ignition, low NOx, natural gas-fired fully modulating sealed combustion, direct vent, high efficiency (95% efficient) boiler, controls piping and valving, 160 psig maximum working pressure, stainless steel heat exchanger with steel jacket.

C. Brass water connections and dip tube, drain valve, high-density magnesium anode and ASME rated temperature / pressure relief and vacuum relief valves, integral condensate charcoal acid dilution basin.

D. Automatic water thermostat with temperature range adjustable from 120 to 180 degrees F., gas pressure regulator, burner, 100 percent safety shut-off pilot and thermocouple.

E. Refer to schedule on drawings for sizes and capacities.

2.2 EXPANSION TANKS

A. Acceptable Manufacturers:

1. Amtrol, Inc.
2. Bell & Gossett/ITT.
3. Richmond Engineering (Reco).
4. Wessells co.

B. Construction: Welded steel, tested and stamped in accordance with Section 8D of ASME Code; supplied with National Board Form U-1, rated for working pressure of 150 psig, with flexible EPDM diaphragm approved for potable water sealed into tank, and steel base.

C. Accessories: Air-charging fitting, tank drain; precharge to 65 psig.

D. Size: Refer to Schedule on drawings.

2.3 IN-LINE CIRCULATOR PUMPS

A. Acceptable Manufacturers:

1. Armstrong Pump Co.
2. Bell & Gossett/ITT.
3. Taco.
4. Grundfoss.

B. Casing: Bronze, rated for 125 psig working pressure, with stainless steel rotor assembly.

C. Impeller: Bronze.

D. Shaft: Alloy steel with integral thrust collar and two oil lubricated bronze sleeve bearings.

E. Seal: Carbon rotating against a stationary ceramic seat.

F. Drive: Flexible coupling.

G. Performance: Refer to Schedule on drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install water heaters in accordance with manufacturer's instructions and to AGA and NFPA 54 requirements.

1. Provide support on 4 inch high concrete equipment pad, independent of building structural framing members.
2. Provide manufacturer approved/authorized start-up and certification. Submit start-up report to Construction Manager in accordance with Division 01 Specification Sections.

B. Coordinate all equipment with plumbing piping and related fuel piping, gas venting and electrical work to achieve proper operating system.

C. Domestic Hot Water Expansion Tanks:

1. Provide support on 4 inch high concrete equipment pad, or hung off building structural framing members.
2. Clean and flush after installation. Seal until pipe connections are made.
3. Provide manufacturer approved/authorized start-up and certification. Submit start-up report to Construction Manager in accordance with Division 01 Specification Sections.

D. In-Line Circulator Pumps:

1. Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and globe valve on discharge.
2. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
3. Provide hydronic indicator gauges.
4. Provide manufacturer approved/authorized start-up and certification. Submit start-up report to Construction Manager in accordance with Division 01 Specification Sections.

3.2 OWNER TRAINING BY INSTALLING CONTRACTOR

- A. At the completion of the project, the Installing Contractor shall provide training for all the plumbing equipment for the Owner's staff. Training shall consist of two parts. Part One is a classroom situation which describes the equipment's operation, maintenance and repair requirements. Part Two will be on-site (hands-on) training which will show the location of all devices and the operation and maintenance of all controls, devices, motors, etc. This training will be in addition to other training specified in the contract. Prior to commencement of training, Contractor shall provide Architect/Engineer with a schedule of dates, times and agenda for each training session. This Contractor shall provide a minimum of eight (8) hours of training for work installed under this section of the contract. Contractor shall furnish a minimum of six (6) equipment manuals, maintenance manuals and repair parts list for all equipment and systems reviewed.
- B. Submit Certification of Completion in accordance with Division 01 Specification Sections.

END OF SECTION 223400

SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Water closets.
- B. Lavatories.
- C. Service Sink Receptor.
- D. Electric Water Coolers.

1.2 RELATED WORK

- A. Section 220503 - Plumbing Piping.
- B. Section 224001 - Plumbing Specialties.
- C. Section 230529 - Anchors and Supports.

1.3 REFERENCES

- A. ANSI A112.18.1 - Finished and Rough Brass Plumbing Fixture Fittings.
- B. ANSI A112.19.1 - Enameled Cast Iron Plumbing Fixtures.
- C. ANSI A112.19.2 - Vitreous China Plumbing Fixtures.
- D. ANSI A112.19.5 - Trim for Water-Closet Bowls, Tanks and Urinals.
- E. ANSI Z124.3 and Z124.6 - Composite Resin Castings.

1.4 QUALITY ASSURANCE

- A. Fixtures: By same manufacturer for each product specified throughout.
- B. Trim: By same manufacturer for each product specified throughout.
- C. Flush Valves: By same manufacturer for each product specified throughout.

1.5 SUBMITTALS

- A. Submit product data under provisions of Division 01 Specification Sections.
- B. Include fixtures, sizes, rough-in dimensions, utility sizes, trim and finishes.
- C. CONTRACTOR SHALL REVIEW ALL SUBMITTALS PRIOR TO SUBMITTING THEM FOR THE ARCHITECT/ENGINEER'S REVIEW. CONTRACTOR SHALL STAMP EACH DRAWING AND EACH PIECE OF PRODUCT DATA TO CERTIFY THAT HE HAS REVIEWED IT. ARCHITECT/ENGINEER WILL NOT REVIEW ANY SUBMITTAL THAT CONTRACTOR HAS NOT STAMPED WITH HIS REVIEW CERTIFICATION.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provision of Division 01 Specification Sections.
- B. Include fixture trim exploded view and replacement parts lists.

1.7 WARRANTY

- A. Provide manufacturer's warranty under provisions of Division 01 Specification Sections.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site under provisions of Division 01 Specification Sections.
- B. Store, protect and handle products under provisions of Division 01 Specification Sections.
- C. Accept specialties on site in original factory packaging. Inspect for damage.

1.9 EXTRA MATERIALS

- A. Deliver to building maintenance prior to project completion. Submit written verification to Architect/Engineer.
- B. Provide the following quantities of the materials listed:
 - 1. One (1) complete faucet repair kit for each faucet type.
 - 2. Three (3) water closet flush valve repair including vacuum breaker rebuild kits.
 - 3. Three (3) urinal flush valve repair including vacuum breaker rebuild kits.
 - 4. Ten (10) slow compression fixture stop loose keys.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS - FIXTURES

- A. Kohler.
- B. Crane/Fiat Co.
- C. America Standard.
- D. Owner Approved Equal.

2.2 ACCEPTABLE MANUFACTURERS - FIXTURE TRIM

- A. Chicago Faucet Co.
- B. Cambridge Brass/ Delta Commercial.
- C. T & S Brass and Bronze Works, Inc.
- D. Zurn Aqua Spec.
- E. Owner Approved Equal.

2.3 ACCEPTABLE MANUFACTURERS - FLUSH VALVES

- A. Sloan Valve Co. – Royal Series, 186-1.
- B. Owner Approved Equal.

2.4 ACCEPTABLE MANUFACTURERS - FIXTURE CARRIERS

- A. Josam Co.
- B. J.R. Smith Mfg. Co.
- C. Mifab.
- D. Tyler/Wade Co.
- E. Zurn Co.
- F. Owner Approved Equal.

2.5 ACCEPTABLE MANUFACTURERS – SERVICE SINK RECEPTORS

- A. Fiat Co.
- B. Floorstone.
- C. Mustee.
- D. Owner Approved Equal.

2.6 ACCEPTABLE MANUFACTURERS – ELECTRIC WATER COOLERS

- A. Elkay Mfg. Co.
- B. Haws Co.
- C. Halsey Taylor Co.
- D. Oasis/Ebco
- E. Owner Approved Equal.

2.7 ACCEPTABLE MANUFACTURER - LOOSE KEY STOPS AND SUPPLIES

- A. Chicago Faucet Co.
- B. McGuire Manufacturing – Heavy Duty Series.
- C. Engineered Brass – Heavy Duty Series.
- D. Owner Approved Equal.

2.8 WATER CLOSET (WC-1)

- A. Bowl: ANSI A112.19.2; wall hung, mounted at handicap height, siphon jet white vitreous china 1.6 gallon flush closet bowl, with elongated rim, 1-1/2 inch spud, china bolt caps; Model Kingston K-4325 manufactured by Kohler.
- B. Flush Valve: ANSI A112.19.6; exposed chrome plated, sensor activated, diaphragm type water closet flush valve assembly with true mechanical override button and hard wired in wall sensor and transformer and electrical box positioning and support kit. Stainless steel vandal resistant sensor panel and frame with courtesy flush override button. Valve body, tailpiece and control stop will be in conformance with ASTM alloy classification for semi-red brass. Flush valve assembly to be constructed with dual filtered diaphragm for flush valve accuracy, skirted high back pressure vacuum breaker with bottom hex coupling nut, hand wheel angle checkstop, sweat solder adapter kit, and cast wall flange with set screw; Model Royal Optima 116-1.6 ES-S-TMO-EL-154 manufactured by Sloan Valve Co.

- C. Seat: Anti-microbial solid white plastic, open front, extended, self-sustaining continuous stainless steel hinge, brass bolts, without cover.
- D. Wall Mounted Carrier: ANSI A112.6.1; adjustable cast iron frame, integral drain hub and vent, adjustable spud. Lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

2.9 LAVATORY (L-1)

- A. Basin: ANSI A112.19.2; white vitreous china; handicapped wall-hung lavatory 21 X 18 inch minimum, with 4 inch high back, single drilling, overflow and soap depression; Model Kingston K-2005 manufactured by Kohler.
- B. Trim: ANSI A112.18.1; chrome plated vandal resistant combination supply fitting with offset open grid strainer and tailpiece, 2.2 GPM water aerator, vandal proof push, self-closing, single metering handle, chrome plated 17 gauge brass P-trap (installed parallel with wall) and arm with escutcheon; Model 333-665PSHABCP manufactured by Chicago Faucet. Provide undersink protective pipe covering for P-trap, tailpiece, angle valves and supply tubing; Model 103 as manufactured by Truebro, Inc. Provide undersink TMV per detail on drawings.
- C. Wall Mounted Carrier: ANSI A112.6.1; cast iron and steel frame, lugs for wall attachment, exposed bracket supports, bearing plate and studs.
- D. Stops: ANSI A112.18.1; chrome plated brass loose key stop with renewable and interchangeable slow compression operating unit, 1/2 inch O.D. flexible riser and female compression inlet; Model 1027 manufactured by Chicago Faucet Co.

2.10 SERVICE SINK RECEPTOR (SSR-1)

- A. Bowl: ANSI A112.19.1; 36 x 24 x 12 inches deep, precast terrazzo sink, with 12 inch high sides, stainless steel curb caps, drop front, chrome plated strainer, cast iron P-trap with adjustable floor flange; Model TSB-3003 manufactured by Fiat Corp.
- B. Trim: ANSI A112.18.1; exposed wall type chrome plated supply with lever handle spout, wall brace, vacuum breaker, hose end spout, strainers, integral secondary lever handle bypass for soap system connection, integral screwdriver stops with covering caps and adjustable threaded wall flanges; Model 509CR43512 manufactured by Chicago Faucet Co. See detail.
- C. Hose Clamp, Hose and Mop Hanger: 1/2 inch plain end reinforced rubber hose with wall mounted hose clamp and stainless steel wall plate with mop hooks; Model 832-AA and 889-CC manufactured by Fiat Products Corp.

2.11 ELECTRIC WATER COOLER (EWC-1)

- A. Fountain: ARI 1010; two station, high-low surface handicapped mounted vandal resistant electric water cooler and bottle filling station with stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, front push button activation, automatic stream regulator, mounting bracket, bottle filler to have no touch sensor activated fill with automatic shut off, refrigerated with integral air cooled condenser; capacity of 8.0 gal/min. of 50 degrees F. water with inlet at 80 degrees F. and room temperature of 90 degrees F., 1/5 HP compressor; Model EZSTL8WSLK manufactured by Elkay Mfg. Co.
- B. Stops: ANSI A112.18.1; chrome plated brass loose key stop with renewable and interchangeable slow compression operating unit, 3/8 inch O.D. flexible riser and female compression inlet; Model 1029 manufactured by Chicago Faucet Co.

2.12 FAUCET REPAIR KIT - TYPE I

- A. Complete rebuild kit for each faucet type and repair kits with parts enclosed in a baked enamel metal storage case.

2.13 FLUSH VALVE REPAIR KIT - WATER CLOSETS

- A. Complete diaphragm unit flush valve repair kit with one (1) internal assembly rebuild, vacuum breaker and check stop parts.

2.14 FLUSH VALVE REPAIR KIT - URINALS

- A. Complete diaphragm unit flush valve repair kit with one (1) internal assembly rebuild, vacuum breaker and check stop parts.

2.15 LOOSE KEY STOPS

- A. Stops: ANSI A112.18.1; chrome plated brass loose key stop with renewable and interchangeable slow compression operating unit, 1/2 inch O.D. flexible riser and 1/2 inch female compression inlet; Model 1027 manufactured by Chicago Faucet Co.

PART 3 - EXECUTION

3.1 INSPECTION

- A. Review millwork shop drawings. Confirm location and size of fixtures and existing rough-in before installation.

3.2 INSTALLATION

- A. Install each water closet with neoprene rubber closet gasket; felt or wax rings will not be accepted.
- B. Install each fixture with trap, easily removable for servicing and cleaning.
- C. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops reducers and escutcheons on each service to fixture.
- D. Install components level and plumb.
- E. Install and secure fixtures in place with wall carriers and bolts.
- F. Seal fixtures to wall and floor surfaces with sealant; color to match fixture.
- G. Mount fixtures to the heights as specified on Architectural Drawings.

3.3 ADJUSTING AND CLEANING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise or overflow.
- B. At completion, clean plumbing fixtures and equipment.
- C. Solidly attach water closets to floor with new lag screws and to wall with carrier bolts. Lead flashing is not intended hold fixture in place. Adjust closet flange as required.
- D. Contractor to remove each aerator or strainer screen and flush piping system at each fixture.

3.4 FIXTURE ROUGH-IN SCHEDULE

- A. Rough-in fixture piping connections in accordance with following table of minimum sizes for particular fixtures.

	Hot Water	Cold Water	Waste	Vent
Water Closet	----	1 inch	4 inch	2 inch
Lavatory/Laundry System/Wash Fountain	1/2 inch	1/2 inch	1-1/2 inch	1-1/2 inch
Service Sink Receptor	1/2 inch	1/2 inch	3 inch	2 inch
Electric Water Cooler/ Drinking Fountain	----	1/2 inch	1-1/2 inch	1-1/2 inch

END OF SECTION 224000

SECTION 224001 - PLUMBING SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Floor drains.
- B. Cleanouts.
- C. Thermostatic Mixing Valves.
- D. Grease Interceptors.
- E. Water hammer arrestors and air chambers.

1.2 RELATED WORK

- A. Section 220503 - Plumbing Piping.
- B. Section 224000 - Plumbing Fixtures.
- C. Section 230553 - Mechanical Identification: Product requirements for pipe identification for placement by this section.
- D. Section 230701 - Piping Insulation.

1.3 REFERENCES

- A. ANSI/ASSE 1011 - Hose Connection Vacuum Breakers.
- B. ANSI/ASSE 1019 - Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types.
- B. ANSI A112.21.1 - Floor Drains.
- C. ANSI A112.21.2 - Roof Drains.
- D. ANSI A112.26.1 - Water Hammer Arresters.
- E. PDI WH-201 Water Hammer Arresters.

1.4 REGULATORY REQUIREMENTS

- A. Conform to State of Illinois Plumbing Code (2014).

1.5 SUBMITTALS

- A. Submit under provisions of Division 01 General Requirements.
- B. Shop Drawings: Indicate dimensions, weights and placement of openings and holes.
- C. Product Data: Provide component sizes, rough-in requirements, service sizes and finishes.
- D. Manufacturer's Installation Instructions: Indicate assembly and support requirements.
- E. CONTRACTOR SHALL REVIEW ALL SUBMITTALS PRIOR TO SUBMITTING THEM FOR THE ARCHITECT/ENGINEER'S REVIEW. CONTRACTOR SHALL STAMP EACH DRAWING AND EACH PIECE OF PRODUCT DATA TO CERTIFY THAT HE HAS REVIEWED IT. ARCHITECT/ENGINEER WILL NOT REVIEW ANY SUBMITTAL THAT CONTRACTOR HAS NOT STAMPED WITH HIS REVIEW CERTIFICATION.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 01 General Requirements.
- B. Record actual locations of equipment, cleanouts, backflow preventers and other devices.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of Division 01 General Requirements.
- B. Maintenance Data: Include installation instructions, spare parts lists, exploded assembly views.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 01 General Requirements.
- B. Accept specialties on site in original factory packaging. Inspect for damage.

1.9 EXTRA MATERIALS

- A. Deliver to maintenance department prior to project completion. Submit written verification to Architect/Engineer.

PART 2 – PRODUCTS

2.1 ACCEPTABLE MANUFACTURER - PLUMBING SPECIALTIES

- A. Mi Fab. Company
- B. Josam Co.
- C. J.R. Smith
- D. Tyler/Wade Co.
- E. Zurn Co.
- F. Owner Approved Equal.

2.2 ACCEPTABLE MANUFACTURERS THERMOSTATIC MIXING VALVES

- A. Leonard Valve.
- B. Powers Co.
- C. Symmons Industries.
- D. Owner Approved Equal.

2.3 FLOOR DRAINS AND AREA DRAINS

- A. FD-1: ANSI A112.21.1; lacquered cast iron two piece body with double drainage flange, 6 inch diameter heavy-duty nickel bronze secured square hole strainer, sediment bucket, vandal resistant fasteners and not flashed; Model 2010-A-6-NB manufactured by J.R. Smith.
 - 1. Provide square tops in quality tile kitchen areas
- B. FD-2: Lacquered cast iron body, 12 inch diameter adjustable ductile iron grate and sediment bucket, not flashed; Model 2360-M manufactured by J.R. Smith.
- C. FS-1: 12 x 12 x 8 inches deep cast iron body, acid resistant coated interior floor sink, nickel bronze hinged half grate and sediment bucket with rubber feet; Model 3151-12-rubber feet manufactured by J.R. Smith Co.

2.4 CLEANOUTS

- A. Exterior Areas (YCO): Round ductile iron access frame and non-skid gasketed cover; Model 4250-M manufactured by J.R. Smith.
- B. Interior Finished Floor Areas (FCO): Lacquered cast iron, two piece body with double drainage flange, brass gasketed plug and adjustable nickel-bronze round vandal-proof scoriated cover in unfinished areas and round with depressed cover to accept floor finish or with carpet markers in carpeted floor area; Model 4021-U manufactured by J.R. Smith.
 - 1. Provide square tops in quarry tile kitchen areas.
- C. Interior Finished Wall Areas (WCO): Line type with lacquered cast iron body and round brass gasketed plug and round stainless steel access cover secured with vandal-proof fastener; Model 4532-U manufactured by J.R. Smith.
- D. Interior Unfinished Accessible Areas (CO): Cast iron cleanout ferrule with brass tapered plug; Model 4425 manufactured by J.R. Smith.

2.5 THERMOSTATIC MIXING VALVES (TMV-1):

- A. Factory assembled, cabinet mounted with stainless steel surface mounted cabinet, rough bronze finish, inlet manifold piping, locking temperature regulators, integral hot and cold supply checkstops, outlet shut-off ball valve, color coded dial thermometer; capacity 50 G.P.M. at 10 psi maximum pressure drop. Powers 5 or equal.

2.6 GREASE INTERCEPTORS (GI-1)

- A. Acceptable Manufacturers:
 - 1. Schier Products – GB-250
 - 2. Owner Approved Equal
- B. Construction:
 - 1. Material: Seamless, rotationally molded high density polyethylene.
 - 2. Rough-in: Fully recessed, flush (deep rough-in) installation with anchor flange.
 - 3. Accessories: Extension collar for bury depth, deep seal trap, engineered inlet and outlet diffusers, venting connection, draw-off assembly.
 - 4. Cover: Fiberglass composite, non-skid with gasket, bolted cover with 5,000 pound load capacity.
 - 5. Verify connection depths in the field and coordinate with integral extension depth.
- C. Unit Rating: 100 gpm flow, 1,076 lbs grease capacity, 250 gallon liquid holding capacity.

2.7 WATER HAMMER ARRESTORS AND AIR CHAMBERS

- A. Fit water supply to each fixture with air chamber; air chamber same size as supply line or 3/4 inch minimum and minimum 18 inches long.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate cutting and forming of roof and floor construction to receive drains to required invert elevations.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Coordinate floor cleanout cover types and styles with Construction Manager's floor finish schedule.
- E. Install each fixture, HVAC make-up water connection, cooling tower make-up water connection and other devices with air chambers (minimum 3/4 inch x 18 inches long) or water hammer arrestor; size in accordance with PDI WH-201 Standards.
- F. Install pre-charged water hammer arrestors complete with accessible isolation ball valve.
- G. Contractor to adjust yard cleanout covers to coincide with finished grade.
- H. Provide deep seal P-traps for all slab-on grade floor drains.

END OF SECTION 224001

SECTION 230500 - BASIC MECHANICAL REQUIREMENTS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and General Requirement Specification Sections, apply to this and the other sections of Division 22 and Division 23.

1.2 SUMMARY

- A. This Section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in the General Requirements:
 - 1. Submittals.
 - 2. Coordination drawings.
 - 3. Record documents.
 - 4. Maintenance manuals.
 - 5. Rough-ins.
 - 6. Mechanical installations.
 - 7. Cutting and patching.

1.3 DEFINITIONS

- A. Furnish: To purchase; fabricate, as applicable; and deliver to designated location on job site.
- B. Install: To locate and make all necessary connections for complete and operating system. Installing contractor shall provide all necessary labor and miscellaneous piping, fittings, connectors, ductwork, etc. as required for installation and startup. Installing contractor shall also be responsible for all warranties, including the coordination and implementation of all factory warranties, regardless of whether or not the installing contractor has furnished the equipment.
- C. Provide: To furnish and install.

1.4 CODES AND STANDARDS

- A. Code Compliance: Comply with all applicable codes pertaining to product materials and installations.

- B. All product materials and work shall comply to all local codes, including but not limited to the following codes and standards as applicable, in addition to any codes and standards referenced within individual specification sections. These codes and standards shall apply to all Division 22 and 23 Sections as applicable.
1. Americans with Disabilities Act (ADA).
 2. American Gas Association (AGA).
 3. American Society of Heating, Refrigeration, and Air-Conditioning Engineers (ASHRAE).
 4. American Society of Mechanical Engineers (ASME).
 5. Air Moving and Conditioning Associates (AMCA).
 6. American Society for Testing and Materials (ASTM).
 7. American Society of Plumbing Engineers (ASPE).
 8. American National Standard Institute (ANSI).
 9. Air Conditioning and Refrigeration Institute (ARI).
 10. International Building Code.
 11. International Mechanical Code.
 12. Factory Mutual.
 13. Illinois Administrative Code, including, but not limited to:
 - a. Illinois State Plumbing Code
 - b. Illinois Accessibility Code.
 14. National Electric Code (NEC).
 15. National Electric Manufacturers' Association (NEMA).
 16. All applicable sections of National Fire Protection Association (NFPA).
 17. Underwriters' Laboratories (UL).
 18. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
 19. International Fuel Gas Code.
 20. International Fire Code.
 21. International Energy Conservation Code.

1.5 SUBMITTALS

- A. General: Follow the procedures specified in the General Requirements, and additional defined below.
- B. Increase by one copy the number of mechanical related shop drawings, product data, and samples submitted. This copy will be retained by the Consulting Engineer.
- C. Additional copies may be required by individual sections of these Specifications.
- D. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Deviations included within shop drawings shall not be acceptable unless they are clearly identified as deviations. Deviations from the Contract Documents shall only be acceptable subsequent to the deviation being specifically submitted in writing, and responded to by the architect and engineer.

1.6 COORDINATION DRAWINGS

- A. Each trade shall prepare original coordination drawings in accordance with the General Requirements, other Division 22 and 23 Sections and as additionally defined below. Provide individual drawings for each trade, including (1) reproducible copy. Provide original drawings meeting the requirements as described in this section. Marked up copies of the design documents are not acceptable.
- B. Drawings shall include the latest architectural floor plan with column lines identified. These drawings shall detail all elements, components, and systems of the applicable mechanical, plumbing, or fire protection trade. Drawings shall also indicate the locations of other trades and indicate their relationship in all areas where limited space requires detailed coordination. All system components of trade being presented shall appear dark and be easily distinguished from architectural information or other system information included for coordination purposes. All information included that is not a part of the system being presented shall be indicated light or half tone. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
1. Indicate the proposed locations of piping, ductwork, equipment, and materials. Include the following:
 - a. Ductwork mains and branches, size and location, for both exterior and interior; locations of dampers and other control devices; filters, boxes, and terminal units requiring periodic maintenance or repair.
 - b. Mains and branches of all piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., air separators, strainers, expansion compensators, tanks, etc.). Indicate actual inverts and horizontal locations of underground piping.
 - c. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 - d. Clearances for installing and maintaining insulation.
 - e. Clearances for servicing and maintaining equipment, including tube removal, filter removal, and space for equipment disassembly required for periodic maintenance.
 - f. Equipment connections and support details.
 - g. Exterior wall and foundation penetrations.
 - h. Fire-rated wall and floor penetrations.
 - i. Sizes and location of required concrete pads and bases.
 - j. Valve stem movement.
 - k. Indicate location of all equipment, ductwork, plumbing fixtures, piping etc., with dimensions from prominent building lines; and elevations above corresponding floors, roofs or grade as applicable.
 2. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
 3. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.

4. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, light fixtures, communication systems components, sprinklers, and other ceiling-mounted items. Dimension all items from prominent building lines except for those located in modular type ceilings.
5. Submit all coordination drawings and/or shop drawings prior to purchase, fabrication, or installation of any equipment. Any work started or equipment purchased prior to the review of submitted drawings by the design engineer is done at the contractor's risk. The offending contractor shall be entirely responsible for all changes, modifications, and/or extra services required resulting from the improper coordination and/or improper submittal procedures.
6. Encircle or bubble any revisions made on drawings being submitted more than one time. Indicate all revisions or changes made subsequent to the previous submittal reviewed by the engineer.

C. See front end documents for additional coordination requirements.

1.7 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in the General Requirements and other Division 22 and 23 Sections. In addition to the requirements specified indicate the following installed conditions:
 1. Provide one (1) digital copy (CD) and one (1) full size paper copy of "as-built" drawings with all information and meeting the requirements as described under "Coordination Drawings" in this section. Marked up copies of the design documents are not acceptable.
 2. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
 3. The as-built drawings shall indicate the electrical installations as "installed" and required as described under "Coordination Drawings" and "Record Drawings".
 4. As-built drawings shall be complete on contractors own "Title Block".

1.8 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with the General Requirements. In addition to the requirements, include the following information for equipment items:
 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 4. Servicing instructions and lubrication charts and schedules.

1.9 WARRANTIES

- A. The Contractor shall warrant all Mechanical Work to be free of faults and defects in accordance with the General Conditions and Supplementary Conditions for a minimum period of one (1) year from final acceptance of the work. This shall include all materials and labor. Extended warranties shall be provided as indicated in other sections of these Specifications.
- B. The Contractor shall submit signed warranties for installations, equipment and fixtures required by this section and other sections of these Specifications.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- B. Store and protect products under provisions of the General Requirements.
- C. Deliver and store material in shipping containers with labeling in place.
- D. Contractor shall store all materials shipped to this site in a protected area. If material is stored outside of the building, it must be stored off the ground a minimum of six inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visquin. All piping will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and is completely protected with weatherproof covers.

PART 2 PRODUCTS

(Not Applicable)

PART 3 EXECUTION

3.1 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

3.2 MECHANICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:
1. Coordinate mechanical systems, equipment, and materials installation with other building components.
 2. Verify all dimensions by field measurements.
 3. Confirm and arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
 4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
 5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 7. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 8. Install systems, materials, and equipment to conform with approved submittal data, including coordination drawings, to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to the Architect.
 9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.
 10. Install mechanical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location and purge all extended hoses with grease. Use extreme pressure grease to match District standards.
 11. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Division 23 Section - Ductwork Accessories.
 12. Indicate locations and sizes for all access panels or doors where required for service of mechanical devices. Provide this information to the mason and/or drywall contractor before construction of corresponding partition.
 13. Access doors shall be required for service of any concealed device such as fire dampers, valves, VAV boxes, fans, controls, and coils. As much as practical, locate these devices in readily accessible locations.
 14. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

15. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate the general location and arrangement of the systems in a diagrammatic form only. Location and arrangement of pipe, duct, and equipment lay-out shall take into consideration pipe/duct sizing and pressure loss, expansion, pump/fan sizing, and other design considerations. So far as practical, install system as indicated. Refer to individual system specifications for requirements for coordination drawing submittals. Adjust routing and provide all offsets, fittings, etc., as required for coordination with building and all other systems at no additional cost to the owner. All deviations from the design drawings shall be reflected on the shop drawings for review by the architect and engineer before proceeding with fabrication or installation.
16. Where drawings, specifications or notes conflict one another the contractor shall immediately advise the architect of such conflicts. For purposes of bidding and pending written receipt of any direction to the contrary, the contractor shall include in his proposal the more expensive alternate described.

3.3 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with the General Requirements. In addition to the requirements specified in the General Requirements, the following requirements apply:
 1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
- B. Perform cutting, fitting, and patching of mechanical equipment and materials required to:
 1. Uncover Work to provide for installation of ill-timed Work.
 2. Remove and replace defective Work.
 3. Remove and replace Work not conforming to requirements of the Contract Documents.
 4. Remove samples of installed Work as specified for testing.
 5. Upon written instructions from the Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.
- C. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
 1. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
- D. All piping penetrations to be by contractor including sleeves and patching. Use coring whenever possible through concrete and masonry.
- E. Contractor to fire safe and seal all wall penetrations for ductwork, piping, conduits, etc. in new and existing walls or floors.

END OF SECTION 230500

SECTION 230501 - MECHANICAL DEMOLITION

PART 1 GENERAL

1.1 REQUIREMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and the General Requirements apply to this Section.

1.2 DESCRIPTION OF WORK

- A. Contractor shall provide all labor, materials, tools, equipment and services for the complete demolition, removal, and legal disposal of existing abandoned equipment; chillers, cooling towers, air cooled condensing units, refrigerant, piping, boilers, tanks, concrete pads, pumps, ductwork, associated controls, associated structural supports, hangers, rods, supports, anchors, miscellaneous hardware, miscellaneous equipment, removal of appurtenant equipment and materials, and lawfully dispose of all equipment, and materials rendered obsolete off the premises.
 - 1. Recover and dispose of legally, all refrigerants in equipment being demolished, removed or modified. Prior to the disposal of any refrigerant, give the owner the option of salvaging. Reclaim of refrigerant shall be performed by personnel certified in refrigerant reclaim by the State of Illinois.
 - 2. Drain down entire piping system, flush and fill.
 - 3. Disconnect, remove, transport, properly and lawfully dispose of all incidental and miscellaneous materials, hardware, equipment associated with the above items.
 - 4. Maintain temporary fences, warning signage, barricades, yellow protection tape, warning lights, and other similar items around any areas that create a hazard during the demolition process.
 - 5. Remove indicated piping including all associated hangers, rods, supports, channels, trapeze and anchors, and patching of existing walls, floors, slabs and ceilings to match existing conditions in all respects.
 - 6. Remove concrete housekeeping pads for existing chillers, cooling towers, boilers, pumps, strainers and miscellaneous equipment scheduled for demolition. Repair floors to match existing conditions, in all respects.
 - 7. Where disturbed by demolition of mechanical equipment, patch existing walls, ceilings, floor surfaces with materials and workmanship to match existing conditions. Where surfaces are painted and components are removed, walls shall be painted to match existing conditions by this contractor.
 - 8. Coordinate all demolition with Division 26 contractor for shut down of electrical power. Do not proceed with mechanical demolition until all electrical power has been safely disconnected from equipment to be demolished.

1.3 REQUIREMENTS

- A. Contractor shall provide caution and warning signs at all hazardous areas and at all door entries to construction rooms and areas during the entire construction period per IEPA law and regulations.

1.4 MAINTAIN CONTINUITY OF SERVICE

- A. Any downtime time periods shall be at the convenience of the Owner and approved by the Architect. Contractor shall give a minimum of 30 days prior written notice to the Architect in advance of any desired shutdown. Prior written notice shall include a schedule for downtime, work to be performed, complete with detailed drawings indicating all temporary wiring and equipment. All downtime periods shall be on weekends or off hours with exact time period approved in advance in writing by the Architect. Coordinate an overall schedule that is to be submitted and approved by the Architect.
- B. An electrician shall be on the premises when any trade is working in close proximity to live equipment or within electric rooms during renovations by any trade.
- C. All premium time, overtime, labor, material and equipment costs required to accomplish the above shall be included in the Contractor's bid proposal.

1.5 PROTECTION

- A. Perform removal of equipment and related components, in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations.
 - 1. Wherever a cutting torch or other equipment that might cause a fire is used, provide and maintain fire extinguishers nearby ready for immediate use. All possible users shall be instructed in use of fire extinguishers. For each area in which a cutting torch or welding apparatus is used, a designated fire watchman shall be appointed.
 - 2. Contractor shall notify the Architect in writing of the time and location that cutting torches or welding equipment is used. The notice shall be turned in to the Architect prior to commencing work. Due to this being an occupied building, protect adjacent areas from cutting torch flame.
- C. Contractor to employ the services of a GPR (ground penetrating radar) specialist prior to major concrete floor saw cutting to assist in the location of underground/poured in concrete utilities and or services.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 DEMOLITION

- A. Verify existing conditions and locations in field prior to submitting proposal. Failure to do so shall not relieve this contractor from performing the work required under this contract.
- B. Remove all piping indicated to be demolished back to associated main, terminating with branch capped as short as possible.
- C. All equipment and materials shall be removed from the premises. Materials and equipment becomes the property of the contractor and shall be legally disposed of.
- D. Provide all cutting, coring and patching and fire sealing as required for demolition work.
- E. The demolition drawings may be helpful in determining existing conditions, however they are based on original contract drawings and not "AS-BUILT". They do not show modifications made after the original construction.
- F. Maintain continuity of all existing systems for all buildings at all times.
- G. All demolition of the HVAC system as called for on the demolition drawings shall be under the mechanical (HVAC) contractors work.
- H. Mechanical contractor shall visit the building, before submitting his bid, to verify the existing conditions which will affect his work.
- I. Before starting any demolition on HVAC equipment which has an electrical connection. The mechanical contractor shall meet with the electrical contractor to identify all such equipment. The electrical contractor will disconnect the power to each unit, remove conduit, wiring, disconnect switches, and starters under his contract. Mechanical contractor will remove all equipment, electrical temperature control wiring, disconnect switches and starters under his contract. Mechanical contractor will remove all equipment, electrical temperature control wiring and conduit under this contract.
- J. Mechanical contractor shall verify size of all existing openings, doors, etc. for getting equipment and material out of building. Mechanical contractor shall provide any new or enlarged openings in existing building construction required to facilitate exiting of his equipment/material and restore such openings to their original state after completion.
- K. Mechanical contractor shall be responsible for his own clean-up throughout the course of the demolition work.

- L. All equipment, material, etc. that is being demolished will become the property of the mechanical contractor. All such items will be removed from the building site by the mechanical contractor. No item which is being removed under the demolition contract may be reused under the new work contract.
- M. Sequence of all demolition work shall be in strict accordance with the specifications, drawings and/or as directed by Engineer.
- N. The contractor performing the demolition work shall remove no more than 8" of building material around each device being demolished.
- O. Remove all abandoned ductwork not being reused under the new construction. Field verify all conditions.

3.2 FLOOR AND WALL OPENINGS

- A. Openings through floors and walls where piping or equipment has been removed shall be sealed to maintain any fire ratings and to seal off cold, smoke and toxic fumes.

3.3 DAMAGE TO OTHER WORK

- A. The Contractor shall be held responsible for any damage caused to existing installations not pertinent to the Contract. The cost of repairs to such damaged work shall be charged against the Contractor.

3.4 CLEAN-UP

- A. On completion of work of this section and after removal of all debris, site shall be left in clean condition satisfactory to the Architect. Clean up shall include off the premises disposal of all items and materials not required to remain the property of the Contractor as well as all debris and rubbish resulting from demolition operations.
- B. Debris, including brick, asphalt, concrete, stone, and similar materials shall become property of Contractor and shall be disposed of by the Contractor, off the property. Remove concrete foundations, conduits, anchor bolts, and all appurtenances.

END OF SECTION 230501

SECTION 230502 - GAGES AND METERS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Pressure gages and Pressure gage taps.
- B. Thermometers and thermometer wells.
- C. Static pressure gages.
- D. Filter gages.

1.2 RELATED SECTIONS

- A. Section 22 05 03 - Plumbing Piping.
- B. Section 23 09 13 – Instrumentation and Controls.
- C. Section 23 09 93 – Sequence of Operation.
- D. Section 23 11 26 - Fuel Piping.

1.3 REFERENCES

- A. ASME - B40.1 - Gages - Pressure Indicating Dial Type - Elastic Element.
- B. ASTM E1 - Specification for ASTM Thermometers.
- C. ASTM E77 - Verification and Calibration of Liquid-in-Glass Thermometers.
- D. AWWA C700 - Cold Water Meters - Displacement Type.
- E. UL 393 - Indicating Pressure Gages for Fire and Protection Services.

1.4 SUBMITTALS FOR REVIEW

- A. Product Data: Provide list, which indicates use, operating range, total range and location for manufactured components.
- B. Submit under provisions of the General Requirements.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

- A. Project Record Documents: Record actual locations of components and instrumentation.
- B. Submit under provision of the General Requirements.

1.6 INSTALLATION OF CONTROL PRODUCTS

- A. Install valves, temperature and pressure sensors and other instrumentation in the locations directed by the BAS contractor.
- B. Install BAS valves and sensors in the locations shown on the plans.
- C. Failure of this contractor to adequately coordinate his work with the BAS contractor shall not be justification for any request for additional payment.
- D. This contractor shall include the cost of coordinating and installing related BAS components in his bid.

PART 2 PRODUCTS

2.1 PRESSURE GAGES

- A. Manufacturers:
 - 1. Terice.
 - 2. Owner approved equal.
- B. Gage: ASME B40.1, stainless steel or cast aluminum case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with adjustable pointer, black scale on white background.
 - 1. Case: Stainless steel or cast aluminum with brass bourdon tube.
 - 2. Size: 4-1/2 inch diameter (minimum).
 - 3. Mid Scale Accuracy: One percent full scale.
 - 4. Scale: Psi.

2.2 PRESSURE GAGE TAPPINGS

- A. Gage Cock: Tee or lever handle, brass for maximum 150 psig.
- B. Needle Valve: Brass, 1/4 inch NPT for minimum 150 psig.
- C. Pulsation Damper: Pressure snubber, brass with 1/4 inch connections.
- D. Syphon: Steel, Schedule 40, 1/4 inch angle or straight pattern.

2.3 STEM TYPE THERMOMETERS

A. Manufacturers:

1. Miljoco.
2. Weiss.
3. Owner approved equal.

B. Thermometer: ASTM E1, adjustable angle, blue organic, lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device.

1. Size: 9 inch scale.
2. Window: Clear Lexan.
3. Stem: $\frac{3}{4}$ inch NPT brass.
4. Accuracy: One scale division.
5. Calibration: Degrees F.

2.4 THERMOMETER SUPPORTS

A. Socket: Brass separable sockets for thermometer stems with or without extensions as required, and with cap and chain.

B. Flange: 3 inch outside diameter reversible flange, designed to fasten to sheet metal air ducts, with brass perforated stem.

2.5 TEST PLUGS

A. Test Plug: 1/4 inch or 2 inch brass fitting and cap for receiving 1/8 inch outside diameter pressure or temperature probe with neoprene core for temperatures up to 210 degrees F.

B. Test Kit: Carrying case, internally padded and fitted containing one 2-1/2 inch diameter pressure gages, one gage adapters with 1/8 inch probes, two one inch dial thermometers.

2.6 STATIC PRESSURE GAGES

A. Inclined manometer, red liquid on white background with black figures, front recalibration adjustment, 3 percent of full scale accuracy.

B. Accessories: Static pressure tips with compression fittings for bulkhead mounting, 1/4 inch diameter tubing.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install pressure gages with pulsation dampers. Provide gage cock to isolate each gage.
- C. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch for installation of thermometer sockets. Ensure sockets allow clearance from insulation.
- D. Install thermometer sockets and pressure taps as directed by BAS contractor adjacent to controls systems transmitter, or sensor sockets and as required.
- E. Coil and conceal excess capillary on remote element instruments.
- F. Provide instruments with scale ranges selected according to service with largest appropriate scale.
- G. Install gages and thermometers in locations where they are easily read from normal operating level. Install vertical to 45 degrees off vertical.
- H. Adjust gages and thermometers to final angle, clean windows and lenses, and calibrate to zero.
- I. Locate test plugs adjacent thermometers and thermometer sockets and adjacent to pressure gages and pressure gage taps.
- J. Install all gauges and meters.

3.2 SCHEDULES

- A. Pressure Gage Schedule
LOCATION
Pumps
Pressure reducing valves
Pressure Tanks
- B. Pressure Gage Tapping Schedule
LOCATION
Pumps
Control pressure-sensing locations

- C. Stem Type Thermometer Schedule
LOCATION
Headers to central equipment
After major coils
Water zone supply and return
Domestic hot water supply and recirculation
- D. Thermometer Socket Schedule
LOCATION
Control temperature-sensing locations
- E. Static Pressure and Filter Gage Schedule
LOCATION
Unitary filter sections

END OF SECTION 230502

SECTION 230503 - TESTING OF HVAC AND GAS PIPING

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Natural gas piping.
- B. Refrigerant piping.

1.2 RELATED SECTIONS

- A. Section 23 11 26 - Fuel Piping.
- B. Section 23 61 00 – Refrigerant Piping and Specialties.

1.3 REFERENCES

- A. NFPA.
- B. ARI.
- C. International Mechanical Code.

1.4 REGULATORY REQUIREMENTS

- A. Conform to International Mechanical Code.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 GENERAL

- A. Before final acceptance of all HVAC and gas piping systems, all systems must be tested in accordance with the schedule and prove to be free of leaks.
 - 1. Perform tests under observation of Architect/ Engineer.
 - 2. Remove, replace or satisfactorily repair defective work revealed by tests.

3. Make piping repairs with new materials; caulking of screwed joints or pin holes is not permitted.
4. Furnish all test equipment and materials for testing.
5. Owner to furnish water for testing and flushing.

3.2 TESTING MATERIAL

A. Testing Medium:

1. Hydrostatic Testing Medium: Clean water.
2. Pneumatic Testing Medium: Clean compressed air.

B. Pressure Testing Gauges: ANSI B40.1, Grade AA; minimum 6 inch diameter dial with scale divisions equal or less than maximum allowable pressure drop.

3.3 TESTING SYSTEMS

A. All plumbing and fire protection piping to be tested as called for in Section 22 05 03.

B. HVAC and Gas System Piping:

1. Test with water and air.
2. Water Test:
 - a. When entire system is tested, tightly close all openings in pipes except highest opening and fill system with water to overflow point.
 - b. When system is tested in sections, tightly plug each opening except highest opening, fill each section with water and test each section with minimum 10 foot head of water; test each preceding section until entire system has been tested with minimum 10 foot head of water, except uppermost 10 feet of system.
 - c. Keep water in system or in portion under test, for minimum 30 minutes before inspection.
 - d. System must be tight at all joints.
3. Air Test:
 - a. When tests are made with air, apply minimum 30 psi with force pump and maintain for period of time indicated in Paragraph D with no leakage apparent.
 - b. Use mercury-column in making test.

C. Hydrostatic and Pneumatic Testing Requirements:

1. Hydrostatic and pneumatic tests apply to piping indicate as scheduled is Paragraph D.
2. Pressure to be raised gradually to given value; then block off tight at source.
3. Allowable Pressure Drop: Maximum amount scheduled during corresponding minimum time interval.
 - a. Visually examine all joints during test.
4. Upon successful completion and test approval, relieve piping of pressure, drain, put into normal operation except for potable water to be sterilized before placing in service.

D. Hydrostatic and Pneumatic Testing Schedule:

Service	Normal Hydrostatic Work Pressure psig	Pneumatic Test Pressure psig	Maximum Allowable Test Pressure psig	Minimum Pressure Drop psi	Test Time Hours
1. Fuel					
Natural Gas	To 5	---	30	0	8
2. Miscellaneous					
Refrigeration	To 290	---	300	0	4

3.4 CLEANING AND ADJUSTING

A. Cleaning: Thoroughly clean all parts of the piping installation at completion of work.

1. Remove grease, metal cutting and sludge from all equipment, pipes, valves all fittings.
2. Repair all stoppages, discoloration or other damage to finish, furnishings or parts of building that are due to Contractor's failure to properly clean piping system.
3. Remove and clean all flow control devices.

B. Adjusting:

1. Adjust all valves and other parts of work for quiet operation.
2. Adjust control devices for proper operation.
3. Demonstrate to Architect/Engineer satisfactory operation following adjustment.
4. Readjust or replace all items not functioning properly.

END OF SECTION 230503

SECTION 230513 - MOTORS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Single phase electric motors.
- B. Three phase electric motors.

1.2 REFERENCES

- A. AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- B. AFBMA 11 - Load Ratings and Fatigue Life for Roller Bearings.
- C. IEEE 112 - Test Procedure for Polyphase Induction Motors and Generators.
- D. NEMA MG 1 - Motors and Generators.
- E. NFPA 70 - National Electrical Code.

1.3 SUBMITTALS

- A. Submit under provisions of the General Requirements.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.

1.4 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of the General Requirements.
- B. Operation Data: Include instructions for safe operating procedures.
- C. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacture of electric motors for commercial use, and their accessories, with minimum three (3) years documented product development, testing, and manufacturing experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to NFPA 70 and ANSI.
- B. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of the General Requirements.
- B. Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering.

1.8 WARRANTY

- A. Provide five (5) year warranty under provisions of the General Requirements.
- B. Warranty: Include coverage for motors larger than 5 horsepower.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Century E + 3 High Efficiency.
- B. Lincoln.
- C. Reliance.
- D. Dayton.
- E. General Electric.
- F. Owner approved equal.

2.2 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Motors Less Than 250 Watts, for Intermittent Service: Equipment manufacturer's standard and need not conform to these specifications.
- B. Electrical Service:
 - 1. Motors 2 HP and Smaller: 120 volts, single phase, 60 Hz.
 - 2. Motors Larger than 3/4 Horsepower: 460 volts, three phase, 60 Hz.
- C. Type:
 - 1. Open drip-proof except where specifically noted otherwise.
 - 2. Motors: Design for continuous operation in 40 degrees C environment.
 - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
 - 4. Motors with frame sizes 184T and larger: Energy Efficient Type equal to Century E + 3.
- D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- E. Wiring Terminations:
 - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.3 SINGLE PHASE POWER - SPLIT PHASE MOTORS

- A. Starting Torque: Less than 150 percent of full load torque.
- B. Starting Current: Up to seven times full load current.
- C. Breakdown Torque: Approximately 200 percent of full load torque.
- D. Drip-proof Enclosure: Class A insulation, NEMA Service Factor, prelubricated sleeve or ball bearings.
- E. Enclosed Motors: Class A insulation, 1.0 Service Factor, prelubricated ball bearings.

2.4 SINGLE PHASE POWER - PERMANENT-SPLIT CAPACITOR MOTORS

- A. Starting Torque: Exceeding one fourth of full load torque.
- B. Starting Current: Up to six times full load current.
- C. Multiple Speed: Through tapped windings.
- D. Open Drip-proof or Enclosed Air Over Enclosure: Class A insulation, minimum 1.0 Service Factor, prelubricated sleeve or ball bearings, automatic reset overload protector.

2.5 SINGLE PHASE POWER - CAPACITOR START MOTORS

- A. Starting Torque: Three times full load torque.
- B. Starting Current: Less than five times full load current.
- C. Pull-up Torque: Up to 350 percent of full load torque.
- D. Breakdown Torque: Approximately 250 percent of full load torque.
- E. Motors: Capacitor in series with starting winding; provide capacitor-start/capacitor-run motors with two capacitors in parallel with run capacitor remaining in circuit at operating speeds.
- F. Drip-proof Enclosure: Class A insulation, NEMA Service Factor, prelubricated sleeve bearings.
- G. Enclosed Motors: Class A insulation, 1.0 Service Factor, prelubricated ball bearings.

2.6 THREE PHASE POWER - SQUIRREL CAGE MOTORS

- A. Starting Torque: Between 1 and 1-1/2 times full load torque.
- B. Starting Current: Six times full load current.
- C. Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
- D. Design, Construction, Testing, and Performance: Conform to NEMA MG 1 for Design B motors.
- E. Insulation System: NEMA Class B or better.
- F. Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.
- G. Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.

- H. Thermistor System Motor Frame Sizes 254T and Larger: Three PTC thermistors imbedded in motor windings and epoxy encapsulated solid state control relay for wiring into motor starter.
- I. Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum AFBMA 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate. Replace plugs at completion of project and provide grease fittings.
- J. Sound Power Levels: To NEMA MG 1.
- K. Part Winding Start Above 254T Frame Size: Use part of winding to reduce locked rotor starting current to approximately 60 percent of full winding locked rotor current while providing approximately 50 percent of full winding locked rotor torque.
- L. Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.
- M. Nominal Efficiency: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.
- N. Nominal Power Factor: As scheduled at full load and rated voltage when tested in accordance with IEEE 112.

PART 3 EXECUTION

3.1 APPLICATION

- A. Single phase motors for shaft mounted fans: Split phase type.
- B. Single phase motors for shaft mounted fans or blowers: Permanent split capacitor type.
- C. Motors located in exterior locations, air cooled condensers explosion proof environments and dust collection systems shall be: Totally enclosed type.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C. Check line voltage and phase and ensure agreement with nameplate.
- D. Replace bearing plugs with grease fittings at project completion.

3.3 NEMA OPEN MOTOR SERVICE FACTOR SCHEDULE

HP	1800 RPM
1/6-1/3	1.35
2	1.25
3/4	1.25
1	1.15
1.5-75	1.15

3.4 PERFORMANCE SCHEDULE: THREE PHASE - ENERGY EFFICIENT, OPEN DRIP-PROOF

HP	RPM (Syn)	NEMA Frame	Minimum Percent Efficiency	Minimum Percent Power Factor
1	1800	143T	82	84
1-1/2	1800	145T	84	85
2	1800	145T	84	85
3	1800	182T	86	86
5	1800	184T	87	87
7-1/2	1800	213T	88	86
10	1800	215T	89	85
15	1800	256T	91	85
20	1800	256T	91	86
25	1800	284T	91	85
30	1800	286T	92	88

3.5 PERFORMANCE SCHEDULE: THREE PHASE-ENERGY EFFICIENT (E+3) TOTALLY ENCLOSED, FAN COOLED

HP	RPM (Syn)	NEMA Frame	Minimum Percent Efficiency	Minimum Percent Power Factor
1	1800	143T	82	84
1-1/2	1800	145T	84	85
2	1800	145T	84	85
3	1800	182T	87	83
5	1800	184T	88	83
7-1/2	1800	213T	89	85
10	1800	215T	90	84
15	1800	254T	91	86
20	1800	256T	91	85
25	1800	284T	92	84
30	1800	286T	93	86

END OF SECTION 230513

SECTION 230516 - PIPING EXPANSION COMPENSATION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Flexible pipe connectors.
- B. Pipe loops, offsets, and swing joints.
- C. Steel and copper pipe guides and anchors.

1.2 RELATED SECTIONS

- A. Section 22 05 03 - Plumbing Piping.
- B. Section 23 25 29 - Supports and Anchors.

1.3 REFERENCES

- A. Conform to Standards of Expansion Joint Manufacturers Association Selection Guide.
- B. ASHRAE Chapter 23, Pipes Tubes and Fittings.

1.4 PERFORMANCE REQUIREMENTS

- A. Provide structural work and equipment required to control expansion and contraction of piping. Verify that anchors, guides, and expansion joints provided, adequately protect system.
- B. Expansion Calculations:
 - 1. Installation Temperature: 40 degrees F.
 - 2. Hot Water Heating and Condensate: 210 degrees F.
 - 3. Domestic Hot Water: 140 degrees F.
 - 4. Safety Factor: 30 percent.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirements.

B. Product Data:

1. Flexible Pipe Connectors: Indicate maximum temperature and pressure rating, face-to-face length, live length, hose wall thickness, hose convolutions per foot (meter) and per assembly, fundamental frequency of assembly, braid structure, and total number of wires in braid.
2. Expansion Joints: Indicate maximum temperature and pressure rating, and maximum expansion compensation.

C. Design Data: Indicate selection calculations.

D. Manufacturer's Installation Instructions: Indicate special procedures, and external controls.

1.6 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of the General Requirements.
- B. Record actual locations of flexible pipe connectors, expansion joints, anchors, and guides.

1.7 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of the General Requirements.
- B. Maintenance Data: Include adjustment instructions.

1.8 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of the General Requirements.
- B. Accept expansion joints on site in factory packing with shipping bars and positioning devices intact. Inspect for damage.
- C. Protect equipment from exposure by leaving factory coverings, pipe end protection, and packaging in place until installation.

1.10 WARRANTY

- A. Provide five year warranty under provisions of the General Requirements.
- B. Warranty: Include coverage for leak free performance of packed expansion joints.

PART 2 PRODUCTS

2.1 FLEXIBLE PIPE CONNECTORS

- A. Manufacturers:
 - 1. Mason Industries - Model BSS.
 - 2. MetraFlex - Model Mini.
 - 3. Hyspan Precision - Model 4500.
 - 4. General Rubber Corporation.
 - 5. Victaulic Engineered Assemblies.
 - 6. Owner approved equal.
- B. Inner Hose: Stainless Steel.
- C. Exterior Sleeve: Double braided, bronze.
- D. Pressure Rating: 200 psi WOG and 250 degrees F maximum temperature.
- E. Joint: Flanged.
- F. Maximum offset: 1 inch on each side of installed center line.

2.2 ACCESSORIES

- A. Pipe Alignment Guides:
 - 1. Two piece welded steel with enamel paint, bolted, with spider to fit standard pipe, frame with four mounting holes, clearance for minimum 1 inch thick insulation, minimum 3 inch travel.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Construct spool pieces to exact size of flexible connection for future insertion.
- C. Install flexible pipe connectors on pipes connected to equipment supported by vibration isolation. Provide line size flexible connectors.
- D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- E. Rigidly anchor pipe to building structure where necessary. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
- F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets or expansion joints where required.
- G. Provide expansion loops as required on drawings or as required by field conditions. Engineered expansion compensators shall be used in lieu of expansion loops if clearance is limited.

END OF SECTION 230516

SECTION 230529 - SUPPORTS AND ANCHORS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Pipe and equipment hangers and supports.
- B. Inserts.
- C. Equipment bases and supports.
- D. Sleeves and seals.
- E. Flashing and sealing equipment and pipe stacks.

1.2 RELATED SECTIONS

- A. Section 22 05 03 - Plumbing Piping.
- B. Section 23 07 01 - Piping Insulation.
- C. Section 23 11 26 - Fuel Piping.

1.3 REFERENCES

- A. American Society of Mechanical Engineers:
 - 1. ASME B31.1 – Power Piping.
 - 2. ASME B31.2 – Fuel Gas Piping.
 - 3. ASME B31.9 – Building Services Piping.
- B. ASTM International:
 - 1. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
 - 2. ASTM E814 – Standard Test Method for Fire Tests of Through Penetration Fire Stops.
 - 3. ASTM F708 – Standard Practice for Design and Installation of Rigid Pipe Hangers.
 - 4. ASTM E1966 – Standard Test Method for Fire-Resistive Joint Systems.
- C. American Welding Society:
 - 1. AWS D1.1 – Structural Welding Code – Steel.

D. FM Global:

1. FM – Approved Guide, A Guide to Equipment, Materials & Services Approved by Factory Mutual Research for Property Conservation.

E. Underwriters Laboratories, Inc.

1. UL 263 – Fire Tests of Building Construction and Materials.
2. UL 723 – Tests for Surface Building Characteristics of Building Materials.
3. UL 1479 – Fire Tests of Through-Penetration Firestops.
4. UL 2079 – Tests for Fire Resistance of Building Joint Systems.
5. UL – Fire Resistance Directory.

1.4 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirements.
- B. Shop Drawings: Indicate system layout with location and detail of trapeze hangers.
- C. Product Data: Provide manufacturers catalog data including load capacity.
- D. Design Data: Indicate load carrying capacity of trapeze, multiple pipe, and riser support hangers.
- E. Manufacturer's Installation Instructions: Indicate special procedures and assembly of components.

1.6 REGULATORY REQUIREMENTS

- A. Conform to International Mechanical Code for support of plumbing.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Plumbing Piping - DWV:

1. Conform to ASME B31.9, ASTM F708.
2. Hangers for Pipe Sizes 2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.

4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
7. Vertical Support: Steel riser clamp.
8. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
9. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Plumbing Piping - Water:

1. Conform to ASME B31.9, ASTM F708.
2. Hangers for Pipe Sizes 2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
3. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
5. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
6. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
7. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
8. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
9. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
10. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
11. Vertical Support: Steel riser clamp.
12. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
13. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
14. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
15. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Fuel Gas Piping:

1. Conform to ASME B31.2, ASTM F708.
2. Hangers for Pipe Sizes 2 to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
3. Hangers for Hot Pipe Sizes 2 to 4 Inches: Carbon steel, adjustable, clevis.
4. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6 Inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
7. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
8. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.

9. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
10. Vertical Support: Steel riser clamp.
11. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
12. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
13. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

D. Refrigerant Piping:

1. Conform to ASME B31.5, ASTM F708.
2. Hangers for Pipe Sizes to 1-1/2 Inch: Malleable iron, adjustable swivel, split ring.
3. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
6. Vertical Support: Steel riser clamp.
7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.2 ACCESSORIES

- A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

2.3 INSERTS

- A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

- A. Metal Flashing: 26 gage galvanized steel.
- B. Metal Counterflashing: 22 gage galvanized steel.
- C. Lead Flashing:
1. Waterproofing: 5 lb/sq ft sheet lead.
 2. Soundproofing: 1 lb/sq ft sheet lead.
- D. Flexible Flashing: 47 mil thick sheet compatible with roofing.
- E. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.5 EQUIPMENT CURBS

A. Manufacturers:

1. Thycurb.
2. Pate.
3. Owner approved equal.

B. Fabrication: Welded 18 gage galvanized steel shell and base, mitered 3 inch cant, 1-1/2 inch thick insulation, factory installed wood nailer, 18 inches high, see architectural drawings for additional information.

2.6 SLEEVES

A. Sleeves for Pipes Through Non-fire Rated Floors: 18 gage galvanized steel.

B. Sleeves for Pipes Through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.

C. Sleeves for Pipes Through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.

D. Sleeves for Round Ductwork: Galvanized steel.

E. Sleeves for Rectangular Ductwork: Galvanized steel.

F. Firestopping Insulation: Glass fiber type, non-combustible.

G. Sealant: Acrylic.

2.7 MECHANICAL SLEEVE SEALS

A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.8 FORMED STEEL CHANNEL

A. Product Description: Galvanized 12-gauge thick steel. With holes 1-1/2 inches on center.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.

3.2 INSERTS

- A. Provide inserts for placement in concrete formwork.
- B. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

3.3 PIPE HANGERS AND SUPPORTS

- A. Support horizontal piping as scheduled.
- B. Install hangers to provide minimum 2 inch space between finished covering and adjacent work.
- C. Place hangers within 12 inches of each horizontal elbow.
- D. Use hangers with 1-1/2 inch minimum vertical adjustment.
- E. Support horizontal cast iron pipe adjacent to each hub, with 5 feet maximum spacing between hangers.
- F. Support vertical piping at every floor. Support vertical cast iron pipe at each floor at hub.
- G. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Provide copper plated hangers and supports for copper piping.
- J. Design hangers for pipe movement without disengagement of supported pipe.

3.4 EQUIPMENT BASES AND SUPPORTS

- A. Provide housekeeping pads of concrete, minimum 4 inches thick and extending 6 inches beyond supported equipment.
- B. Provide templates, anchor bolts, and accessories for mounting and anchoring equipment.
- C. Construct supports of steel members. Brace and fasten with flanges bolted to structure.
- D. Provide rigid anchors for pipes after vibration isolation components are installed.

3.5 FLASHING

- A. Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Flash vent and soil pipes projecting 3 inches minimum above finished roof surface with lead worked one inch minimum into hub, 8 inches minimum clear on sides with 24 x 24 inches sheet size. For pipes through outside walls, turn flanges back into wall and calk, metal counterflash, and seal.
- C. Flash floor drains in floors with topping over finished areas with lead, 10 inches clear on sides with minimum 36 x 36 inch sheet size. Fasten flashing to drain clamp device.
- D. Seal floor, shower and mop sink drains watertight to adjacent materials.
- E. Provide curbs for mechanical roof installations 18 inches minimum high above roofing surface. Flash and counterflash with sheet metal; seal watertight. Attach counterflashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints. Roof curbs shall match roof pitch.
- F. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.6 SLEEVES

- A. Set sleeves in position in formwork. Provide reinforcing around sleeves.
- B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- C. Extend sleeves through floors 1-1/2 inch above finished floor level. Caulk sleeves.
- D. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and calk air tight. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- E. Install chrome plated steel escutcheons at finished surfaces.

3.7 SCHEDULES

A. Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8
2-1/2 (Note 2)	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8
5	13	16	1/2	5/8
6	14	17	5/8	3/4
8	16	19	3/4	3/4

B. Plastic and Ductile Iron Pipe Hanger Spacing:

PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
ABS (All sizes)	4	3/8
FRP (All Sizes)	4	3/8
Ductile Iron (Note 2)		
PVC (All Sizes)	4	3/8

C. Note 1: Refer to manufacturer's recommendations for grooved end piping systems.

D. Note 2: 20 feet maximum spacing, minimum of one hanger for each pipe section close to joint behind bell. Provide hanger at each change of direction and each branch connection. For pipe sizes 6 inches and smaller, subjected to loadings other than weight of pipe and contents, limit span to maximum spacing for water service steel pipe.

END OF SECTION 2305229

SECTION 230548 - VIBRATION ISOLATION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Vibration isolation for piping and equipment.
- B. Piping flexible connections.

1.2 RELATED EQUIPMENT SECTIONS

- A. Section 23 61 00 – Refrigerant Piping and Specialties.
- B. Section 23 82 00 – Terminal Heat Transfer Units.
- C. Section 23 83 10 – Heat Pump Heat Recovery System.

1.3 REFERENCES

- A. ASHRAE – Guide to Average Noise Criteria Curves.

1.4 QUALITY ASSURANCE

- A. Maintain ASHRAE criteria for average noise criteria curves for all equipment at full load condition.
- B. Provide all vibration isolators and equipment bases for Division 23 work from the product line of a single manufacturer, unless otherwise accepted by the Acoustics Consultant.
- C. Select isolators to provide uniform deflections within acceptable tolerances when supporting the equipment approved for this project. Coordinate as required with the equipment manufacturers to accomplish this.
- D. Provide engineering, isolator selection, site supervision, and inspection by manufacturer's personnel who shall perform these services directly. Alert the Engineer and Acoustics Consultant of isolator selections that may result in resonances with the equipment and structural systems they are intended to isolate. Replace isolators that upon installation are found to resonate with the supported equipment.

- E. Provide complete isolation systems that include all elements recommended by the manufacturer for compliance with project requirements and applicable codes, ordinances, and regulations. Include all incidental products and materials required for a complete installation even if not explicitly described in the Construction Documents.
- F. Install vibration isolation systems using skilled workers trained and licensed, as applicable, by the manufacturer for installations of the types used on this project. Upon completion of the Work, provide final inspection by the manufacturer's representative and submit to the Architect and Engineer a written report authored by the manufacturer's representative certifying the correctness of installation and compliance with the approved submittal data. Include tabulation of the static deflection expected under design and operating loads in comparison with the actual static deflection measured in the completed installations.

1.5 UNACCEPTABLE TYPES

- A. Do not use housed spring mounts on this project. Mason models C, CI, and CS; Amber-Booth models XI and XK; Kinetics SL and SM; and similar mounts are not acceptable.
- B. Do not use captive spring mounts on this project. Provide seismic restraint by means of resilient snubbers at the perimeter of the equipment or equipment base and not by mounts that combine isolation and snubbing functions. Mason model SSLFH, Amber-Booth model SWPQ, and similar mounts are not acceptable.
- C. Do not use cork as an isolation material.
- D. Do not use braided metallic hose for vibration isolation in piping unless fluid temperatures and pressures are beyond the service range of spherical elastomeric isolators.

1.6 SUBMITTALS

- A. Submit manufacturer's data, shop drawings, and product performance certifications in accordance with the General Requirements.
- B. Manufacturer's Data: Submit technical product data confirming that products comply with specified requirements:
 - 1. Illustrations and descriptions of components including, but not limited to isolators, equipment bases, thrust and seismic restraints, anchors, and accessories.
 - 2. Operation and maintenance instructions.
- C. Shop Drawings
 - 1. Full-size details of isolation systems, including plan and section drawings indicating isolator and flexible connection locations and types, isolator and connector schedules, and installation details.
 - 2. Indicate substrate construction required of other subcontractors.

- D. Color code legend for spring and elastomer capacities.
- E. Samples: provide a sample of each type of isolator assembly used in the project. It is not necessary to submit samples of each spring capacity and pad hardness.
- F. Calculations: submit manufacturer's engineer's calculations of loads, deflections, and natural frequencies for record only.
- G. General Requirements for Vibration Isolation Mounts and Hangers: Provide catalog cut sheets, shop drawings, and other documents as necessary to describe the installation and its components.
 - 1. Springs:
 - a. Equipment name and number
 - b. Operating Weight of Equipment
 - c. Lowest reciprocating or rotating speed
 - d. Isolator type
 - e. Weight supported by isolator
 - f. Scheduled deflection
 - g. Proposed deflection under operating load
 - h. Natural Frequency
 - i. Spring free height
 - j. Spring operating height
 - k. Spring solid height at coil bind
 - l. Spring diameter
 - 2. Elastomeric Pads:
 - a. Equipment name and number
 - b. Operating Weight of Equipment
 - c. Isolator type
 - d. Weight supported by isolator
 - e. Pad bearing area
 - f. Pad free height
 - g. Pad operating height
 - h. Scheduled deflection
 - i. Proposed deflection under operating load
 - j. Percent deflection
 - k. Natural Frequency
 - l. Hardness and compliance with AASHTO Bridge Bearing Neoprene quality standard

1.7 REGULATORY REQUIREMENTS

- A. Conform to International Mechanical Code.

1.8 MANUFACTURER RESPONSIBILITIES

- A. Manufacturer of vibration isolation equipment shall have the following responsibilities:
1. Determine vibration isolation sizes and locations.
 2. Provide piping and equipment isolation systems as scheduled or specified.
 3. Guarantee specified isolation system deflection.
 4. Provide installation instruction, drawings and field supervision to assure proper installation and performance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers listed below have demonstrated an ability to comply with specifications for vibration isolation products similar to those required for this project. However, specific products made by the listed manufacturers do not all comply with the requirements of this specification. Subject to the requirement for a single manufacturer and the restrictions regarding unacceptable types of isolators, the products of the following manufacturers are acceptable sources for this project:
1. Mason Industries, Inc.
 2. Kinetics Noise Control.
 3. Amber-Booth Company, Inc.
 4. E.A.R.
 5. PSI-Thunderline/Link-Seal.
 6. Ductmate Industries, Inc.
 7. Unger Technologies.
 8. Owner Approved Equal.

2.2 SPRING REQUIREMENTS

- A. Provide steel springs with static deflections equal to or greater than those shown on the Construction Documents. Submittals based on rated deflections will be rejected.
- B. Unless otherwise noted, size springs to provide a natural frequency of not more than 3 Hertz. Where spring deflections called out in the Construction Documents exceed those required to achieve a natural frequency of 3 Hz or less, the greater deflection will govern.
- C. Size springs to provide not less than 50 percent additional travel to solid, coil-bind condition beyond the deflection under operating load.
- D. Size springs so that diameter is not less than 80 percent of the height of the spring at operating load.
- E. Provide springs that do not permanently deflect after loading to a solid, coil-bind condition.

- F. Do not weld springs to other components of the isolator assembly unless specifically noted in the Submittals and accepted by the Acoustics Consultant.
- G. Color code springs to allow positive identification after installation. Match color coding to the color code legend provided with the submittals.

2.3 ELASTOMER REQUIREMENTS

- A. Provide elastomeric elements with static deflections equal to or greater than those shown on the Construction Documents. Submittals based on rated deflections will be rejected.
- B. Provide neoprene elements with a maximum hardness of 40 durometer, Shore A rating, where possible, but in no case exceeding 50 durometer. Where deflections called out in the construction documents exceed those required to achieve the specified natural frequencies, the greater deflection will govern.
- C. Meet AASHTO Highway Bridge Specifications for all neoprene products installed in irretrievable locations and as required elsewhere in the Construction Documents.

2.4 ACCEPTABLE PRODUCTS

- A. (Type A) Elastomeric Pads: 5/16-inch minimum thickness, waffled or ribbed neoprene. Where multiple layers are required to provide the specified deflections, interleave pads with 16 gauge steel shim plates. Size pads for deflection equal to 10 to 15 percent of unloaded height and provide pads of sufficient thickness to achieve the specified deflection. Provide load-distributing top plates if required for uniform loading. Acceptable products include:
 - 1. Individual pads
 - a. Mason W, SW, and Super W
 - b. Kinetics NP
 - c. Amber-Booth NR
 - d. Owner Approved Equal.
 - 2. Neoprene/Steel composite pads:
 - a. Mason WSW
 - b. Amber-Booth SP-NR Style E
 - c. Owner Approved Equal.

- B. (Type B) Neoprene-In-Shear Base-Mounted Isolators: Provide double-deflection isolators with steel bottom plates with pre-drilled bolt holes for attachment to floor or base, a threaded steel insert at the top of the isolator for attaching the equipment, and friction surfaces at both top and bottom. Coat all metal surfaces with neoprene. Design isolators for 0.25 to 0.35 inches of deflection. Acceptable products include:

1. Neoprene-In-Shear Isolators:

- a. Mason ND
- b. Kinetics RD
- c. Amber-Booth RVD
- d. Owner Approved Equal.

- C. (Type D) Restrained Open Spring Base-Mounted Isolators: Provide built-in adjustable spring restraints for equipment with operating weight greater than weight upon installation to prevent equipment from deflecting (or rising) when the additional weight is applied (or removed in the future). Provide isolators as specified for Type C but with restraint studs and adjustable nuts. Provide ½ inch minimum clearance around the restraint studs. Use bridge-bearing quality neoprene for elastomeric friction pads at chillers and cooling towers. Acceptable products include:

1. Restrained Base Mounted Isolators:

- a. Mason SLR
- b. Kinetics FLS
- c. Amber-Booth CT
- d. Owner Approved Equal.

- D. (Type F) Spring Hangers: Provide spring of the general characteristics specified in Paragraph 2.2, above in a rigid steel hanger box. Seat spring in a molded neoprene cup with steel washer reinforcing. Mold neoprene element with a rod isolation bushing that prevents rigid contact between hanger rod and housing from vertical through an angular deflection of not less than 15 degrees in any direction. For ductwork hung by straps, provide hangers with eyes on the top and bottom to allow for bolting to the straps. Acceptable products include:

1. Spring hangers:

- a. Mason types 30 and W30
- b. Owner Approved Equal.

- E. (Type G) Spring/Elastomer-in-Series Hangers: Provide neoprene-in-shear element of 1¼-inch minimum thickness and a spring of the general characteristics specified in Paragraph 2.2, above. Seat spring in a molded neoprene cup with steel washer reinforcing. Mold neoprene element with a rod isolation bushing that prevents rigid contact between hanger rod and housing from vertical through an angular deflection of not less than 15 degrees in any direction. Design neoprene for .25 to .35 inch minimum static deflection at rated load. Do not directly stack the spring and neoprene isolator elements. For ductwork hung by straps, provide hangers with eyes on the top and bottom to allow for bolting to the straps. Acceptable products include:

1. Spring/Elastomer-in-Series Hangers:

- a. Mason 30N
- b. Kinetics SRH
- c. Amber-Booth BSRA
- d. Owner Approved Equal.

- F. (Type H) Pre-compressed Spring/Elastomer-in-Series Hangers: Provide built-in adjustable spring restraints for equipment with operating weight greater than weight upon installation to prevent equipment from deflecting (or rising) when the additional weight is applied (or removed in the future). Provide isolators as specified in Subparagraph G but pre-compressed with restraint mechanisms that can be released to free the spring when subjected to its operational load. Provide an integral scale to indicate amount of deflection. For ductwork hung by straps, provide hangers with eyes on the top and bottom to allow for bolting to the straps. Acceptable products include:

1. Pre-compressed Spring/Elastomer-in-Series Hangers:

- a. Mason PC30N
- b. Amber-Booth PBSRA
- c. Owner Approved Equal.

- G. (Type P) Flexible Neoprene Piping Connectors: Provide flanged twin-sphere or threaded single-sphere isolators with Kevlar cord and peroxide-cured EPDM body with steel rings embedded in flanges to prevent pull-out. Connectors must accept elongation, compression, axial, and transverse motion. Select materials to suit system temperature, pressure, and fluid type. Do not use control rods or cables to limit extension of the isolator. Use twin-sphere isolators for pipes 2 inches to 14 inches in diameter. Single-sphere isolators may be used for pipes less than 2 inches and greater than 14 inches in diameter. Straight-wall flexible connectors are not acceptable except for sewage ejector pumps. Acceptable products include:

1. Flexible Neoprene Piping Connectors:

- a. Mason types SFDEJ, SFDJR, and SFU
- b. Owner Approved Equal.

- H. (Type Q) Flexible Duct Connections: Provide Hypalon-coated, woven fiberglass, flameproof fabric (24 oz per square yard), serviceable from -40°F to 250°F. Acceptable products include:
1. Ductmate Pro-Flex
 - a. Owner Approved Equal.
- I. (Type S) Elastomeric Isolators for Mounting Bolts: Provide neoprene grommets, bushings, and washers for all bolts used to secure isolators to floors and housekeeping slabs and for all snubbers. Size bolt holes and washers to accommodate grommets, sleeves, and bushings and to preclude contact between rigid components that would cause bridging between isolated elements and the building structure. Baseplates for neoprene pads may be rigidly bolted to the floor or housekeeping slab if the bolts secure the baseplates only and do not continue through the neoprene to meet any other rigid material. Do not exceed 40 durometer, Shore A hardness. Acceptable products include:
1. Grommets (Washer Bushings):
 - a. Mason HG
 - b. E.A.R. Isodamp and C-1000
 - c. Owner Approved Equal.
 2. Bushings:
 - a. Mason HLB
 - b. Owner Approved Equal.
 3. Washers:
 - a. Mason HLW
 - b. Owner Approved Equal.

PART 3 EXECUTION

3.1 INSTALLATION

A. General:

1. Install in accordance with manufacturer's written instructions. Vibration isolators must not cause any change of position of equipment or piping resulting in piping stresses or misalignment.
2. Mechanical equipment shall be isolated from the building structure by means of noise and vibration isolators as scheduled on the drawings.
3. All piping and vertical risers shall be isolated from the building structure by means of noise and vibration isolation guides and supports.

4. All piping and ductwork to be isolated shall freely pass through walls and floors without rigid connections. Penetration points shall be sleeved or otherwise formed to allow passage of piping or ductwork, and maintain 3/4" to 1 1/4" clearance around the outside surfaces. This clearance space shall be tightly packed with fiberglass, and caulked airtight after installation of piping or ductwork.
5. No rigid connections between equipment and building structure shall be made that degrades the noise and vibration isolation system herein specified.
6. Electrical circuit connections to isolated equipment shall be looped to allow free motion of isolated equipment.
7. The Contractor shall not install any equipment, piping or conduit which makes rigid contact with the "building" unless permitted in the Specification. Building includes, but is not limited to slabs, beams, columns, studs and walls.
8. Coordinate work with other trades to avoid rigid contact with the building. Inform other trades following work, such as plastering or electrical, to avoid any contact which would reduce the vibration isolation.
9. Bring to the Architect's attention prior to installation any conflicts with other trades which will result in unavoidable rigid contact with equipment or piping as described herein, due to inadequate space or other unforeseen conditions. Corrective work necessitated by conflicts after installation shall be at the responsible contractor's expense.
10. Bring to the Architect's attention any discrepancies between the specifications and field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the contractor's expense.
11. Obtain inspection and approval of any installation to be covered or enclosed, prior to such closure.
12. Correct, at no additional cost, all installation which are deemed defective in workmanship or materials.
13. For all isolated equipment, make connections of piping, ductwork, and conduit using flexible connections specified in this section. Make no connections to isolated equipment in a manner that would compromise the performance of the isolation systems.

3.2 MOUNTS AND HANGERS

- A. Align mounts and hangers squarely above or below the equipment mounting holes to avoid introducing lateral loads and deflection.
- B. Deflection requirements:
 1. Verify installed isolators have deflections equal to or greater than deflections specified on the submittals.
 2. Where multiple deflections apply to a single isolator (where a single isolator supports multiple isolated elements), the largest deflection governs.
 3. Vary the size and/or hardness of isolators as required to yield equal deflection for all isolators supporting a single piece of equipment or length of pipe or ductwork. Consult manufacturer for direction when specified isolators do not yield required deflection and correct non-compliant isolators at no cost to the Owner.

- C. Support equipment, ductwork, conduit and piping independently. Do not hang equipment, ductwork, piping, or conduit from other isolated equipment, ductwork, piping, or conduit.
- D. Maintain 2 inches of clearance between isolated elements and walls, ceilings, and other non-isolated building components.
- E. Isolate drain piping attached to vibration isolated equipment from rigid components of the building.
- F. Limit stops must be inactive and out of contact with the isolator during equipment operation.
- G. Adjust leveling bolts and hanger rod lengths so that equipment is level and in alignment with connecting ductwork and piping.
- H. Restrained isolators may be substituted for unrestrained isolators at installer's option to simplify installation.
- I. Isolate hanger rods passing through barrier ceilings with elastomeric sleeves or grommets or treat as resilient penetrations in accordance with the details and Section 13082 – Acoustical Sealants. Unless noted otherwise, locate equipment, piping, and ductwork below barrier ceilings.

3.3 DUCTWORK

- A. Connect ductwork to equipment using Type Q flexible duct connections. Crimp fabric into duct flanges and seal airtight. Provide minimum separation of 6 inches between duct and equipment. Provide 1½ inch minimum slack or as required to accommodate full range of equipment and duct movement when subjected to maximum operating and lateral loads simultaneously without becoming taut. Utilize Type I thrust restraints to limit horizontal movement so that flexible connections do not become taut under any combination of operational loads. Mount flexible duct connections as close to equipment housings as practical but in no case beyond the first duct hanger.
- B. Duct Connections at Rigidly-Mounted Fire Dampers: Provide Type Q flexible duct connections at each side of all fire dampers rigidly connected to the associated partition construction.
- C. Isolator Types:
 - 1. Provide Type G spring/elastomer-in-series hangers for the first 3 duct hangers from the equipment. Provide hangers with minimum static deflection equal to that of the isolators supporting the equipment.
 - 2. Beyond the first 3 hangers, support all ductwork with short-side dimension less than 24 inches in the following manner:
 - a. Support with Type F elastomeric hangers, Type B neoprene-in-shear base mounts, or Type A elastomeric pads at all points of support within 50 feet of the equipment to which the ductwork connects.
 - b. Beyond 50 feet from the equipment, no isolation is required unless the ductwork is supported from construction enclosing Acoustically Sensitive or Critical Rooms, in which case provide the isolators described in (a).

3. Beyond the first 3 hangers, support ductwork with short-side dimension of 24 inches or greater in the following manner:
 - a. Support with Type H pre-compressed spring/elastomer-in-series hangers or Type E restrained open spring base mount isolators for a minimum of 50 feet from the equipment.
 - b. If air velocities exceed 800 feet per minute, continue the isolators for an additional 50 feet.
 - c. In addition to the requirements of (a) and (b), provide isolators for all ductwork with velocities exceeding 800 feet per minute that is supported from Acoustically Sensitive or Acoustically Critical Rooms or that is otherwise indicated on the Drawings to receive isolation.
4. Vertical Ductwork:
 - a. Support vertical ductwork for the 3 supports nearest the equipment with Type D open mount spring isolators with minimum deflections equal to or greater than the isolators supporting the equipment.
 - b. Thereafter, support all vertical ductwork with short-side dimension less than 24 inches with Type B neoprene-in-shear isolators for not less than 50 feet from the equipment.
 - c. Support all vertical ductwork with short-side dimension equal to or greater than 24 inches and all other ductwork indicated on the Drawings to receive isolation on Type D open spring base mount isolators.

3.7 EQUIPMENT SCHEDULE

A. Equipment to be installed on isolators:

1. Air cooled condensing units.

3.8 TESTING, EVALUATION AND ACCEPTANCE PROCEDURES

- A. If it is found that the construction fails the acoustic test measurements or performance requirements identified in the Contract Documents, make changes necessary to meet the requirements identified in the Contract Documents and be responsible for the costs associated with performing all additional acoustical tests to verify the acoustic performance of the construction. Costs for additional acoustical testing shall include consulting fees at per hour rates in effect at the time of testing along with related expenses including, but not limited to, travel expenses and test equipment use charges.

END OF SECTION 230548

SECTION 230553 - MECHANICAL IDENTIFICATION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Nameplates.
- B. Tags.
- C. Stencils.
- D. Pipe Markers.

1.2 RELATED SECTIONS

- A. Section 22 05 03 - Plumbing Piping.
- B. Section 23 07 00 – Ductwork Insulation.
- C. Section 23 07 01 - Piping Insulation.
- D. Section 23 11 26 - Fuel Piping.
- E. Section 23 31 00 - Ductwork.
- F. Section 23 61 00 – Refrigerant Piping and Specialties.

1.3 REFERENCES

- A. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS

- A. Submit under provisions of the General Requirements.
- B. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- C. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- D. Product Data: Provide manufacturers catalog literature for each product required.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of the General Requirements.
- B. Record actual locations of tagged valves.

PART 2 PRODUCTS

2.1 NAMEPLATES

- A. Manufacturers:
 - 1. Laco.
 - 2. Seton.
 - 3. Brady.
 - 4. Owner Approved Equal.
- B. Description: Laminated three-layer plastic with engraved black letters on light contrasting background color.

2.2 TAGS

- A. Manufacturers:
 - 1. Laco.
 - 2. Seton.
 - 3. Brady
 - 4. Owner Approved Equal.
- B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2 inch diameter.
- C. Chart: Typewritten letter size list in anodized aluminum frame.

2.3 STENCILS

- A. Stencil: Paint for labeling will not be accepted. All labeling will be with manufacturers labels and letters.

2.4 PIPE MARKERS

- A. Color: Conform to ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Duct Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- D. Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape, minimum 6 inches wide by 4 mil thick, manufactured for direct burial service.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

- A. Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant stainless steel chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- E. Identify control panels and major control components outside panels with plastic nameplates.
- F. Identify valves in main and branch piping with tags (ie: HWS, HWR, BWS, BWR, HW, CW, etc).
- G. Identify air terminal units with numbered tags.
- H. Tag automatic controls, instruments, and relays. Key to control schematic.

- I. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- J. Identify ductwork with plastic tape markers. Identify type of service ie. supply, return, fresh air, exhaust relief and direction of flow. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- K. Identify calibrated balancing valves with tags indicating model number, flow rate, service and setting.

3.3 VALVE CHART AND SCHEDULE

- A. Provide valve chart and schedule in aluminum frame with clear plastic shield. Install in location directed by Owner.

END OF SECTION 230553

SECTION 230593 - TESTING, ADJUSTING AND BALANCING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Measurement of final operating condition of HVAC systems.

1.2 RELATED SECTIONS

- A. General Conditions - Starting of Systems.
- B. Division 22 Specifications.
- C. Division 23 Specifications.

1.3 REFERENCES

- A. AABC - National Standards for Total System Balance.
- B. ADC - Test Code for Grilles, Registers, and Diffusers.
- C. ASHRAE 111 - Practices for Measurement, Testing, Adjusting, and Balancing of Building Heating, Ventilation, Air-conditioning, and Refrigeration Systems.
- D. NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- E. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

1.4 SUBMITTALS

- A. Submit under provisions of the General Requirements.
- B. Submit name of adjusting and balancing agency for approval within 30 days after notice of award of Contract.
- C. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
- D. Prior to commencing work, submit report forms or outlines indicating adjusting, balancing, and equipment data required.

- E. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect/Engineer and for inclusion in operating and maintenance manuals.
- F. Provide reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations.
- G. Test Reports: Indicate data on AABC National Standards for Total System Balance forms.
- H. BAS Contractor shall provide to the Test & Balance Company the following minimum information to help expedite the initial review of the HVAC System:
 - 1. Provide design drawings and specifications for balancing review.
 - 2. Layout the project on data sheets to further review the design for correct total air flows, pump flows, box sizes, etc.
 - 3. Provide sheet metal shop drawings.
 - 4. Provide equipment submittals.
 - 5. Provide control company submittals.
- I. BAS Contractor shall submit complete background experience of his proposed Air and Water Testing and Balancing Contractor for Architect/Engineer's approval before executing a contract for the work.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of the General Requirements.
- B. Record actual locations of flow measuring stations, balancing valves and rough setting.

1.6 QUALITY ASSURANCE

- A. The TAB firm shall be a sub-contractor to the Building Automation System (BAS) Contractor and have at least fifteen (15) years successful testing, adjusting and balancing experience on projects with testing and balancing requirements similar to those required for this project.
- B. The TAB firm SHALL NOT BE THE ORIGINAL INSTALLER of the systems or equipment to be tested and shall not be related to any of the successful Mechanical Contractors. He shall otherwise act as an independent contractor that specializes in and whose business is limited to testing and balancing.
- C. Work shall be done under the direct supervision of a qualified test and balance engineer employed by the TAB contractor. Instruments used by this contractor shall be accurately calibrated and maintained in good working order. If requested, tests shall be conducted in the presence of the Engineer or Owner.

1.7 SEQUENCING AND SCHEDULING

- A. Sequence work to commence after completion of each system and schedule completion of work before Substantial Completion of Project. TBS Contractor shall coordinate his work with the Building Automation Contractor's work. Refer to the General Requirements for Sequence of Construction for each school. TAB Contractor shall be required to start and stop work as required to accommodate phase sequence of each school.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
 2. Temperature control systems are installed complete and operable.
 3. Proper thermal overload protection is in place for electrical equipment.
 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 5. Duct systems are clean of debris.
 6. Fans are rotating correctly.
 7. Fire and volume dampers are in place and open.
 8. Air coil fins are cleaned and combed.
 9. Access doors are closed and duct end caps are in place.
 10. Air outlets are installed and connected.
 11. Duct system leakage is minimized.
 12. Hydronic systems are flushed, filled, vented, and pressure tested.
 13. Pumps are rotating correctly.
 14. Proper strainer baskets are clean and in place.
 15. Service and balance valves are open.
 16. All automatic and manual dampers are operable and fully open.
- B. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
- C. Beginning of work means acceptance of existing conditions.
- D. A construction deviation field report must be submitted noting deviation or deficiencies in the above 3.1A, that would preclude or prevent system balance.

3.2 PREPARATION

- A. Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Architect/Engineer to facilitate spot checks during testing.
- B. Provide additional balancing devices as required.
- C. All HVAC systems must have manufacturers start-up reports prior to balancing systems.

3.3 INSTALLATION TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
- C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.
- D. Balance to reduce/eliminate objectionable noise and note on report as required.

3.4 ADJUSTING

- A. Ensure recorded data represents actual measured or observed conditions.
- B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.5 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, exhaust fresh air quantities.
- B. As a minimum, air system shall be prepared for testing in the following manner:
 - 1. Using pitot tube transverse, set main line dampers to deliver proper air volumes to zones.
 - 2. Using pitot tube transverse, set branch line dampers to deliver proper air volumes to air terminal outlets in each zone.

3. Read CFM at each air terminal outlet and adjust to meet design requirements. Test and record items as listed in the following test procedures.
 - a. Test and adjust fan RPM to design requirements.
 - b. Test and record fan motor full amperes.
 - c. Make pitot tube transverse of main air ducts and obtain design volume at fans.
 - d. Test and record system static pressure at fan suction and discharge.
 - e. Test and adjust system for design recirculated air volume.
 - f. Test and adjust system for design outdoor air volume.
 - g. Adjust main duct to proper design volume.
 - h. Adjust zones to proper design volume supply and return/exhaust.
 - i. Test and adjust each air terminal to within tolerance of 10 percent or as specified on the drawings.
 4. In cooperation with the control manufacturer's representative, who is responsible for setting adjustments of automatically operated dampers to operate as specified, indicated and/or noted, TAB agency shall check controls for proper operation and list controls requiring adjustment by control installer.
 5. Air terminal outlets shall be adjusted to minimize drafts. Adjust air patterns to match plans.
- C. Adjust outside air automatic dampers, outside air, return air and exhaust dampers for design conditions.
- D. Measure temperature conditions across outside air, return air and exhaust dampers to check leakage.
- E. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling and at minimum air flow rate, full heating.
- F. Measure building static pressure and adjust supply, return and exhaust air systems to provide required relationship between each to maintain approximately 0.02 inches positive static pressure near the building entries.
- G. Provide and install replacement sheaves, belts, pulleys, etc. as required to meet final balancing requirements.

3.6 SCHEDULES

- A. Equipment Requiring Testing, Adjusting, and Balancing (Including but Not Limited to):

Terminal Heat Transfer Units
Fans
Air Inlets and Outlets
Air Cooled Condensing Units
Rooftop Units
Supplementary Air Conditioning units
Air Filters
Terminal Units

B. Report Forms

1. Title Page:

- a. Name of Testing, Adjusting, and Balancing Agency
- b. Address of Testing, Adjusting, and Balancing Agency
- c. Telephone number of Testing, Adjusting, and Balancing Agency
- d. Project name
- e. Project location
- f. Project Architect
- g. Project Engineer
- h. Project Contractor
- i. Project altitude
- j. Report date

2. Summary Comments:

- a. Design versus final performance
- b. Notable characteristics of system
- c. Description of systems operation sequence
- d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
- e. Nomenclature used throughout report
- f. Test conditions

3. Instrument List:

- a. Instrument
- b. Manufacturer
- c. Model number
- d. Serial number
- e. Range
- f. Calibration date

4. Electric Motors:

- a. Manufacturer
- b. Model/Frame
- c. HP/BHP
- d. Phase, voltage, amperage; nameplate, actual, no load
- e. RPM
- f. Service factor
- g. Starter size, rating, heater elements
- h. Sheave Make/Size/Bore

5. V-Belt Drive:
 - a. Identification/location
 - b. Required driven RPM
 - c. Driven sheave, diameter and RPM
 - d. Belt, size and quantity
 - e. Motor sheave diameter and RPM
 - f. Center to center distance, maximum, minimum, and actual
6. Cooling Coil Data:
 - a. Identification/number
 - b. Location
 - c. Service
 - d. Manufacturer
 - e. Air flow, design and actual
 - f. Entering air DB temperature, design and actual
 - g. Entering air WB temperature, design and actual
 - h. Leaving air DB temperature, design and actual
 - i. Leaving air WB temperature, design and actual
 - j. Air pressure drop, design and actual
7. Air Moving Equipment
 - a. Location
 - b. Manufacturer
 - c. Model number
 - d. Serial number
 - e. Arrangement/Class/Discharge
 - f. Air flow, specified and actual
 - g. Return air flow, specified and actual
 - h. Outside air flow, specified and actual
 - i. Total static pressure (total external), specified and actual
 - j. Inlet pressure
 - k. Discharge pressure
 - l. Sheave Make/Size/Bore
 - m. Number of Belts/Make/Size
 - n. Fan RPM
8. Return Air/Outside Air Data:
 - a. Identification/location
 - b. Design air flow
 - c. Actual air flow
 - d. Design return air flow
 - e. Actual return air flow
 - f. Design outside air flow
 - g. Actual outside air flow
 - h. Return air temperature
 - i. Outside air temperature

- j. Required mixed air temperature
- k. Actual mixed air temperature
- l. Design outside/return air ratio
- m. Actual outside/return air ratio

9. Exhaust Fan Data:

- a. Location
- b. Manufacturer
- c. Model number
- d. Serial number
- e. Air flow, specified and actual
- f. Total static pressure (total external), specified and actual
- g. Inlet pressure
- h. Discharge pressure
- i. Sheave Make/Size/Bore
- j. Number of Belts/Make/Size
- k. Fan RPM

10. Duct Traverse:

- a. System zone/branch
- b. Duct size
- c. Area
- d. Design velocity
- e. Design air flow
- f. Test velocity
- g. Test air flow
- h. Duct static pressure
- i. Air temperature
- j. Air correction factor

11. Duct Leak Test:

- a. Description of ductwork under test
- b. Duct design operating pressure
- c. Duct design test static pressure
- d. Duct capacity, air flow
- e. Maximum allowable leakage duct capacity times leak factor
- f. Test apparatus
 - 1) Blower
 - 2) Orifice, tube size
 - 3) Orifice size
 - 4) Calibrated
- g. Test static pressure
- h. Test orifice differential pressure
- i. Leakage

12. Air Distribution Test Sheet:

- a. Air terminal number
- b. Room number/location
- c. Terminal type
- d. Terminal size
- e. Area factor
- f. Design velocity
- g. Design air flow
- h. Test (final) velocity
- i. Test (final) air flow
- j. Percent of design air flow

END OF SECTION 230593

SECTION 230700 - DUCTWORK INSULATION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Ductwork insulation.
- B. Duct liner.
- C. Insulation jackets.

1.2 RELATED WORK

- A. Section 23 05 53 - Mechanical Identification.
- B. Section 23 31 00 - Ductwork.

1.3 REFERENCES

- A. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- B. ASTM C553 - Mineral Fiber Blanket and Felt Insulation.
- C. ASTM C612 - Mineral Fiber Block and Board Thermal Insulation.
- D. ASTM E84 - Surface Burning Characteristics of Building Materials.
- E. ASTM E96 - Water Vapor Transmission of Materials.
- F. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.4 SUBMITTALS

- A. Submit under provisions of the General Requirements.
- B. Product Data: Provide product description, list of materials and thickness for each service and locations.
- C. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that contractor has not stamped with his review certification.

1.5 REGULATORY REQUIREMENTS

- A. Conform to 2009 International Mechanical Code and Energy Code with all amendments and requirements of the local regulating authority.

1.6 QUALITY ASSURANCE

- A. Materials: Flame spread/smoke developed rating of 25/50 in accordance with ASTM E84.

1.7 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this Section with minimum three years experience.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of the General Requirements.
- B. Deliver materials to site in original factory packaging, labeled with manufacturer's density and thickness.
- C. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building it must be stored off the ground a minimum of 6 inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visquin. All ductwork will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and completely protected with weatherproof covers.

1.9 ENVIRONMENTAL REQUIREMENTS

- A. Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics and insulation cements.

PART 2 PRODUCTS

2.1 GLASS FIBER, FLEXIBLE DUCT WRAP (TYPE A)

- A. Acceptable Manufacturers:
 - 1. Owens Corning Corp.
 - 2. CertainTeed Corp.
 - 3. Knauf Fiberglass.
 - 4. Manville.
 - 5. Owner Approved Equal.

B. Insulation: ASTM C553; flexible, noncombustible blanket.

1. R Value: ASTM C518, 5.7 at 75 degrees F.
2. Maximum Service Temperature: 250 degrees F.
3. Maximum Moisture Absorption: 0.20 percent by volume.
4. Density: 1.0 lb/cu.ft.
5. Thickness: 1-1/2 inch.

C. Vapor Barrier Jacket:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Transmission: ASTM E96; 0.04 perm.
3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

E. Tie Wire: Annealed steel, 16 gauge.

2.2 GLASS FIBER, RIGID DUCT WRAP (TYPE B)

A. Acceptable Manufacturers:

1. Owens Corning Corp.
2. CertainTeed Corp.
3. Knauf Fiberglass.
4. Manville.
5. Owner Approved Equal.

B. Insulation: ASTM C612; rigid, noncombustible board with ASJ facing and ASJ tape.

1. K Value: ASTM C518, 0.23 at 75 degrees F.
2. Maximum Service Temperature: 250 degrees F.
3. Maximum Moisture Absorption: 0.20 percent by volume.
4. Density: 3.0 lb/cu.ft.
5. Thickness: 2 inch.

C. Vapor Barrier Jacket:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film.
2. Moisture Vapor Transmission: ASTM E96; 0.04 perm.
3. Secure with pressure sensitive tape.

D. Vapor Barrier Tape:

1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.3 GLASS FIBER DUCT LINER, FLEXIBLE (TYPE C)

A. Acceptable Manufacturers:

1. Owens Corning Corp.
2. Knauf Fiberglass.
3. Manville.
4. Certain Teed Corp.
5. Owner Approved Equal.

B. Insulation: ASTM C553; flexible, noncombustible blanket.

1. K Value: ASTM C518, 0.27 at 75 degrees F.
2. Maximum Service Temperature: 250 degrees F.
3. Density: 3.0 lb/cu.ft.
4. EPA registered anti-microbial coating on air side.
5. Maximum Velocity on Coated Air Side: 4,000 ft/min.

C. Adhesive:

1. Waterproof fire-retardant type.

D. Mechanical Fasteners: Galvanized steel, self-adhesive pad or impact applied with press on head. Install in accordance with the requirements of SMACNA Standards. Compression of linear surface not to exceed 10% of thickness.

E. Liner shall be attached to sheet metal using adhesive covering 90% of the metal surface.

F. Coat edge of upstream end of liner with adhesive.

OCTAVE BAND CENTER FREQUENCY						
THICKNESS	125	250	500	2000	4000	5000
1 Inch	0.09	0.19	0.48	0.65	0.83	0.9
2 Inch	0.22	0.47	0.76	0.89	0.91	0.95

2.4 HIGH TEMPERATURE GLASS FIBER, FLEXIBLE DUCT WRAP (D)

A. Acceptable Manufacturers:

1. Certain Teed Corp.
2. Thermal Ceramics.
3. Owner Approved Equal.

B. Insulation: UL1978, ASTM E-119, (2) layers @ 1.5" thick high temperature glass fiber blanket, completely encapsulated in a UL Classified Aluminum foil, fiberglass reinforced scrim, to achieve a two-hour fire rating. Insulation to provide zero clearance to combustible.

C. Secure insulation with stainless steel banding.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify that ductwork has been tested before applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed and dry.

3.2 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Insulated ductwork conveying air below ambient temperature:
 - 1. Provide insulation with vapor barrier jackets.
 - 2. Finish with tape and vapor barrier jacket.
 - 3. Continue insulation through walls, sleeves, hangers and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections and expansion joints.
- C. Insulated ductwork conveying air above ambient temperature:
 - 1. Provide with standard vapor barrier jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.

D. External Duct Insulation Application:

1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket; vapor tight.
2. Install without sag on underside of ductwork. Use adhesive and mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
5. Supply and return air ductwork routed on exterior roof of building shall be internally and externally insulated. Provide exterior jacket over exterior insulation as indicated above. Provide roof curb at roof penetration.
6. Exterior Applications: Provide vapor barrier jacket. Insulate fittings and joints with insulation of like materials and thickness as adjoining ductwork and finish with glass mesh reinforced vapor barrier cement. Cover with jacket with seams located on bottom side of horizontal ductwork.

E. Duct and Plenum Liner Applications:

1. Adhere insulation with adhesive for 90 percent coverage.
2. Secure insulation with mechanical liner fasteners. Refer to SMACNA Standards for spacing.
3. Seal and smooth joints.
4. Seal liner surface penetrations with adhesive.
5. Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

- F. All insulation shall be installed neatly in a workman like manner in strict accordance with manufacturer's instructions.

3.3 TOLERANCE

- A. Substituted insulation materials shall provide thermal resistance within 10 percent at normal conditions, as materials indicated.

3.4 GLASS FIBER DUCTWORK INSULATION SCHEDULE

<u>TYPE DUCTWORK</u>	<u>THICKNESS INCHES</u>	<u>TYPE</u>
All low and medium pressure. Re: Supply and return ductwork	1"	C
Relief and transfer ducts	1"	C
Exhaust ducts	1"	C
Outdoor air intake ductwork/plenums	2"	B
Concealed round low and medium velocity supply and return ducts	1-1/2"	A
Combustion air ductwork	2"	B
Kitchen range hood exhaust duct from hood up to and including fan discharge	Two layers @ 1 1/2" thick	D

END OF SECTION 230700

SECTION 230701 - PIPE INSULATION

PART 1 GENERAL

1.1 WORK INCLUDED

- A. All plumbing and HVAC piping jackets and accessories.
- B. All piping saddles.

1.2 RELATED SECTIONS

- A. Section 22 05 03 - Plumbing Piping.
- B. Section 23 05 29 - Supports and Anchors.
- C. Section 23 05 53 - Mechanical Identification.
- D. Section 23 21 13 - Hydronic Piping.
- E. Section 23 61 00 - Refrigerant Piping and Specialties.

1.3 REFERENCES

- A. ANSI/ASTM C195 - Mineral Fiber Thermal Insulation Cement.
- B. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
- C. ASTM C449 - Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- D. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- E. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- F. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
- G. ASTM C585 - Inner and Outer Diameters and Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
- H. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.
- I. ASTM D1667 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed Cell Foam).

- J. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.
- K. ASTM E84 - Surface Burning Characteristics of Building Materials.
- L. ASTM E96 - Water Vapor Transmission of Materials.

1.4 REGULATORY REQUIREMENTS

- A. Conform to 2012 International Mechanical Code and Energy Code.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirements.
- B. Product Data: Provide product description, list of materials and thickness for each service and locations.
- C. Submit manufacturer's installation instructions under provisions of the General Requirements.
- D. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that Contractor has not stamped with his review certification.

1.6 QUALITY ASSURANCE

- A. Materials: Flame spread/fuel contributed/smoke developed rating of 25/50 or less in accordance with ASTM E84. Material shall not melt or drip when exposed to flame.

1.7 QUALIFICATIONS

- A. Applicator: Company specializing in performing the work of this Section with minimum five years experience.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site under provisions of the General Requirements.
- B. Store, protect and handling products under provisions of the General Requirements.
- C. Deliver materials to site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Insulation Work:

1. Maintain ambient temperatures and conditions for installation of insulation as required by manufacturers of insulation adhesives, mastics and insulation cements.

PART 2 PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Insulation:

1. Manville Corporation.
2. Knauf Fiberglass.
3. CertainTeed Corp.
4. Owens Corning Fiberglass.
5. Owner Approved Equal.

B. Steel and Wood Insulation Protection Saddles:

1. Acceptable Manufacturers:
 - a. Grinnell.
 - b. B-Line.
 - c. Unistrut.
 - d. Owner Approved Equal.

2.2 INSULATION MATERIALS

A. Glass Fiber Insulation (Type "A"):

1. Insulation: ASTM C547; rigid molded, noncombustible.
 - a. K Value: 0.23 at 75 degrees F.
 - b. Minimum Service Temperature: 0 degrees F.
 - c. Maximum Service Temperature: 850 degrees F.
 - d. Maximum Moisture Absorption: 0.2 percent by volume.
2. Vapor Barrier Jacket:
 - a. ASTM C921; factory applied vapor retarder composed of a white draft facing out reinforced with glass fiber yarn and bonded to aluminized film (ASJ).
 - b. Moisture Vapor Transmission: ASTM E96; 0.02 perm inches.
 - c. Secure with factory applied self-sealing longitudinal laps and butt strips.
 - d. Jacket Temperature Limit: Minus 20 to 150 degrees F.

3. Vapor Barrier Lap Adhesive:
 - a. Compatible with insulation.
4. Fittings (Concealed and Exposed):
 - a. Insulate all fittings (plumbing and HVAC) with a minimum of two layers of precut blanket insulation.
 - b. Insulation blanket thickness to equal K value of straight sections of insulation.
 - c. Tie wire to be 18 gauge stainless steel with twisted ends.
 - d. Jacket shall be a one piece pre-molded high impact fitting 25/50 rated, off-white color, 10 mil thick, brush on welding adhesive connections.
5. Insulating Cement/Mastic:
 - a. Acceptable Manufacturers:
 - 1) Fibrex.
 - 2) Pabco.
 - 3) Manville.
 - 4) Owner Approved Equal.
 - b. ASTM C195; hydraulic setting on mineral wool.

2.3 ELASTOMERIC CELLULAR FOAM (TYPE B):

A. Manufacturers:

1. Armstrong World Industries - Model AP Armaflex.
2. Halstead.
3. Rubatex.
4. Owner Approved Equal.

B. Insulation: ASTM C534; flexible, cellular elastomeric, molded or sheet.

1. K Value: ASTM C177 or C518; 0.27 at 75 degrees F.
2. Minimum Service Temperature: -20 degrees F.
3. Maximum Service Temperature: 220 degrees F.
4. Maximum Moisture Absorption: ASTM D1056; 1.0 percent (pipe) by volume, 1.0 percent (sheet) by volume.
5. Moisture Vapor Transmission: ASTM E96; 0.20 perm inches.
6. Maximum Flame Spread: ASTM E84; 25.
7. Maximum Smoke Developed: ASTM E84; 50.
8. Connection: Waterproof vapor barrier adhesive.

C. Elastomeric Foam Adhesive:

1. Acceptable manufacturers:
 - a. Armstrong - Model 520.
 - b. Owner Approved Equal.
2. Air dried, contact adhesive, compatible with insulation.

2.4 JACKETS

A. PVC Plastic (Fittings and ALL Exposed Interior Piping – Below 9’-0”)

1. Jacket: ASTM C921, one-piece molded type fitting covers and sheet material, off-white color.
 - a. Minimum service temperature: -40 degrees F.
 - b. Maximum service temperature: 150 degrees F.
 - c. Moisture vapor transmission: ASTM E96; 0.002 perm-inches.
 - d. Maximum Flame Spread: ASTM E84; 25.
 - e. Maximum Smoke Developed: ASTM E84; 50.
 - f. Thickness: 10 mil.
 - g. Connections: Brush on welding adhesive.

B. Aluminum Jacket: ASTM B209 (All exterior refrigerant piping serving air cooled condenser).

1. Thickness: 0.016-inch sheet.
2. Finish: Embossed.
3. Joining: Longitudinal slip joints and 2-inch laps.
4. Fittings: 0.016-inch thick die shaped fitting covers with factory attached protective liner.
5. Metal Jacket Bands: 3/8 inch wide; 0.010-inch thick stainless steel.

C. Water Based Armaflex Finish: ASTM 84 (all exterior suction refrigerant piping service air cooled condenser)

1. Color: Standard white.
2. Composition: Pigmented Acrylic Latex.
3. Flammability: Non flammable; water based.
4. Application: Brass or roller.

PART 3 EXECUTION

3.1 INSULATION

A. Examination:

1. Verify that piping has been tested before applying insulation materials.
2. Verify that surfaces are clean, foreign material removed and dry. Flux to be removed from copper piping.

B. Installation:

1. Install materials in accordance with manufacturer's instructions.
2. On exposed piping, locate insulation and cover seams in least visible locations.
3. All insulation to have a vapor barrier jacket (ASJ) with factory applied self-sealing longitudinal laps and butt strips.
4. Support all piping with insulation protection saddles.
 - a. Plumbing Piping:
 - 1) 2 Inch Pipe Size: Wood dowel with insulation shields.
 - 2) 3/4 Inch and Larger: High density pre-molded type with insulation shields or manufactured wood saddles.
5. Run insulation continuous through walls, floors, sleeves, pipe hangers and other pipe penetrations.
6. Insulate all piping located behind chases.
7. Insulate entire system including fittings, valves, unions, flanges, strainers, expansion joints, pump bodies, chemical feeders, rolairtrols, chemical feed piping from pot feeders and separators.
8. Finish all insulation at supports, protrusions and interruptions.
9. Seal all aluminum jackets outdoors air and water tight.
10. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.

3.2 INSULATION SCHEDULE

PIPING SYSTEMS	INSULATION TYPE	PIPE SIZES/INSULATION THICKNESS			
		<u>1/2 To 1”</u>	<u>1-1/4 To 1-1/2”</u>	<u>2” To 4”</u>	<u>5” & Larger</u>
A. Plumbing and Mechanical Systems					
Domestic Hot Water Supply	A	1”	1”	2”	2”
Domestic Hot Water Recirc. (HWC)	A	1”	1”	2”	2”
Refrigerant Suction and Hot Gas	B	1”	1”	1-1/2”	--- (Exterior Piping Shall Include Aluminum Jacket)
Condensate Dew Drain Pipes (if installed in copper or steel pipe)	A	1/2”	1/2”	1/2”	1/2”
Storm, Roof Drains and Horizontal Conductors	A	1/2”	1/2”	1/2”	1/2”
Plumbing Vents Within 10 Feet of Exterior	A	1/2”	1/2”	1/2”	1/2”
Sanitary Drainage From Mech. Equipment Rooms	A	1/2”	1/2”	1/2”	1/2”

Note: ALL exposed interior piping below 9'-0" shall have a PVC jacket as specified.

END OF SECTION 230701

PART 1 – GENERAL

A. Section Includes:

1. Carbon dioxide sensors.
2. Control panel enclosures.
3. Thermostats/sensors.
4. Control air dampers.
5. Electric damper actuators.
6. Input/output sensors.

B. Related Sections:

1. Section 23 09 93 - Sequence of Operations for HVAC Controls: Sequences of operation implemented using products specified in this section.
2. Section 23 33 00 - Duct Accessories: Product requirements for duct mounted thermometers. Installation requirements for dampers and other duct mounted products furnished in this section.
3. Section 26 05 03 - Wiring Connections: Execution requirements for electric connections specified by this section.

A. Air Movement and Control Association International, Inc.:

1. AMCA 500 - Test Methods for Louvers, Dampers, and Shutters.

B. American Society of Heating, Refrigerating and Air-Conditioning Engineers:

1. ASHRAE 62 - Ventilation for Acceptable Indoor Air Quality.

C. American Society of Mechanical Engineers:

1. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
2. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.

1. ASTM A126 - Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
2. ASTM A536 - Standard Specification for Ductile Iron Castings.
3. ASTM B32 - Standard Specification for Solder Metal.
4. ASTM B88 - Standard Specification for Seamless Copper Water Tube.
5. ASTM B280 - Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
6. ASTM D2737 - Standard Specification for Polyethylene (PE) Plastic Tubing.

1. AWS A5.8 - Specification for Filler Metals for Brazing and Braze Welding.

1. NEMA DC 3 - Residential Controls - Electrical Wall Mounted Room Thermostats.
2. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

1. NFPA 72 - National Fire Alarm Code.
2. NFPA 90A - Standard for the Installation of Air Conditioning and Ventilating Systems.

1. UL 1820 - Fire Test of Pneumatic Tubing for Flame and Smoke Characteristics.

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Coordinate submittals with information requested in Section 23 09 93.

C. **Product Data:** Submit description and engineering data for each control system component. Include sizing as required.

D. Manufacturer's Installation Instructions: Submit installation requirements for each control component.

E. **Manufacturer's Certificate:** Certify products meet or exceed specified requirements.

- ## PART 2 – PRODUCTS

- A. Room Thermostats/Sensors:
 - 1. Room sensors shall be constructed for either surface or wall box mounting.
 - 2. Room sensors shall be flush mounted stainless steel plate with 10K Type II thermistor sensor only, setpoint to be adjusted via BAS, no occupancy override.
- B. Line Voltage Thermostats:
 - 1. Integral manual On/Off/Auto selector switch, single or two-pole.
 - 2. Dead band: Maximum 2 degrees F.
 - 3. Cover: Locking with concealed setpoint, without thermometer.
 - 4. Load Motor capacity rating.
- C. Outdoor Reset Thermostat:
 - 1. Remote bulb or bimetal rod and tube type, proportioning action with adjustable throttling range, adjustable setpoint.
 - 2. Scale range: -10 to 70 degrees F.
- D. Immersion Thermostat: Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint and adjustable throttling range.

E. Air-stream Thermostats:

1. Remote bulb or bimetallic rod and tube type, proportional action with adjustable setpoint in middle of range and adjustable throttling range.
2. Averaging service remote bulb element: 20 feet.
3. Furnish with flange and shield.

F. Electric Low Limit Duct Thermostat

1. Snap acting, double pole, single throw snap action contacts rated for 16 amps at 120 vac, manual reset switch which trips if temperature sensed across any 18 inches of bulb length is equal to or below setpoint.
2. Bulb length: Minimum 20 feet.
3. Provide one thermostat for every 20 sq ft of coil surface.

G. Outside Air Sensors

1. Outside air sensors shall be designed to withstand the environmental conditions to which they will be exposed. They shall also be provided with a solar shield.
2. Sensors exposed to wind velocity pressures shall be shielded by a perforated plate that surrounds the sensor element.
3. Temperature transmitters shall be of NEMA 3R construction and rated for ambient temperatures.

H. Duct Mount Sensors

1. Duct mount sensors shall mount in an electrical box through a hole in the duct, and be positioned so as to be easily accessible for repair or replacement.
2. Duct sensors shall be insertion type and constructed as a complete assembly, including lock nut and mounting plate.
3. For outdoor air duct applications, a weatherproof mounting box with weatherproof cover and gasket shall be used.

I. Averaging Sensors

1. For ductwork greater in any dimension than 48 inches and/or where air temperature stratification exists, an averaging sensor with multiple sensing points shall be used.
2. For plenum applications, such as mixed air temperature measurements, a string of sensors mounted across the plenum shall be used to account for stratification and/or air turbulence. The averaging string shall have a minimum of 4 sensing points per 12-foot long segment.
3. Capillary supports at the sides of the duct shall be provided to support the sensing strip.

2.3 CONTROL AIR DAMPERS

- A. Performance: Test in accordance with AMCA 500.
- B. Frames: Galvanized steel, welded or riveted with corner reinforcement.

- C. Blades: Galvanized steel, maximum blade size 6 inches wide, 48 inches long, attached to minimum 1/2 inch shafts with set screws.
- D. Blade Seals: Synthetic elastomeric or Neoprene mechanically attached, field replaceable.
- E. Jamb Seals: Stainless steel spring.
- F. Shaft Bearings: Graphite impregnated nylon sleeve, with thrust washers at bearings or Lubricant free, stainless steel, single row, ground, flanged, radial, anti-friction type with extended inner race.
- G. Linkage Bearings: Graphite impregnated nylon.
- H. Damper Leakage: Maximum leakage rate of 3.0 cfm per square foot at 1.0 inches wg pressure differential.
- I. Maximum Pressure Differential: 6 inches wg.
- J. Temperature Limits: - 40 to 200 degrees F.

2.4 DAMPER OPERATORS

- A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
- B. Electric Operators:
 - 1. Spring return, adjustable stroke motor having oil immersed gear train, with auxiliary end switch position potentiometer and 24 VDC, 24va transformer.
 - 2. Manufacturer: Belimo.
- C. Number: Sufficient to achieve unrestricted movement throughout damper range. Provide one damper operator for maximum 25 sq. ft damper section.

2.5 INPUT/OUTPUT SENSORS

- A. Temperature:
 - 1. Resistance temperature detectors with resistance tolerance of plus or minus 0.1 percent at 70 degrees F, interchangeability less than plus or minus 0.2 percent, time constant of 13 seconds maximum for fluids and 200 seconds maximum for air.
 - 2. Use insertion elements in ducts not affected by temperature stratification or smaller than one square meter. Use averaging elements where larger or prone to stratification sensor length 8 feet or 16 feet as required.
 - 3. Insertion elements for liquids shall be with stainless steel socket with minimum insertion length of 2-1/2 inches.
 - 4. Outside air sensors: Watertight inlet fitting, shielded from direct rays of sun.

2.6 TRANSMITTERS

A. Differential Pressure Transmitters

1. Pressure transmitters shall be constructed to withstand 100% pressure over-range without damage, and to hold calibrated accuracy when subject to a momentary 40% over-range input.
2. Pressure transmitters shall transmit a 0 to 5 VDC, 0 to 10 VDC, or 4 to 20 mA output signal.
3. Differential pressure transmitters used for flow measurement shall be sized to the flow sensing device, and shall be supplied with Tee fittings and shut-off valves in the high and low sensing pick-up lines to allow the balancing Contractor and Owner permanent, easy-to-use connection.
4. A minimum of a NEMA 1 housing shall be provided for the transmitter. Transmitters shall be located in accessible local control panels wherever possible. Low Differential Water Pressure Applications (0" – 20" w.c.).
5. The differential pressure transmitter shall be of industrial quality and transmit a linear, 4 to 20 mA output in response to variation of flow meter differential pressure or water pressure sensing points.
6. The differential pressure transmitter shall have non-interactive zero and span adjustments that are adjustable from the outside cover and meet the following performance specifications:
 - a. .01-20" w.c. input differential pressure range.
 - b. 4-20 mA output.
 - c. Maintain accuracy up to 20 to 1 ratio turndown.
 - d. Reference Accuracy: +0.2% of full span.

B. Low Differential Air Pressure Applications (0" to 5" w.c.).

1. The differential pressure transmitter shall be of industry quality and transmit a linear, 4 to 20 mA output in response to variation of differential pressure or air pressure sensing points.
2. The differential pressure transmitter shall have non-interactive zero and span adjustment that are adjustable from the outside cover and meet the following performance specifications:
 - a. (0.00 – 1.00" to 5.00") w.c. input differential pressure ranges. (Select range appropriate for system application.)
 - b. 4-20 mA output.
 - c. Maintain accuracy up to 20 to 1 ratio turndown.
 - d. Reference Accuracy: +.02% of full span.

C. Temperature Transmitters:

1. One pipe, directly proportional output signal to measured variable, linearity within plus or minus 1.2 percent of range for 200 degree F span and plus or minus 1 percent for 50 degree span, with suitable temperature range, compensated bulb, averaging capillary, or rod.

2.7 STATUS AND SAFETY SWITCHES

A. General Requirements.

1. Switches shall be provided to monitor equipment status, safety conditions, and generate alarms at the FMS when a failure or abnormal conditions occurs. Safety switches shall be provided with two sets of contacts and shall be interlock wired to shut down respective equipment.

B. Current Sensing Switches

1. The current sensing switch shall be self-powered with solid state circuitry and a dry contact output. It shall consist of a current transformer, a solid state current sensing circuit, adjustable trip point, solid state switch, SPDT relay, and an LED indicating the on or off status. A conductor of the load shall be passed through the window of the device. It shall accept over-current up to twice its trip point range.
2. Current sensing switches shall be used for run status for fans, over-current up to twice its trip point range.
3. Current sensing switches shall be calibrated to show a positive run status only when the motor is operating under load. A motor running with a broken belt or coupling shall indicate a negative run status.

C. Air Filter Status Switches

1. Differential pressure switches used to monitor air filter status shall be of the automatic reset type with SPDT contacts rated for 2 amps at 120 VAC.
2. A complete installation kit shall be provided, including: static pressure tops, tubing, fittings, and air filters.
3. Provide appropriate scale range and differential adjustment for intended service.

D. Air pressure Safety Switches

1. Air pressure safety switches shall be of the manual reset type with SPDT contacts rated for 2 amps at 120 VAC.
2. Pressure range shall be adjustable with appropriate scale range and differential adjustment for intended service.

2.8 CABLE

A. Manufacturers:

1. Southwest Wire, 5950 Office Boulevard NE, Albuquerque, New Mexico 87109.
2. Windy City Wire. 832 South Central Avenue, Chicago, Illinois 60644.
3. Owner Approved Equal.

B. School District 205 Wiring Standard:

1. Cable shall be 18 AWG wire, plenum rated, shield.
2. Color Coding (verify final color coding with school district and school district's controls maintenance contractor prior to purchase):
 - a. N2 Bus Blue
 - b. Analog Input Cable Yellow
 - c. Analog Output Cable Tan
 - d. Binary Input Cable Orange
 - e. Binary Output Cable Violet
 - f. N1 Bus Purple
 - g. 24 VAC Cable Gray
 - h. Spare White
 - i. Ethernet –CAT 5 Purple
 - j. N2 E Pink
3. All cable will be purchased from the school district's preferred vendors listed above.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Coordination and project conditions.
- B. Verify air handling units and ductwork installation is complete and air filters are in place before installing sensors in air streams.
- C. Verify location of thermostats and humidistats and other exposed control sensors with Drawings before installation.
- D. Verify building systems to be controlled are ready to operate.

3.2 INSTALLATION

- A. Install thermostats, humidistats, space temperature sensors, and other exposed control sensors after locations are coordinated with other Work.
- B. Install thermostats, humidistats, space temperature sensors, and other exposed control sensors 48 inches above floor. Align with light switches.
- C. Install freeze protection thermostats using flanges and element holders.
- D. Install outdoor reset thermostats and outdoor sensors indoors, with sensing elements outdoors with sun shield.
- E. Provide separable sockets for liquids and flanges for air bulb elements. Refer to Section 23 21 16.

- ### 3.3 FIELD QUALITY CONTROL

- ### 3.4 DEMONSTRATION AND TRAINING

- END OF SECTION 230900

1.1 SUMMARY

- A. Section includes control equipment and software.
- B. Related Sections:
 - 1. Section 23 09 00 - Instrumentation and Control for HVAC: Control system components.
 - 2. Section 23 09 93 - Sequence of Operations for HVAC Controls: Sequences of operation implemented using products specified in this section.
 - 3. Section 26 05 03 - Equipment Wiring Connections: Execution requirements for electric connections specified by this section.

A. American National Standards Institute:

1. ANSI MC85.1 - Terminology for Automatic Control.

- A. Building automation system shall be an extension of the existing Tridium JACE based LON control system.
- B. Automatic temperature controls field monitoring and control system using field programmable microprocessor based units with communications to Building Automation and Control System.
- C. Base system on distributed system of fully intelligent, stand-alone controllers, operating in a multi-tasking, multi-user environment on token passing network, with central and remote hardware, software, and interconnecting wire and conduit.
- D. Provide computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.
- E. Provide controls for air terminals, radiation, reheat coils, unit heaters, fan coils, rooftop units, etc. when directly connected to control units. Individual terminal unit control is specified in Section 23 09 00.
- F. Provide control systems consisting of thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories to operate mechanical systems, and to perform functions specified.
- G. Provide installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

- ## 2.4 OPERATING SYSTEM SOFTWARE

- Hagney Architects, LLC DIRECT-DIGITAL CONTROL SYSTEM**
Job #C1823 FOR HVAC

1. Utilizes custom symbols or system supported library of symbols.
2. Sixteen (16) colors.
3. Sixty (60) outputs of real-time live dynamic data for each graphic.
4. Dynamic graphic data.
5. 1,000 separate graphic pages.
6. Modify graphic screen refresh rate between 1 and 60 seconds.

1. Accept data from LAN as needed without scanning entire network for updated point data.
2. Interrogate LAN for updated point data when requested.
3. Allow operator command of devices.
4. Allow operator to place specific control units in or out of service.
5. Allow parameter editing of control units.
6. Store duplicate data base for every control unit and allow down loading while system is on line.
7. Control or modify specific programs.
8. Develop, store and modify dynamic color graphics.
9. Data archiving of assigned points and support overlay graphing of this data using up to four (4) variables.

1. Off normal condition: Cause alarm and appropriate message, including time, system, point descriptor, and alarm condition. Select alarm state or value and alarms causing automatic dial-out.
2. Critical alarm or change-of-state: Display message, stored on disk for review and sort, or print.
3. Print on line changeable message, up to 60 characters in length, for each alarm point specified.
4. Display alarm reports on video. Display multiple alarms in order of occurrence.
5. Define time delay for equipment start-up or shutdown.
6. Allow unique routing of specific alarms.
7. Operator specifies when alarm requires acknowledgment.
8. Continue to indicate unacknowledged alarms after return to normal.
9. Alarm notification:
 10. Print automatically.
 11. Display indicating alarm condition.
 12. Selectable audible alarm indication.

H. Automatic Restart: Automatically start field equipment on restoration of power. Furnish time delay between individual equipment restart and time of day start/stop.

1. Page linking.
2. Generate, store, and retrieve library symbols.
3. Single or double height characters.
4. Sixty (60) dynamic points of data for each graphic page.
5. Pixel level resolution.
6. Animated graphics for discrete points.
7. Analog bar graphs.
8. Display real time value of each input or output line diagram fashion.

1. Perform optimized start/stop as function of outside conditions, inside conditions, or both.
2. Adaptive and self-tuning, adjusting to changing conditions unattended.
3. For each point under control, establish and modify:
 - a. Occupancy period.
 - b. Desired temperature at beginning of occupancy period.
 - c. Desired temperature at end of occupancy period.

1. Control loops: Defined using "modules" are analogous to standard control devices.
2. Output: Paired or individual digital outputs for pulse width modulation, and analog outputs.
3. Firmware:
 - a. PID with analog or pulse-width modulation output.
 - b. Floating control with pulse-width modulated outputs.
 - c. Two-position control.
 - d. Primary and secondary reset schedule selector.
 - e. Hi/Low signal selector.
 - f. Single pole double-throw relay.
 - g. Single pole double throw time delay relay with delay before break, delay before make and interval time capabilities.
4. Direct Digital Control loop: Downloaded upon creation or on operator request. On sensor failure, program executes user defined failsafe output.
5. Display: Value or state of each of lines interconnecting DDC modules.

1. Monitor heating and cooling loads in building spaces, terminal reheat systems, both hot deck and cold deck temperatures on dual duct and multizone systems, single zone unit discharge temperatures.
2. Adjust discharge temperatures to most energy efficient levels satisfying measured load by:
 - a. Raising cooling temperatures to highest possible value.
 - b. Reducing heating temperatures to lowest possible level.
3. Operator commands:
 - a. Add/delete fan status point.
 - b. Lock/unlock program.
 - c. Request HVAC point summary.
 - d. Add/Delete discharge controller point.
 - e. Define discharge controller parameters.
 - f. Add/delete air flow rate.
 - g. Define space load and load parameters.
 - h. Request space load summary.
4. Control summary:
 - a. HVAC control system status (begin/end).
 - b. Supply air reset system status.
 - c. Optimal run time system status.
 - d. Heating and cooling loop.
 - e. High/low limits.
 - f. Deadband.
 - g. Response timer.
 - h. Reset times.
5. Space load summary:
 - a. HVAC system status.
 - b. Optimal run time status.
 - c. Heating/cooling loop status.
 - d. Space load point ID.
 - e. Current space load point value.
 - f. Control heat/cool limited.
 - g. Gain factor.
 - h. Calculated reset values.
 - i. Fan status point ID and status.
 - j. Control discharge temperature point ID and status.
 - k. Space load point ID and status.
 - l. Airflow rate point ID and status.

D. Enthalpy Switchover:

1. Calculate outside and return air enthalpy using measured temperature and relative humidity; determine energy expended and control outside and return air dampers.
2. Operator commands:
 - a. Add/delete fan status point.
 - b. Add/delete outside air temperature point.
 - c. Add/delete discharge controller point.
 - d. Define discharge controller parameters.
 - e. Add/delete return air temperature point.
 - f. Add/delete outside air dewpoint/humidity point.
 - g. Add/delete return air dewpoint/humidity point.
 - h. Add/delete damper switch.
 - i. Add/delete minimum outside air.
 - j. Add/delete atmospheric pressure.
 - k. Add/delete heating override switch.
 - l. Add/delete evaporative cooling switch.
 - m. Add/delete air flow rate.
 - n. Define enthalpy deadband.
 - o. Lock/unlock program.
 - p. Request control summary.
 - q. Request HVAC point summary.
3. Control summary:
 - a. HVAC control system begin/end status.
 - b. Enthalpy switchover optimal system status.
 - c. Optimal return time system status.
 - d. Current outside air enthalpy.
 - e. Calculated mixed air enthalpy.
 - f. Calculated cooling coil enthalpy using outside air.
 - g. Calculated cooling coil enthalpy using mixed air.
 - h. Calculated enthalpy difference.
 - i. Enthalpy switchover deadband.
 - j. Status of damper mode switch.

2.7 PROGRAMMING APPLICATION FEATURES

A. Trend Point:

1. Output trend logs as line-graphs or bar graphs. Output graphic on terminal, with each point for line and bar graphs designated with a unique [pattern] [color], vertical scale either actual values or percent of range, and horizontal scale time base. Print trend logs up to 12 columns of one point/column.

1. Assign alarm messages to system messages including point's alarm condition, point's off-normal condition, totaled point's warning limit, hardware elements advisories.
2. Output assigned alarm with "message requiring acknowledgment".
3. Operator commands include define, modify, or delete; output summary listing current alarms and assignments; output summary defining assigned points.

1. Automatically initiate equipment or system commands, based on selected time schedule for points specified.
2. Program times for each day of week, for each point, with one minute resolution.
3. Automatically generate alarm output for points not responding to command.
4. Allow for holidays, minimum of 366 consecutive holidays.
5. Operator commands:
 - a. System logs and summaries.
 - b. Start of stop point.
 - c. Lock or unlock control or alarm input.
 - d. Add, delete, or modify analog limits and differentials.
 - e. Adjust point operation position.
 - f. Change point operational mode.
 - g. Open or close point.
 - h. Enable/disable, lock/unlock, or execute interlock sequence or computation profile.
 - i. Begin or end point totals.
 - j. Modify total values and limits.
 - k. Access or secure point.
 - l. Begin or end HVAC or load control system.
 - m. Modify load parameter.
 - n. Modify demand limiting and duty cycle targets.

1. Permit events to occur, based on changing condition of one or more associated master points.
2. Binary contact, high/low limit of analog point or computed point capable of being used as master. Master capable of monitoring or commanding multiple slaves.
3. Operator commands:
 - a. Define single master/multiple master interlock process.
 - b. Define logic interlock process.
 - c. Lock/unlock program.
 - d. Enable/disable interlock process.
 - e. Execute terminate interlock process.
 - f. Request interlock type summary.

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for demonstration and training.
- B. Furnish basic operator training for 3 persons on data display, alarm and status descriptors, requesting data, execution commands and log requests. Include a minimum of 16 hours instructor time. Furnish training on site.
- C. Demonstrate complete and operating system to Owner.
- D. Training of the Owner's operating and maintenance personnel is required in cooperation with the Owner's representative, provide competent, factory authorized personnel to provide instruction to operation and maintenance personnel concerning the location, operation, and troubleshooting of the installed systems, the instruction shall be scheduled in coordination with the Owner's representative after submission and approval of formal training plans. Refer to Section 01 77 06 for general contractor closeout requirements. Refer to individual sections for specific contractor training requirements.

Hagney Architects, LLC DIRECT-DIGITAL CONTROL SYSTEM 230923-17

Job #C1823 FOR HVAC

SECTION 23 09 93 - SEQUENCE OF OPERATIONS FOR HVAC CONTROLS

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes sequence of operation for:

1. Rooftop Unit Control – CV and VAV.
 - a. Constant Volume Unit – Gas Fired Heater (Optional DX Cooling).
 - b. Variable Air Volume (DX Cooling).
 - c. Rooftop Unit Power Exhaust Control.
2. Kitchen Make-Up Air Unit Control.
3. Fire Shut Down Of Air Supply Units Over 2000 CFM
4. Miscellaneous Exhaust Fan Control.
5. Electrical Wall Heater Control.
6. Electrical Cabinet/Suspend Unit Heater Control.
7. Variable Refrigerant Flow System Control.

B. Related Sections:

1. Section 23 09 00 - Instrumentation and Control for HVAC: For equipment, devices, and system components to implement sequences of operation.
2. Section 23 09 23 - Direct-Digital Control System for HVAC: For equipment, devices, system components, and software to implement sequences of operation.

1.2 SUBMITTALS

A. Section 01 33 00 - Submittal Procedures: Submittal procedures.

B. Shop Drawings: Indicate mechanical system controlled and control system components.

1. Label with settings, adjustable range of control and limits. Submit written description of control sequence.
2. Submit flow diagrams for each control system, graphically depicting control logic.
3. Submit draft copies of graphic displays indicating mechanical system components, control system components, and controlled function status and value.

1.3 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 - Execution and Closeout Requirements: Closeout procedures.
- B. Project Record Documents: Record actual locations of components and set points of controls, including changes to sequences made after submission of shop drawings.

1.4 REGULATORY REQUIREMENTS

- A. Conform to Health/Life Safety Code for Public Schools.
- B. Conform to (IMC) International Mechanical Code (2012).
- C. Conform to (IBC) International Building Code (2012).
- D. Conform to (IFC) International Fire Code, excluding Chapter 4 (2012).
- E. Conform to State of Illinois Plumbing Code (2014).
- F. Conform to Illinois Accessibility Code. (71 IL Adm. Code 400)
- G. Conform to (IECC) International Energy Conservation Code (2012)
- H. Conform to (IFGC) International Fuel Gas Code (2012).
- I. Conform to Illinois State Fire Marshal's Boiler and Pressure Vessel Safety. (41 IL Adm Code 120)
- J. Conform to (ICC) International Code Council Reference Standards (2012).
- K. Conform to (NFPA) National Fire Protection Association 70 National Electrical Code (2008).
- L. Products: Listed and classified by Underwriter's Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.1 GENERAL

- A. Temperature control system shall be DDC as specified in Section 23 09 23 "Direct Digital Control System for HVAC" and Section 23 09 00 "instrumentation and Control for HVAC".
- B. Temperature control system shall be web-based and communicate seamlessly, via LON over the district's Ethernet LAN/WAN. All DDC control points listed in this section shall be performed by the DDC system and displayed on a PC browser with Internet Explorer. For future work, new DDC system software shall have capability and sufficient capacity to control entire building plus 20 percent spare capacity.
- C. All DDC control points listed in this section shall be performed by the DDC system. Any other control work required to complete the sequence of operation herein specified shall be electric temperature controls. Contractor shall provide all wiring, conduit where required, transformers, relays, etc. necessary for a complete operating system. At contractor's option, entire control system specified herein may be DDC.

3.2 SEQUENCE OF OPERATION

- A. Rooftop Unit Control – Constant Volume and VAV.
 - 1. Constant Volume Unit – Gas Fired Heater (Optional DX Cooling)
 - a. These rooftop unit systems contain a self-contained, factory furnished control system including economizer, heating, mechanical cooling, morning warm-up, and fan volume controls. The system shall be indexed from the occupied to the unoccupied modes of operation from the BAS.
 - b. This contractor shall install and wire all components shipped loose with the rooftop unit. This includes but is not limited to the following items.
 - 1). Space temperature sensor for reset of discharge air temperature.
 - 2). Space pressure sensor for control of exhaust fans.
 - 3). Tie-in of BAS to interface module provided on the rooftop units to pick up available control and monitoring points from the rooftop unit.
 - 4). Install and wire remote diagnostic/alarm panel to rooftop units.
 - 5). Provide field wiring from unit-mounted controller to hot water control valve furnished with rooftop unit for field installation.
 - c. This contractor shall provide and install a dedicated DDC control panel with all the necessary field devices to control and monitor each rooftop unit per the Point List at the end of this section and to pick up control and monitoring points available from the rooftop unit's interface module. Coordinate installation and other requirements with the rooftop unit manufacturer.

- d. This contractor shall provide all required interlock wiring for ductwork smoke detectors furnished and installed by this contractor. Upon sensing particles of combustion, the smoke detectors shall stop the supply and exhaust fan. A second set of contacts shall close, providing a smoke alarm signal at the local DDC control panel and the BAS. Smoke detection system to comply with NFPA 90A requirements.
- e. Parallel available rooftop unit alarms and provide alarm to the BAS. Provide the control and monitoring points as listed in the Point List at the end of this section.
- f. The system control panel shall be capable of communicating with the rooftop and monitoring various points. The control manufacturer shall provide one controller for the rooftop that communicates back to the main control panel.
- g. General:
 - 1) Control electronically with dedicated stand-alone HVAC controller.
 - 2) Provide graphic display terminal mounted on the controller panel face.
 - 3) Provide optimized start/stop with multiple schedule options for each system through the DDC system on a 365 day annual time of day schedule with four events per day and programming for holidays and up to ten (10) user defined special uses.
 - 4) Provide a timed override mode enabled through a space sensor to return space to occupied mode for 2 hours (adj.) for tenant comfort.
 - 5) All set points will be adjustable through the BAS, at the operator workstation and through a dial-up connection.
- h. System Off:
 - 1) The supply and return fans shall be off. The outside air damper shall be closed.
 - 2) The return air dampers shall be open.
 - 3) The gas fired heater shall be off.
 - 4) The direct expansion cooling compressor shall be off.
- i. System Start:
 - 1) When the air-handling unit is indexed to operate, the return fan shall start first. Following a 5-second (adj.) delay, the supply fan shall start.
 - 2) Upon proof of supply and return fans operation, dampers and control valve shall be indexed to their "System Run" conditions.
- j. System Run:
 - 1) Unoccupied Heating Mode:
 - a) Supply and Return Fans: Supply and return fans shall cycle to maintain supply air temperature at the unoccupied heating set point (adj.).
 - b) Economizer Dampers: Outside air and exhaust dampers are fully closed and return air damper is fully open.
 - c) Gas Fired Heater: Operate when the supply and return fans are on.
 - d) Direct Expansion Cooling: Off.

- 2) Unoccupied Cooling Mode
 - a) Supply and Return Fans: Cycle supply and return fans to maintain space temperature at the unoccupied cooling set point (adj.).
 - b) Economizer Dampers: Economizer dampers shall be enabled to provide free cooling when the outside air temperature is below the dry bulb economizer set point.
 - c) Economizer Available: Outside air and exhaust air dampers are fully open and return air damper is fully closed when the supply and return fans are on.
 - d) Economizer Not Available: Outside air and exhaust dampers are fully closed and return air damper is fully open.
 - e) Gas Fired Heater: Off.
 - f) Direct Expansion Cooling: Allow to operate when the supply fan and return fans are on to maintain space temperature set point.
- 3) Warm-up Mode:
 - a) Supply and Return Fans: Supply and return fans shall start and run continuously.
 - b) Economizer Dampers: Outside air and exhaust dampers are fully closed and return air damper is fully open.
 - c) Gas Fired Heater: Enabled and modulated to maintain the space temperature at set point as reset by space temperature.
 - d) Direct Expansion Cooling: Off.
- 4) Cool-down Mode:
 - a) Supply and Return Fans: Supply and return fans shall start and run continuously.
 - b) Economizer Dampers: Economizer dampers shall be enabled to provide free cooling when the outside air temperature is below the dry bulb economizer set point (adj.).
 - c) Economizer Available: Economizer dampers shall modulate subject to a mixed air low limit of 40 degrees F. (adj.).
 - d) Economizer Not Available: Outside air and exhaust dampers are fully closed and return air damper is fully open.
 - e) Gas Fired Heater: Off.
 - f) Direct Expansion Cooling: Stage cooling in sequence with the economizer dampers to maintain the discharge air temperature at set point as reset by space temperature.
- 5) Occupied Mode:
 - a) Supply and Return Fans: Supply and return fans shall run continuously.
 - b) Outside Air Damper: Damper shall open to provide code required minimum outside air.

- c) Economizer Dampers: Economizer dampers shall be enabled to provide free cooling when the outside air temperature is below the dry bulb economizer set point.
 - i) Economizer Available: Economizer dampers shall modulate subject to a mixed air low limit of 40 degrees F. (adj.).
 - ii) Economizer Not Available: The economizer dampers shall maintain a minimum outside air damper position (adj.). Provide CO2 sensor in return air ductwork. If CO2 levels increase, an alarm shall be generated at the front-end computer screen. CO2 sensor shall modulate OA damper open to provide additional outside air subject to mixed air set point (adj.). CO2 sensor shall modulate OA damper below minimum when CO2 levels allow.
 - d) Gas Fired Heater: Enabled and modulated to maintain the discharge air temperature at set point as reset by space temperature.
 - e) Direct Expansion Cooling: Stage cooling in sequence with the economizer dampers to maintain the discharge air temperature at set point as reset by the space temperature.
- k. System Stop:
- 1) When the air-handling unit is indexed to shut down, the supply and return fans shall stop.
 - 2) Dampers and control valve shall be indexed to their "System Off" conditions.
- l. Safeties and Alarms:
- 1) Low Limit: Manual reset low limit thermostat shall stop the supply and return fans, close the outdoor air dampers and open the heating coil valve fully, and annunciate alarm should the coil discharge air temperature fall below 38 degrees F.
 - 2) Smoke Control:
 - a) Duct smoke detector(s) shall stop the supply fan and annunciate alarm when products of combustion are detected in the air stream. Dampers and control valves shall be indexed to their "System Off" conditions.
 - b) The supply fan shall be interlocked to shut down upon a command from the building fire alarm system.
 - c) Upon a return to normal, the supply fan shall start after an adjustable delay to provide a staggered start of all building loads.
 - 3) Annunciate off normal alarms whenever supply or return fan status does not equal alarm.
 - 4) All alarms shall be reported to the operator workstation from the BAS

5) Points List.

- a) Fan Start/Stop
- b) Fan Status (CSR)
- c) Discharge Air Temperature
- d) Room Temperature Set Point
- e) Room Temperature
- f) Room CO2 Set Point (PPM)
- g) Room CO2 Concentration (PPM)
- h) OA/RA Damper Control
- i) Cooling Valve Control (or DX Stages if applicable)
- j) Heating Control
- k) Cooling Control
- l) Mixed Air Temperature.
- m) Return Air Temperature

m. Failure Modes:

- 1) Fan Failure: If the supply fan fails to operate, both fans shall shut down and alarm be annunciated. Dampers and control valves shall be indexed to their "System Off" conditions.
- 2) Sensor Failure: Upon the failure of an analog sensor, associated dampers and control valves shall remain at their last position and alarm shall be annunciated.
- 3) Power Failure:
 - a) Fans: Upon restoration of power, the supply fan and power exhaust fan shall start after an adjustable delay to provide a staggered start of all building loads.
 - b) Dampers: Economizer dampers and face & bypass dampers shall be provided with spring return actuators to fail to their "System Off" positions.
 - c) Gas Fired Heater: Upon restoration of power, the heater shall start.
- 4) Direct Expansion Cooling: Upon restoration of power, the direct expansion cooling shall start after an adjustable delay to provide a staggered start of all building loads.

- n. Each rooftop shall be provided with a sensor that has an after hours override button. The occupant shall be able to override any scheduled night setback/setup period for two hours of after hours comfort by depressing the button for a period of 2-5 seconds. The override shall also be cancelable from the sensor at any time during the override with the use of a Cancel button.

2. Variable Air Volume – (DX Cooling)

- a. These rooftop unit systems contain a self-contained, factory furnished control system including economizer, heating, mechanical cooling, morning warm-up, and fan volume controls. The system shall be indexed from the occupied to the unoccupied modes of operation from the BAS.

- b. This contractor shall install and wire all components shipped loose with the rooftop unit. This includes but is not limited to the following items.
 - 1). Supply duct static pressure sensor for control of supply fan variable frequency drive.
 - 2) Space temperature sensor for reset of discharge air temperature.
 - 3) Space pressure sensor for control of exhaust fans.
 - 4) Tie-in of BAS to interface module provided on the rooftop units to pick up available control and monitoring points from the VAV rooftop unit.
 - 5) Install and wire remote diagnostic/alarm panel to rooftop units.
 - 6) Provide field wiring from unit-mounted controller to hot water control valve furnished with rooftop unit for field installation.
- c. This contractor shall furnish and install a duct mounted static pressure sensor located approximately 2/3 of the way downstream in the main supply air duct run. Verify exact location in the field. Sensor shall be tied back to the rooftop unit for control of the supply and exhaust fan variable frequency drives. Coordinate the type and compatibility of the static pressure control system with the rooftop unit manufacturer.
- d. This contractor shall provide and install a dedicated DDC control panel with all the necessary field devices to control and monitor each rooftop unit per the Point List at the end of this section and to pick up control and monitoring points available from the rooftop unit's interface module. Coordinate installation and other requirements with the rooftop unit manufacturer.
- e. This contractor shall provide all required interlock wiring for ductwork smoke detectors furnished and installed by this contractor. Upon sensing particles of combustion, the smoke detectors shall stop the supply and exhaust fan. A second set of contacts shall close, providing a smoke alarm signal at the local DDC control panel and the BAS. Smoke detection system to comply with NFPA 90A requirements.
- f. Parallel available rooftop unit alarms and provide alarm to the BAS. Provide the control and monitoring points as listed in the Point List at the end of this section.
- g. The system control panel shall be capable of communicating with the rooftop and monitoring various points. The control manufacturer shall provide one controller for the rooftop that communicates back to the main control panel.
- f. General:
 - 1) Control electronically with dedicated stand-alone HVAC controller.
 - 2) Provide graphic display terminal mounted on the controller panel face.
 - 3) Provide optimized start/stop with multiple schedule options for each system through the DDC system on a 365 day annual time of day schedule with four events per day and programming for holidays and up to ten (10) user defined special uses.
 - 4) Provide a timed override mode enabled through a space sensor to return space to occupied mode for 2 hours (adj.) for tenant comfort.
 - 5) All set points will be adjustable through the BAS, at the operator workstation and through a dial-up connection.

g. System Off:

- 1) The supply and return fans shall be off. The outside air damper shall be closed.
- 2) The return air dampers shall be open.
- 3) The gas fired heater shall be off.
- 4) The direct expansion cooling compressor shall be off.

h. System Start:

- 1) When the air-handling unit is indexed to operate, the return fan shall start first. Following a 5-second (adj.) delay, the supply fan shall start.
- 2) Upon proof of supply and return fans operation, dampers and control valve shall be indexed to their "System Run" conditions.

i. System Run:

1) Unoccupied Heating Mode:

- a) Supply and Return Fans: Supply and return fans shall cycle to maintain supply air temperature at the unoccupied heating set point (adj.).
- b) Economizer Dampers: Outside air and exhaust dampers are fully closed and return air damper is fully open.
- c) Gas Fired Heater: Operate when the supply and return fans are on.
- d) Direct Expansion Cooling: Off.

2) Unoccupied Cooling Mode

- a) Supply and Return Fans: Cycle supply and return fans to maintain space temperature at the unoccupied cooling set point (adj.).
- b) Economizer Dampers: Economizer dampers shall be enabled to provide free cooling when the outside air temperature is below the dry bulb economizer set point.
- c) Economizer Available: Outside air and exhaust air dampers are fully open and return air damper is fully closed when the supply and return fans are on.
- d) Economizer Not Available: Outside air and exhaust dampers are fully closed and return air damper is fully open.
- e) Gas Fired Heater: Off.
- f) Direct Expansion Cooling: Allow to operate when the supply fan and return fans are on to maintain space temperature set point.

3) Warm-up Mode:

- a) Supply and Return Fans: Supply and return fans shall start and run continuously.
- b) Economizer Dampers: Outside air and exhaust dampers are fully closed and return air damper is fully open.
- c) Gas Fired Heater: Enabled and modulated to maintain the space temperature at set point as reset by space temperature.
- d) Direct Expansion Cooling: Off.

4) Cool-down Mode:

- a) Supply and Return Fans: Supply and return fans shall start and run continuously.
- b) Economizer Dampers: Economizer dampers shall be enabled to provide free cooling when the outside air temperature is below the dry bulb economizer set point (adj.).
- c) Economizer Available: Economizer dampers shall modulate subject to a mixed air low limit of 40 degrees F. (adj.).
- d) Economizer Not Available: Outside air and exhaust dampers are fully closed and return air damper is fully open.
- e) Gas Fired Heater: Off.
- f) Direct Expansion Cooling: Stage cooling in sequence with the economizer dampers to maintain the discharge air temperature at set point as reset by space temperature.

5) Occupied Mode:

- a) Supply and Return Fans: Supply and return fans shall run continuously.
- b) Outside Air Damper: Damper shall open to provide code required minimum outside air.
- c) Economizer Dampers: Economizer dampers shall be enabled to provide free cooling when the outside air temperature is below the dry bulb economizer set point.
 - i) Economizer Available: Economizer dampers shall modulate subject to a mixed air low limit of 40 degrees F. (adj.).
 - ii) Economizer Not Available: The economizer dampers shall maintain a minimum outside air damper position (adj.). Provide CO2 sensor in return air ductwork. If CO2 levels increase, an alarm shall be generated at the front-end computer screen. CO2 sensor shall modulate OA damper open to provide additional outside air subject to mixed air set point (adj.). CO2 sensor shall modulate OA damper below minimum when CO2 levels allow.
- d) Gas Fired Heater: Enabled and modulated to maintain the discharge air temperature at set point as reset by space temperature.
- e) Direct Expansion Cooling: Stage cooling in sequence with the economizer dampers to maintain the discharge air temperature at set point as reset by the space temperature.

k. System Stop:

- 1) When the air-handling unit is indexed to shut down, the supply and return fans shall stop.
- 2) Dampers and control valve shall be indexed to their "System Off" conditions.

l. Safeties and Alarms:

- 1) Low Limit: Manual reset low limit thermostat shall stop the supply and return fans, close the outdoor air dampers and open the heating coil valve fully, and annunciate alarm should the coil discharge air temperature fall below 38 degrees F.
- 2) Smoke Control:
 - a) Duct smoke detector(s) shall stop the supply fan and annunciate alarm when products of combustion are detected in the air stream. Dampers and control valves shall be indexed to their "System Off" conditions.
 - b) The supply fan shall be interlocked to shut down upon a command from the building fire alarm system.
 - c) Upon a return to normal, the supply fan shall start after an adjustable delay to provide a staggered start of all building loads.
- 3) Annunciate off normal alarms whenever supply or return fan status does not equal alarm.
- 4) All alarms shall be reported to the operator workstation from the BAS
- 5) Points List.
 - a) Fan Start/Stop
 - b) Fan Status (CSR)
 - c) Discharge Air Temperature
 - d) Room Temperature Set Point
 - e) Room Temperature
 - f) Room CO2 Set Point (PPM)
 - g) Room CO2 Concentration (PPM)
 - h) OA/RA Damper Control
 - i) Cooling Valve Control (or DX Stages if applicable)
 - j) Heating Control
 - k) Cooling Control
 - l) Mixed Air Temperature.
 - m) Return Air Temperature

m. Failure Modes:

- 1) Fan Failure: If the supply fan fails to operate, both fans shall shut down and alarm be annunciated. Dampers and control valves shall be indexed to their "System Off" conditions.
- 2) Sensor Failure: Upon the failure of an analog sensor, associated dampers and control valves shall remain at their last position and alarm shall be annunciated.
- 3) Power Failure:
 - a) Fans: Upon restoration of power, the supply fan and power exhaust fan shall start after an adjustable delay to provide a staggered start of all building loads.
 - b) Dampers: Economizer dampers and face & bypass dampers shall be provided with spring return actuators to fail to their "System Off" positions.
 - c) Gas Fired Heater: Upon restoration of power, the heater shall start.

- 4) Direct Expansion Cooling: Upon restoration of power, the direct expansion cooling shall start after an adjustable delay to provide a staggered start of all building loads.
 - n. Each rooftop shall be provided with a sensor that has an after hours override button. The occupant shall be able to override any scheduled night setback/setup period for two hours of after hours comfort by depressing the button for a period of 2-5 seconds. The override shall also be cancelable from the sensor at any time during the override with the use of a Cancel button.
3. Rooftop Unit Power Exhaust Control.
 - a. DX Cooling Rooftop Units are provided with integral or remote power exhaust for building pressure control during economizer. BAS contractor shall perform all interlock wiring and install monitoring points as required for proper operation. When the economizer operates the exhaust fan shall start and BAS shall modulate the exhaust damper in unison with the OA damper. If speed modulation is provided the BAS shall modulate the fan speed in response to space pressure, to maintain space pressure setpoint.
 - b. Exhaust Fans for Gas Heating Only RTU's are for continuous exhaust of locker rooms and other athletic areas. BAS contractor shall perform all interlock wiring and install monitoring points as required for proper operation. When the system is in occupied mode the exhaust fans shall run continuously. When the system is in unoccupied mode the exhaust fans shall be off, with exhaust damper closed and the units shall operate in recirculation mode.
 - c. Install all controls for monitoring the following control points:
 - 1) Exhaust Fan Start/Stop
 - 2) Exhaust Fan Status
 - 3) Speed Control (when provided with RTU)
 - 4) Space Pressure (when speed control is provided with RTU)

B. Kitchen Make-Up Air Unit Control

1. BAS Contractor shall interlock kitchen hood exhaust fan and kitchen make-up air unit such that the exhaust fan will start/stop and make-up air unit will be enabled based upon position of manual wall switch located near the hood. The switch shall be furnished, installed and wired by the BAS Contractor.
2. The BAS Contractor shall install the make-up air unit remote indication panel furnished by the unit manufacturer. Also, BAS Contractor shall be required to install any additional remote control devices provided with the unit.
 - a. The BAS systems shall monitor the following points:
 - b. Make-Up Air Unit Status (General Alarm)
 - c. Hood Exhaust Fan Status
 - d. Make-Up Air Unit Discharge Air Temperature
 - e. Dirty Filter Status

C. Fire Shut Down for Air Supply Unit Over 2000 CFM.

1. The Electrical Contractor shall furnish and install smoke and/or heat detectors in air supply system over 2000 CFM. An addressable fire alarm relay shall be furnished and installed by the Electrical Contractor and mounted by the supply fan starter/variable speed drive. BAS Contractor shall pick up signal from relay and provide a program to stop all supply and return/exhaust fans interlocked with the system sensing fire or smoke. DDC program shall also show fire in unit alarm at time of shut down.
2. Air supply units 15,000 CFM and over shall require smoke and/or heat detectors on both supply and return.

D. Miscellaneous Exhaust Fan Control.

1. Exhaust fans shall be furnished with motorized backdraft dampers by the manufacturer. If required, the BAS Contractor shall be responsible for field wiring the damper motors to the exhaust fan motors.
2. Some exhaust fans will have local on/off switch or timer switch with indicator light furnished and installed by this BAS Contractor.
3. Thermostatically controlled fans will not be controlled by the BAS system but BAS Contractor will provide a line or low voltage thermostat (reverse-acting type).
4. BAS system will show status (on/off) of all exhaust fans installed through a current sensing relay on each fan. Issue a non-critical alarm on failure.
5. Refer to exhaust fan schedule on contract documents for control requirements.
6. Interlock associated intake or exhaust air damper with exhaust fan. Remove/replace damper operator.
7. Control toilet exhaust fan(s) with occupancy sensors and local light switch.

E. Electric Wall Heater Control.

1. Units fans shall cycle according to the integral thermostat. On a drop in temperature, the fan shall cycle on and the electric heating elements will be energized. When the thermostat setpoint is satisfied, the fan shall shut off.
2. Integral thermostat continues fan operation until element temperature falls below 100 degrees.

F. Electrical Cabinet/Suspended Unit Heater Control

1. Unit fans shall cycle according to the wall mounted thermostat. On a drop in temperature, the fan shall cycle on and the electric heating elements will be energized. When the thermostat setpoint is satisfied, the fan shall shut off.
2. Integral thermostat continues fan operation until element temperature falls below 100 degrees F.

G. Variable Refrigerant Flow System Control.

1. BAS Contractor shall be required to install all remote control devices provided with VRF System units and all related interconnecting wiring serving indoor units, remote condensing units and energy recovery ventilator.

2. BAS shall monitor system to allow for status, space temperature setpoint adjustment and alarm points. Any additional points available shall also be monitored thru the BAS system.
 - a. Space Temperature
 - b. Space Temperature Setpoint
 - c. Space Temperature Alarm
 - d. Fan Status (alarm)
 - e. Unit General Alarm
 - f. Compressor Status
 - g. Compressor Alarm
3. Interlock remote outdoor air damper to open during occupied periods of building, damper to close when associated unit is "off".

END OF SECTION 2309933

SECTION 230995 - VARIABLE FREQUENCY SPEED CONTROL

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Complete adjustable frequency drive controls consisting of pulse width modulating or step type inverters for use on each standard NEMA Design B induction motor, for building fan(s).
- B. Adjustable frequency drive system designed for continuous duty and suitable for use on motors that are direct connected.

1.2 RELATED WORK

- A. Section 23 34 00 – Power Ventilators.
- B. Section 23 74 13 – Package Rooftop Air Conditioning Units.
- C. Section 23 74 23 – Package Rooftop Make-up Air Units for Kitchen.

1.3 QUALITY ASSURANCE

- A. Units: UL and ETL listed.

1.4 SUBMITTALS

- A. Submit in accordance with the General Requirements.
- B. Product Data:
 - 1. Submit manufacturer's data on variable frequency drive systems including descriptive literature, opening instructions and maintenance and repair data.
- C. Shop Drawings:
 - 1. Submit detailed shop drawings indicating all control and power connections for complete system operation.
- D. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that Contractor has not stamped with his review certification.
- E. Submit manufacturer's performance data including dimensional drawings, power circuit diagrams, installation and maintenance manuals, warranty description, VFD's FLA rating, certification agency file numbers and catalog information.

- F. The specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification. If no departures from the specification are identified, the supplier shall be bound by the specification.
- G. Harmonic filtering. The seller shall, with the aid of the buyer's electrical power single line diagram, providing the data required by IEEE-519, perform an analysis to initially demonstrate the supplied equipment will meet the IEEE standards after installation. If, as a result of the analysis, it is determined that additional filter equipment is required to meet the IEEE recommendations, then the cost of such equipment shall be included in the bid.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products under provisions of the General Requirements.

1.6 WARRANTY

- A. The VFD shall be warranted by the manufacturer for a period of 1 year from date of start-up. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service. The warranty shall be provided by the VFD manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. ABB
- B. Danfoss
- C. Owner Approved Equal

2.2 GENERAL

- A. Furnish complete variable frequency VFDs as specified herein for fans designated on the drawing schedules to be variable speed. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. VFD shall be housed in a metal NEMA 1 enclosure, or other NEMA type according to the installation and operating conditions at the job site. The VFD's UL listing shall allow mounting in plenum.
- B. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three-phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for fan control and to eliminate the need for motor derating.

- C. With the motor's rated voltage applied to the VFD input, the VFD shall allow the motor to produce full rated power at rated amps, RMS fundamental volts, and speed without using the motor's service factor. VFDs utilizing sine weighted/coded modulation (with or without 3rd harmonic injection) must provide data verifying that the motors will not draw more than full load current during full load and full speed operation.
- D. The VFD shall include an input full-wave bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.
- E. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be assembled by the manufacturer, which shall be UL-508 certified for the building and assembly of option panels. Assembly of the option panels by a third-party panel shop is not acceptable. The appropriate UL stickers shall be applied to both the VFD and option panel, in the case where these are not contained in one panel. When these VFDs are to be located in Canada, CSA or C-UL certifications shall apply. Both VFD and option panel shall be manufactured in ISO 9001 certified facilities.
- F. The VFD shall have DC link reactors on both the positive and negative rails of the DC bus to minimize power line harmonics. VFDs without DC link reactors shall provide a minimum 3% impedance line reactor.
- G. The VFD's full load amp rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 160% of rated current for up to 0.5 second while starting.
- H. The VFD shall be able to provide full torque at any selected frequency from 29 Hz to base speed to allow driving direct drive fans without derating.
- I. VFD shall minimize the audible motor noise through the use of an adjustable carrier frequency. The carrier frequency shall be automatically adjusted to optimize motor and VFD efficiencies while reducing motor noise.
- J. Protective Features
 - 1. A minimum of Class 20 I2t electronic motor overload protection for single motor applications and thermal-mechanical overloads for multiple motor applications shall be provided.
 - 2. Protection against input transients, loss of AC line phase, output short circuit, output ground fault, overvoltage, undervoltage, VFD overtemperature and motor overtemperature. The VFD shall display all faults in plain English. Codes are not acceptable.
 - 3. Protect VFD from sustained power or phase loss. The VFD shall provide full rated output with an input voltage as low as 90% of the nominal. The VFD will continue to operate with reduced output with an input voltage as low as 313 V AC for 460 volt units.
 - 4. The VFD shall incorporate a motor preheat circuit to keep the motor warm and prevent condensation build up in the stator.
 - 5. VFD package shall include semi-conductor rated input fuses to protect power components.
 - 6. To prevent breakdown of the motor winding insulation, the VFD shall be designed to comply with IEC Part 34-17. Otherwise the VFD manufacturer must ensure that inverter rated motors are supplied.

7. VFD shall include a "signal loss detection" circuit to sense the loss of an analog input signal such as 4 to 20 mA or 2 to 10 V DC, and shall be programmable to react as desired in such an instance.
8. VFD shall catch a rotating motor operating forward or reverse up to full speed.
9. VFD shall be rated for 100,000 amp interrupting capacity (AIC).
10. VFD shall include current sensors on all three output phases to detect and report phase loss to the motor. The VFD will identify which of the output phases is low or lost.
11. VFD shall continue to operate without faulting until input voltage reaches 539 V AC on 460 volt units.

K. Interface Features

1. Hand/Start, Off/Stop and Auto/Start selector switches shall be provided to start and stop the VFD and determine the speed reference.
2. The VFD shall be able to be programmed to provide a 24 V DC output signal to indicate that the VFD is in Auto/Remote mode.
3. The VFD shall provide digital manual speed control. Potentiometers are not acceptable.
4. The VFD shall include a standard EIA-485 communications port and capabilities to be connected at the existing BAS at no additional cost to the owner. The connection shall be software selectable by the user.
5. As a minimum, the following points shall be controlled and accessible from the Building Automation System:
 - a. VFD Start/Stop
 - b. Speed reference
 - c. Fault diagnostics
 - d. Meter points
 - 1) Motor power in HP
 - 2) Motor power in kW
 - 3) Motor kW-hr
 - 4) Motor current
 - 5) Motor voltage
 - 6) Hours run
 - 7) Feedback signal #1
 - 8) Feedback signal #2
 - 9) DC link voltage
 - 10) Thermal load on motor
 - 11) Thermal load on VFD
 - 12) Heatsink temperature
6. BacNet communication shall be available for factory or field installation within the VFD.
7. Two set-point control interface (PID control) shall be standard in the unit. VFD shall be able to look at two feedback signals, compare with two set-points and make various process control decisions.
8. Floating point control interface shall be provided to increase/decrease speed in response to contact closures.

9. Run permissive circuit shall be provided to accept a “system ready” signal to ensure that the VFD does not start until dampers or other auxiliary equipment are in the proper state for VFD operation. The run permissive circuit shall also be capable of sending an output signal as a start command to actuate external equipment before allowing the VFD to start.
10. The following displays shall be accessible from the control panel in actual units: Reference Signal Value in actual units, Output Frequency in Hz or percent, Output Amps, Motor HP, Motor kW, kWhr, Output Voltage, DC Bus Voltage, VFD Temperature in degrees, and Motor Speed in engineering units per application (in GPM, CFM, etc.). VFD will read out the selected engineering unit either in a linear, square or cubed relationship to output frequency as appropriate to the unit chosen.
11. The display shall be programmed to read in inches of water column (in-wg) for an air handler application, pressure per square inch (psi) for a pump application, and temperature (oF) for a cooling tower application.
12. VFD shall be able to be programmed to sense the loss of load and signal a no load/broken belt warning or fault.
13. If the temperature of the VFD’s heat sink rises to 80°C, the VFD shall automatically reduce its carrier frequency to reduce the heat sink temperature. If the temperature of the heat sink continues to rise the VFD shall automatically reduce its output frequency to the motor. As the VFD’s heat sink temperature returns to normal, the VFD shall automatically increase the output frequency to the motor and return the carrier frequency to its normal switching speed.
14. The VFD shall have temperature controlled cooling fans for quiet operation and minimized losses.
15. The VFD shall store in memory the last 10 faults and related operational data.
16. Two programmable relay outputs, one Form C 240 V AC, one Form A 30 V AC, shall be provided for remote indication of VFD status.
17. Three programmable analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include two voltage (0 to 10 V DC, 2 to 10 V DC) and one current (0 to 20 mA, 4 to 20 mA) input.
18. Two programmable 0 to 20 mA analog outputs shall be provided for indication of VFD status. These outputs shall be programmable for output speed, frequency, current and power. They shall also be programmable to provide a selected 24 V DC status indication.
19. Under fire mode conditions, the VFD shall be able to be programmed to automatically default to a preset speed.

L. Adjustments

1. VFD shall have an adjustable carrier frequency in steps of not less than 0.1 kHz to allow tuning the VFD to the motor.
2. If the VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: undervoltage, overvoltage, current limit and inverter overload.

M. Bypass

1. Provide a manual 3-contactor bypass consisting of a door interlocked main fused disconnect padlockable in the off position, a built-in motor starter and a four position DRIVE/OFF/BYPASS/TEST switch controlling three contactors. In the DRIVE position, the motor is operated at an adjustable speed from the VFD. In the OFF position, the motor and VFD are disconnected. In the BYPASS position, the motor is operated at full speed from the AC power line and power is disconnected from the VFD so that service can be performed. In the TEST position, the motor is operated at full speed from the AC line power while power is applied to the input of the VFD. This allows the VFD to be given an operational test while continuing to run the motor at full speed in bypass. In case of an external safety fault, a customer supplied normally closed dry contact shall be able to stop the motor whether in DRIVE or BYPASS mode.
2. Service personnel shall be able to defeat the main power disconnect and open the bypass enclosure without disconnecting power. This shall be accomplished through the use of a specially designed tool and mechanism while meeting all local and national electrical code requirements for safety.

N. Service Conditions

1. Ambient temperature, -10 to 40°C (14 to 104°F).
2. 0 to 95% relative humidity, non-condensing.
3. Elevation to 3,300 feet without derating.
4. AC line voltage variation, -10 to +10% of nominal with full output.
5. No side clearance shall be required for cooling of any units. All power and control wiring shall be done from the bottom.

O. Quality Assurance

1. To ensure quality and minimize infantile failures at the jobsite, the complete VFD shall be tested by the manufacturer. The VFD shall operate a dynamometer at full load and speed and shall be cycled during the test.
2. All optional features shall be functionally tested at the factory for proper operation.

PART 3 EXECUTION

3.1 START-UP SERVICE

- A. The manufacturer shall provide start-up commissioning of the VFD and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. Sales personnel and other agents who are not factory certified shall not be acceptable as commissioning agents. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options and its interface wiring to the building automation system.

3.2 EXAMINATION

- A. Contractor to verify that job site conditions for installation meet factory recommended and code-required conditions for VFD installation prior to start-up, including clearance spacing, temperature, contamination, dust, and moisture of the environment. Separate conduit installation of the motor wiring, power wiring, and control wiring, and installation per the manufacturer's recommendations shall be verified.
- B. The VFD is to be covered and protected from installation dust and contamination until the environment is cleaned and ready for operation. The VFD shall not be operated while the unit is covered.

3.3 INTERFACING

- A. BAS Contractor shall coordinate with Electrical Contractor to ensure all power and control interlocks are properly made in order to provide complete operating system.
- B. Provide electrical and control diagrams to respective Electrical and BAS Contractors showing all interlocking wiring and control input locations.
- C. BAS control wiring conduit will be furnished and installed by BAS Contractor.

3.4 INSTALLATION

- A. Install units in accordance with manufacturer's installation instructions.
- B. Electrical Connections:
 - 1. Ensure that drive units are wired properly, with rotation in direction indicated, designed for proper fan performance.
 - 2. Provide positive electrical equipment and motor grounding.

3.5 FIELD QUALITY CONTROL

- A. After drive installation and after motor has been energized, test each drive to demonstrate proper operation of unit at performance specifications.
- B. When possible, field correct malfunctioning units; then retest to demonstrate compliance.

END OF SECTION 230995

SECTION 231126 - FUEL PIPING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Pipe and pipe fittings.
- B. Valves.
- C. Gas pressure reducing regulators.
- D. Natural gas piping system.

1.2 RELATED SECTIONS

- A. Section 23 05 03 – Testing of HVAC Piping.
- B. Section 23 05 29 – Supports and Anchors.

1.3 REGULATORY REQUIREMENTS

- A. Illinois State Plumbing Code, ISPC.
- B. Building Officials and Code Administrators International, Inc., 2012 International Mechanical Code.
- C. National Fire Protection Association, NFPA-54: Installation Code for Natural Gas Burning Appliances and Equipment.
- D. National Electric Code, NEC, Spread of Fire Products of Combustion.

1.4 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of the General Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Store and protect products under provisions of the General Requirements.
- B. Deliver and store valves in shipping containers with labeling in place.

- C. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building, it must be stored off the ground a minimum of six inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visquin. All piping will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and is completely protected with weatherproof covers.

PART 2 PRODUCTS

2.1 NATURAL GAS PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53 or A120, Schedule 40 black. Fittings: ANSI/ASME B16.3, malleable iron or ASTM A2434, forged steel welding type. Joints: Screwed for pipe 1-1/2 inches and under (exposed and accessible); ANSI/AWS D1.1, welded, for pipe two inches and over and for 1-1/2 inches and under (concealed and inaccessible; above ceiling).

2.2 FLANGES, UNIONS AND COUPLINGS

- A. Pipe Size 2 Inches and under: 150 psig malleable iron unions for threaded ferrous piping; bronze unions for copper pipe, soldered joints.
- B. Pipe Size 2 Inches and over: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; neoprene gaskets for gas service; 1/16 inch thick preformed neoprene.
- C. Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.3 ACCEPTABLE MANUFACTURERS - GAS COCKS

- A. Stockham.
- B. Eclipse, Inc.
- C. Ladish Co.
- D. Owner Approved Equal.

2.4 GAS COCKS

- A. Up to 2 Inches: Bronze body, bronze tapered plug, non-lubricated, teflon packing, threaded ends.
- B. Over 2 Inches: Cast iron body and plug, non-lubricated, teflon packing, flanged ends.

2.5 FIRE AND SMOKE PENETRATION SEALANTS

A. Fire Seal:

1. Seal penetrations of fire-rated walls, floors or ceilings by raceways for compliance with NEC 300-21.
 - a. Acceptable Manufacturers:
 - 1) Dow Corning: Fire Stop.
 - 2) Nelson: Flameseal.
 - 3) T & B: Flameseal.
 - 4) 3M Co.: Fire Barrier.
 - 5) Owner Approved Equal.
 - b. Fill void around raceways.
 - c. Sleeves: Heavy wall Schedule 40 steel pipe, anchored to building construction and finished plumb with wall, ceiling or floor lines.

B. Thermal Seal:

1. Seal penetrations of thermally insulated equipment, walls or rooms to prevent heat transfer.
2. Dual exterior of raceway with fiberglass or other material compatible to equipment or room and approved by Architect/Engineer.
3. Seal interior of raceway with duct sealing compound at entry to equipment or room.

C. Water Seal:

1. Seal penetrations of perimeter walls or floors below grade to prevent entry of water; use materials compatible with wall or floor construction and approved by Architect/Engineer.
2. Seal Penetrations of Roof: Sealed with flashings compatible with roof design and approved by roofing system manufacturer and Architect/Engineer.

PART 3 EXECUTION

3.1 SERVICE CONNECTIONS

- A. Contractor shall be responsible for installing from the leaving side of the meter, all gas piping, gas cocks, regulators, regulator vent piping, unions, hangers, supports and final connection to all new gas fired equipment.
- B. Support all piping as called for in Section 23 05 29, Supports and Anchors.
- C. Run a vent line from each gas regulator, including the gas regulator at the gas meter, up through and/or above the roof and terminate with a goose neck a minimum of 18 inches above the roof. Provide insect screen on outlet of each vent pipe.

- D. All gas piping in unfinished (exposed structure) areas to run exposed, tight to ceiling. All gas piping in finished (finished ceiling) areas to be run concealed, tight to structure above.
 - 1. All piping above inaccessible ceilings (i.e. drywall, plaster, etc.), buried in or under floor slabs or drops in walls or chases shall have welded or brazed joints, regardless of pipe size.
 - 2. All gas pipe in or below concrete slabs shall be installed in Schedule 40 PVC or 18 gauge galvanized steel pipe sleeve with all joints sealed air tight, and vented to outdoors. Gas pipe sleeves to have ends sealed to prevent gas from escaping into ceiling spaces.
- E. Install Schedule 40 steel pipe sleeves through all foundations, floors, walls and roofs. Each sleeve shall be sealed at both ends with one of the following:
 - 1. Fire Walls: Fire seal.
 - 2. Floors at Grade: Water seal.
 - 3. Floors Above Grade: Fire seal.
 - 4. Foundations and Outside Walls: Water seal.
 - 5. Walls (Not Fire walls): Thermal seal.
- F. Gas piping mounted on roof shall be mounted on pipe stands and painted to match school standards. Mount on a maximum center line as called for on drawings.

END OF SECTION 231126

SECTION 232113 - HYDRONIC PIPING

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Pipe and pipe fittings for:
 - 1. Equipment drains and overflows.

1.2 RELATED SECTIONS

- A. Section 23 05 03 - Testing of HVAC and Gas Piping.
- B. Section 23 05 29 - Supports and Anchors.
- C. Section 23 05 53 - Mechanical Identification.
- D. Section 23 07 01 - Piping Insulation.

1.3 REFERENCES

- A. ASME - Boiler and Pressure Vessel Codes.
- B. ASME B16.3 - Malleable Iron Threaded Fittings Class 50 and 300.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- E. ASME B31.9 - Building Services Piping.
- F. ASTM A53 - Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
- G. ASTM B32 - Solder Metal.
- H. ASTM B88 - Seamless Copper Water Tube.

1.4 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified, ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

- B. Use unions, flanges, and couplings downstream of valves and at equipment or apparatus connections. Do not use direct welded or threaded connections to valves, equipment or other apparatus.
- C. Use non-conducting dielectric connections whenever jointing dissimilar metals in systems.
- D. Provide pipe hangers and supports in accordance with ASTM B31.9, MSS SP69 and ASTM F708.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirements.
- B. Contractor shall review all shop drawings prior to submitting them for Architect/ Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that contractor has not stamped with his review certification.

1.6 REGULATORY REQUIREMENTS

- A. Conform to ANSI/ASME B31.9 code for installation of piping system.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of the General Requirements.
- B. Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- C. Provide temporary protective coating on cast iron and steel valves.
- D. Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- E. Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

PART 2 PRODUCTS

2.1 CONDENSATE DRAINS OVERFLOWS AND EQUIPMENT DRAIN PIPING

- A. Galvanized Steel: ASTM A53 Schedule 40, galvanized.
 - 1. Cast Iron Fittings: ASME B16.4, threaded fittings.

2.2 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 Inches and Under:

1. Ferrous Piping: 150 psig malleable iron, threaded.

B. Flanges for Pipe Over 2 Inches:

1. Ferrous Piping: 150 psig forged steel, slip-on.

PART 3 EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.
- D. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space, and not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Sleeve pipe passing through partitions, walls and floors. Pack fire seal between sleeve and pipe.
- F. Slope piping and arrange to drain at low points.
- G. Inserts: Refer to Section 23 05 29.
- H. Pipe Hangers and Supports: Refer to Section 23 05 29.
- I. Pipe equipment and condensate drains to nearest floor/roof drain. Run pipe close to equipment bases to avoid tripping hazards.

END OF SECTION 232113

SECTION 233100 - DUCTWORK

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Insulated flexible ductwork.
- B. Low pressure (rectangular) ductwork.
- C. Low pressure (round) ductwork.
- D. Kitchen hood ductwork.
- E. Fabric ductwork.
- F. Installation of all dampers in ductwork.
- G. Coordination of building automation system installation.
- H. Installation of BAS components.

1.2 RELATED SECTIONS

- A. Section 23 05 29 - Supports and Anchors: Sleeves.
- B. Section 23 05 53 – Mechanical Identification
- C. Section 23 07 00 - Duct Insulation.
- D. Section 23 33 00 - Ductwork Accessories.
- E. Section 23 37 00 - Air Inlets and Outlets.

1.3 REFERENCES

- A. ASTM A 36 - Structural Steel.
- B. ASTM A 90 - Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles.
- C. ASTM A 366 - Steel, Sheet, Carbon, Cold Rolled, Commercial Quality.
- D. ASTM A 525 - General Requirements for Steel Sheet, Zinc- Coated (Galvanized) by the Hot-Dip Process.

- E. ASTM A 527 - Steel Sheet, Zinc-Coated (Galvanized) by Hot-Dip Process, Lock Forming Quality.
- F. ASTM B209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- G. AWS D9.1 - Welding of Sheet Metal.
- H. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- I. NFPA 91 - Installation of Blower and Exhaust Systems for Dust, Stock and Vapor Removal or Conveying.
- J. NFPA 96 - Installation of Equipment for the Removal of Smoke and Grease-Laden Vapors from Commercial Cooking Equipment.
- K. SMACNA - HVAC Air Duct Leakage Test Manual.
- L. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- M. UL 181 - Factory-Made Air Ducts and Connectors.

1.4 PERFORMANCE REQUIREMENTS

- A. No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts.

1.5 REGULATORY REQUIREMENTS

- A. Construct ductwork to N.F.P.A. 90A standards.
- B. Conform to International Mechanical Code.

1.6 SUBMITTALS

- A. Submit under provisions of the General Requirements.
- B. Shop Drawings: Submit one-quarter inch shop drawing layouts of all ductwork systems prior to fabrication. Drawings are to be coordinated with other trades.
- C. Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following SMACNA HVAC Air Duct Leakage Test Manual.

1.7 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of the General Requirements.
- B. Record actual locations of ducts and duct fittings. Record changes in fitting location and type. Show additional fittings used.

1.8 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- B. Maintain one copy of document on site.

1.9 REGULATORY REQUIREMENTS

- A. Construct ductwork to NFPA 90A and NFPA 96 standards.

1.10 ENVIRONMENTAL REQUIREMENTS

- A. Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B. Maintain temperatures during and after installation of duct sealants.

PART 2 PRODUCTS

2.1 MATERIALS

- A. General: Non-combustible or conforming to requirements for Class 1 air duct materials or UL 181.
- B. All exposed ductwork that is to be painted shall be paint grip galvanized steel ductwork. ASTM A527 galvanized steel sheet. Lock forming quality G90 zinc coating in conformance with ASTM A90.
- C. Steel Ducts: ASTM A525 or ASTM A527 galvanized steel sheet, lock-forming quality, having zinc coating of 1.25 oz. per sq.ft. for each side in conformance with ASTM A90.
- D. Stainless Steel Ducts: 316 stainless steel of all welded construction with bolted flanged joints.
- E. Aluminum Ducts: ANSI/ASTM B209; aluminum sheet, alloy 3003-H14. Aluminum Connectors and Bar Stock: Alloy 6061-T6 or of equivalent strength.

- F. Fasteners: Rivets, bolts, duct mate (TM) or sheet metal screws.
- G. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape or heavy mastic.
- H. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end or continuously threaded.

2.2 FLEXIBLE DUCTWORK

A. Acceptable Manufacturers:

- 1. Thermaflex - Flexible Technologies.
- 2. Flex-Master.
- 3. Wiremold.
- 4. Technaflax.
- 5. Owner Approved Equal.

B. Product:

- 1. Flexible air ducts for connections between branch low pressure ductwork and diffusers, registers and grilles.
- 2. Ductwork shall be Thermaflex Type M-KE air duct listed by Underwriter's Laboratories Standard 181 as a Class 1 flexible air duct and complying NFPA Standards 90A and 90B. Duct shall be factory made and composed of a CPE liner permanently bonded to a coated spring wire helix and supporting a fiberglass insulating blanket. Low permeability outer vapor barrier of fiberglass reinforced film laminate shall complete the composite.
 - a. Maximum velocity - 4000 FPM.
 - b. Maximum positive pressure through 12 inch diameter - 10 inches.
 - c. Maximum positive pressure over 12 inch diameter - 4 inches.
 - d. Maximum negative pressure through 12 inches - 1 inch.
 - e. Thermal conductance - 0.23 BTU/Hr/sq.ft. at 75 degrees F.
 - f. Maximum flamespread 25; maximum smoke developed 50.
- 3. Install all flexible ducts to grilles, diffusers, registers and branch ducts with galvanized steel strap, cadmium plated and fastened with a slotted bolt.

2.3 LOW PRESSURE (RECTANGULAR) DUCTWORK

- A. Fabricate and support in accordance with SMACNA Low Pressure Duct Construction Standards and ASHRAE handbooks, except as indicated. Provide duct material, gauges, reinforcing and sealing for operating pressure indicated.
- B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.

- C. Construct T's, bends and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 45 degrees.
- E. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.
- F. Use crimp joints with or without bead for joining round ducts sizes 8 inch and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.
- H. Seal all joints and fittings throughout the low pressure duct system (supply side) with SMACNA approved sealants. Sealants to have a service temperature range of -30 degrees F. to +175 degrees F.

2.4 LOW PRESSURE (ROUND) DUCTWORK

- A. Duct rated for 2" pressure class.
- B. Adjustable elbows for all changes of direction.
- C. All fittings shall be screwed to duct.

2.5 FABRIC DUCTWORK

- A. Acceptable Manufacturers:
 - 1. Ductsox.
 - 2. Owner approved equal.
- B. Textile air dispersion system:
 - 1. Air diffusers shall be constructed of a woven fire retardant fabric complying with the following physical characteristics:
 - a. Fabric Construction: Fabric shall be constructed of a polyester that includes 55% recycled content, treated with a machine wash-able anti-microbial agent by the fabric manufacturer, of a non-linting filament yarn to meet the requirements of ISO Class 3 environment, and 100% flame retardant.
 - b. Weight: 6.8 oz. /yd² per ASTM D3776
 - c. Color: (Standard: blue, natural white, tan, red, green, gray, black or custom)

- d. Fabric Porosity: 2 (+2/-1) cfm/ft² per ASTM D737, Frazier
- e. Temperature Range: 0 degrees F to 180 degrees F
- f. Fire Retardancy: Classified by Underwriters Laboratories in accordance with the flame spread/smoke developed requirements NFPA 90, ICC AC167 and UL 2518.
- g. Antimicrobial agent shall be proven 99% effective after 10 laundry cycles per AATCC Test Method 100.

2. Systems fabrication requirements:

- a. Air dispersion accomplished by linear vent and permeable fabric. Linear vents must be sized in 1 CFM per linear foot increments (based on .5" SP), starting at 1 CFM through 90 CFM per linear foot. Linear vent is to consist of an array of open orifices rather than a mesh style vent to reduce maintenance requirements of mesh style vents. Linear vents should also be designed to minimize dusting on fabric surface.
- b. Size of vent openings and location of linear vents to be specified and approved by manufacturer.
- c. Inlet connection to metal duct via fabric draw band with anchor patches as supplied by manufacturer. Anchor patches to be secured to metal duct via zip screw fastener – supplied by contractor.
- d. Inlet connection includes zipper for easy removal / maintenance.
- e. Lengths to include required zippers as specified by manufacturer.
- f. System to include Adjustable Flow Devices to balance turbulence, airflow and distribution as needed. Flow restriction device shall include ability to adjust the airflow resistance from 0.06 – 0.60 in w.g. static pressure.
- g. End cap includes zipper for easy maintenance.
- h. Fabric system shall include connectors to accommodate suspension system listed below.
- i. Any deviation from a straight run shall be made using a gored elbow or an efficiency tee. Normal 90 degree elbows are 5 gores and the radius of the elbow is 1.5 times the diameter of the DuctSox.

3. Design parameters:

- a. Use fabric diffusers only for positive pressure air distribution components of the mechanical ventilation system.
- b. Do not use fabric diffusers in concealed locations.
- c. Fabric diffusers shall be designed from 0.25" water gage minimum to 3.0" maximum, with 0.5" as the standard.
- d. Textile air diffusers shall be limited to design temperatures between 0 degrees F and 180 degrees F.
- e. Design CFM, static pressure and diffuser length shall be designed or approved by the manufacturer.

4. Suspension hardware:

- a. 3x1 Suspension: (Available for duct diameters from 10" to 48") System shall include a 3 Row connection to fabric system at 10, 12, and 2 o'clock locations. The powder-coated aluminum hangers are secured and connected to a single (1 Row) tension cable every 3'-0" and connect to the fabric system at the 10 and 2 o'clock locations with detachable D-Clasps. The fabric system will also have intermediate Glides located at 12 o'clock and between the hangers to attach directly to the single tension cable system located 3" above top-dead-center location of the fabric system. Tension cable hardware to include cable, eye bolts, thimbles, cable clamps, and turnbuckles as required.
- b. Component options include:
 - i. Stainless Steel Cable.
- c. Adjustable Mid-Supports – Available lengths: 5'.

2.6 KITCHEN HOOD EXHAUST DUCTWORK

- A. Fabricate in accordance with SMACNA HVAC duct construction standards – metal and flexible and NFPA 96.
- B. Construct of 18-gauge stainless steel using continuous external welded joints.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install and seal ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- C. Duct Sizes are inside clear dimensions for lined ducts, maintain sizes inside lining.
- D. Provide openings in ductwork where required to accommodate controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- F. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.
- G. Use double nuts and lock washers on threaded rod supports.

- H. Seal all joints in medium pressure ductwork with United duct sealer.
- I. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- J. Connect diffusers to low pressure ducts with 3 feet maximum length of flexible duct held in place with strap or clamp.
- K. Connect flexible ducts to metal ducts with adhesive plus draw bands. Flexible duct allowed for final connection to diffuser only (3'-0" max. length).
- L. Connect terminal units to medium pressure main with spiral duct and welding fittings.
- M. Spiral flat oval and round duct is acceptable in equivalent sizes for rectangular medium pressure duct shown on plans.
- N. Provide residual traps in kitchen hood exhaust ducts at base of vertical risers with provisions for clean out. Use stainless steel for ductwork exposed to view and also stainless steel for ducts where concealed.
- O. Install fabric ductwork per manufacturer's recommendations.

3.2 INSTALLATION OF CONTROL PRODUCTS

- A. Install gauges, temperature and pressure sensors and other instrumentation in the locations directed by the BAS contractor.
- B. Failure of this contractor to adequately coordinate his work with the BAS contractor shall not be justification for any request for additional payment.
- C. This contractor shall include the cost of coordinating and installing related BAS components in his bid.
- D. Install duct smoke detectors provided by electrical contractor.

3.3 SCHEDULES

A. DUCTWORK MATERIAL AND PRESSURE CLASS SCHEDULE

<u>SMACNA Air System</u>	<u>Class</u>	<u>Material Pressure</u>
Low Pressure Supply (Heating and Cooling Systems)	Steel	4"
Return and Relief	Steel	4" (Negative)
General Exhaust	Steel (Aluminum if indicated on plan)	2" (Negative)
Outside Air	Steel	4"
Dishwasher	Stainless Steel	4"
Kitchen Hood Exhaust	Stainless Steel/Black Iron	10"

END OF SECTION 233100

SECTION 233300 - DUCTWORK ACCESSORIES

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Air turning devices/extractors.
- B. Duct access doors.
- C. Duct test holes.
- D. Fire dampers.
- E. Flexible duct connections.
- F. Volume control dampers.

1.2 RELATED SECTIONS

- A. Section 23 05 48 - Vibration Isolation.
- B. Section 23 31 00 - Ductwork.
- C. Section 23 34 00 - Power Ventilators.

1.3 REFERENCES

- A. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
- B. NFPA 70 - National Electrical Code.
- C. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- D. UL 33 - Heat Responsive Links for Fire-Protection Service.
- E. UL 555 - Fire Dampers and Ceiling Dampers.
- F. UL 555S - Leakage Rated Dampers for Use in Smoke Control Systems.

1.4 SUBMITTALS

- A. Submit under provisions of the General Requirements.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of the General Requirements.

1.6 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters' Laboratories Inc., as suitable for the purpose specified and indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of the General Requirements.
- B. Protect dampers from damage to operating linkages and blades.

1.8 EXTRA MATERIALS

- A. Provide two of each size and type of fusible link.

PART 2 PRODUCTS

2.1 AIR TURNING DEVICES/EXTRACTORS

- A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.2 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, install minimum one inch thick insulation with sheet metal cover.
 - 1. Less Than 12 Inches Square: Secure with sash locks.
 - 2. Up to 18 Inches Square: Provide two hinges and two sash locks.
 - 3. Up to 24 x 48 Inches: Three hinges and two compression latches with outside and inside handles.
 - 4. Larger Sizes: Provide an additional hinge.
- C. Access doors with sheet metal screw fasteners are not acceptable.

2.3 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.4 FIRE DAMPERS

- A. Manufacturers:
 - 1. Ruskin.
 - 2. Vent Products.
 - 3. Air Balance.
 - 4. Nailor.
 - 5. Owner Approved Equal.
- B. Fabricate in accordance with NFPA 90A, and UL 555S and as indicated.
- C. Ceiling Dampers: Galvanized steel, 22 gage frame and 16 gage flap, two layers 0.125 inch ceramic fiber on top side, and one layer on bottom side for round flaps, with locking clip.
- D. Horizontal Dampers: Galvanized steel, 22 gage frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket. Dynamic type with spring actuated closure. Closure to be against elevated temperature airflow, against minimum 2400 FPM and against 4.5 in. wg. pressure.
- E. Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for horizontal installations, closure under air flow conditions. Configure with blades out of air stream except for 1.0 inch pressure class ducts up to 12 inches in height. Dynamic type with spring actuated closure. Closure to be against elevated temperature airflow, against minimum 2400 FPM and against 4.5 in. wg. pressure.
- F. Multiple Blade Dampers: 16 gage galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 x 2 inch plated steel concealed linkage, stainless steel closure spring, blade stops, and lock. Closure to be against elevated temperature airflow, against minimum 2400 FPM and against 4.5 in. wg. pressure.
- G. Fusible Links: UL 33, separate at 160 degrees F adjustable link straps for combination fire/balancing dampers.
- H. Round Dampers: Curtain type in square frame entirely out of air stream with round collar to match duct size on each side.
- I. Actuators must be factory installed.

2.5 FLEXIBLE DUCT CONNECTIONS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- B. Connector: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz per sq yd.
 - 2. Net Fabric Width: Approximately 3 inches wide.
- C. Lead Vinyl Sheet: Minimum 0.55 inch thick, 0.87 lbs per sq ft, 10 dB attenuation in 10 to 10,000 Hz range.

2.6 VOLUME CONTROL DAMPERS

- A. Manufacturers:
 - 1. Ruskin.
 - 2. Air Balance.
 - 3. Vent Products.
 - 4. Owner Approved Equal.
- B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated.
- C. Single Blade Dampers: Fabricate for duct sizes up to 6 x 30 inch.
- D. Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 4 x 72". Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- E. End Bearings: Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- F. Quadrants:
 - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 - 3. Where rod lengths exceed 30 inches provide regulator at both ends.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- B. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated.
- C. Provide duct test holes where indicated and required for testing and balancing purposes.
- D. Provide fire dampers to match wall fire rating at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges. Fire dampers are required at walls:
 - 1. Building Fire Separations: See Architectural plans for locations.
 - 2. All mechanical rooms, floor penetrations, electrical rooms, stairs.
 - 3. ALL floor openings for ductwork.
- E. Demonstrate re-setting of fire dampers to Owner's representative.
- F. Provide flexible connections immediately adjacent to equipment in ducts associated with all fans and motorized equipment, and supported by vibration isolators.
- G. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- H. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.
- I. Install automatic control dampers provided by BAS contractor in the locations indicated on the floor plans.
- J. Manual balancing dampers shall be multi blade type for any duct where the dimension perpendicular to the damper blades is greater than 14".

3.2 INSTALLATION OF CONTROL PRODUCTS

- A. Install valves, temperature and pressure sensors and other instrumentation in the locations directed by the BAS contractor.
- B. Install BAS valves and sensors in the locations shown on the plans.
- C. Failure of this contractor to adequately coordinate his work with the BAS contractor shall not be justification for any request for additional payment.
- D. This contractor shall include the cost of coordinating and installing related BAS components in his bid.

END OF SECTION 233300

SECTION 233400 - POWER VENTILATORS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Power roof exhaust fans.

1.2 RELATED WORK

- A. Section 23 05 29 - Supports and Anchors.
- B. Section 23 31 00 - Ductwork.
- C. Section 23 33 00 - Ductwork Accessories.

1.3 REFERENCES

- A. AMCA 99 - Standards Handbook.
- B. AMCA 210 - Laboratory Methods of Testing Fans for Rating Purposes.
- C. AMCA 300 - Test Code for Sound Rating Air Moving Devices.
- D. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of the General Requirements.
- B. Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, sound power levels at rated capacity and electrical characteristics and connection requirements.
- C. Manufacturer's installation instruction.
- D. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that Contractor has not stamped with his review certification.

1.5 OPERATION AND MAINTENANCE DATA

- A. Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list and wiring diagrams.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of the General Requirements.
- B. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building it must be stored off the ground a minimum of 6 inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visquin. All duct openings will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and completely protected with weatherproof covers.

1.7 WARRANTY

- A. Equipment manufacturer shall provide a one (1) year warranty (parts and labor) on their equipment. Installing Contractor will provide one (1) year warranty on all parts and labor associated with the installation of the equipment. See the General Requirement Sections for other requirements.

1.8 EXTRA MATERIALS

- A. Provide two sets of belts for each fan.

PART 2 PRODUCTS

2.1 POWER ROOF EXHAUST FANS AND CURBS

- A. Acceptable Manufacturers:
 - 1. Cook.
 - 2. Greenheck.
 - 3. Carnes.
 - 4. Twin City Fans.
 - 5. Owner Approved Equal.

2.2 SPUN ALUMINUM, ROOF MOUNTED BELT DRIVE, DOWNBLAST CENTRIFUGAL EXHAUST VENTILATOR.

- A. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.
- B. The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have continuously welded curb cap corners for maximum leak protection. The discharge baffle shall have stainless steel quick release latches to provide access into the motor compartment without the use of tools. An integral conduit chase shall be provided through the curb cap and into the motor compartment to facilitate wiring connections. The motor, bearings and drives shall be mounted on a minimum 14 gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. These components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Lifting lugs shall be provided to help prevent damage from improper lifting. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.
- C. Wheel: Wheel shall be centrifugal backward inclined, constructed of 100 percent aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans.
- D. Motor: Motor shall be heavy duty type with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and enclosure.
- E. Bearings: Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball type in a cast iron pillow block housing selected for a minimum L50 life in excess of 200,000 hours at maximum catalogued operating speed.
- F. Belts & Drives: Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150 percent of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.
- G. Roof Curbs: 18 inch high galvanized steel with continuously welded seams, one inch insulation and curb bottom and factory installed door nailer strip. Curb shall be fabricated to accommodate roof pitch so fan is mounted on a horizontal level plain. Provide interior sound baffle for units where scheduled.
- H. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- I. Inlet Damper: Motorized backdraft, aluminum multiple parallel blade construction, felt edged with nylon bearings.

2.3 SPUN ALUMINUM, ROOF MOUNTED, BELT DRIVEN, UPBLAST CENTRIFUGAL EXHAUST VENTILATOR

- A. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705). Fan shall bear the AMCA certified ratings seal for sound and air performance.
- B. Construction: The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have a one piece inlet spinning and continuously welded curb cap corners for maximum leak protection. A two piece top cap shall have stainless steel quick release latches to provide access into the motor compartment without the use of tools. An integral conduit chase shall be provided into the motor compartment to facilitate wiring connections. The motor, bearings and drives shall be mounted on a minimum 14 gauge steel power assembly, isolated from the unit structure with rubber vibration isolators. These components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. Lifting lugs shall be provided to help prevent damage from improper lifting. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.
- C. Wheel: Wheel shall be centrifugal backward inclined, constructed of 100 percent aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, *Balance Quality and Vibration Levels for Fans*.
- D. Motor: Motor shall be heavy duty type with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and enclosure.
- E. Bearings: Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball type in a cast iron pillow block housing selected for a minimum L50 life in excess of 200,000 hours at maximum catalogued operating speed.
- F. Belts & Drives: Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150 percent of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.
- G. Roof Curbs: 18 inch high galvanized steel with continuously welded seams, one inch insulation and curb bottom and factory installed door nailer strip. Curb shall be fabricated to accommodate roof pitch so fan is mounted on a horizontal level plain. Provide interior sound baffle for units where scheduled.
- H. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- I. Inlet Damper: Motorized backdraft, aluminum multiple parallel blade construction, felt edged with nylon bearings.

2.4 SPUN ALUMINUM, ROOF MOUNTED, BELT DRIVEN, UPBLAST HIGH PRESSURE CENTRIFUGAL EXHAUST VENTILATOR.

- A. Certifications: Fan shall be manufactured at an ISO 9001 certified facility. Fan shall be listed by Underwriters Laboratories (UL 762) and UL listed for Canada (Power Ventilator for Restaurant Exhaust Appliances). Fan shall bear the AMCA certified ratings seal for sound and air performance.
- B. Construction: The fan shall be of bolted and welded construction utilizing corrosion resistant fasteners. The spun aluminum structural components shall be constructed of minimum 16 gauge marine alloy aluminum, bolted to a rigid aluminum support structure. The aluminum base shall have a one piece inlet spinning and continuously welded curb cap corners for maximum leak protection. The windband shall have a rolled bead for added strength. A two piece top cap shall have stainless steel quick release latches to provide access into the motor compartment without the use of tools. An external wiring compartment with integral conduit chase shall be provided into the motor compartment to facilitate wiring connections. The motor, bearings and drives shall be mounted on a minimum 14 gauge steel power assembly. These components shall be enclosed in a weather-tight compartment, separated from the exhaust airstream. A one inch thick, three pound density foil back heat shield shall be utilized to protect the motor and drive components from excessive heat. Lifting lugs shall be provided to help prevent damage from improper lifting. Unit shall bear an engraved aluminum nameplate. Nameplate shall indicate design CFM, static pressure, and maximum fan RPM. Unit shall be shipped in ISTA certified transit tested packaging.
- C. Wheel: Wheel shall be centrifugal backward inclined, constructed of 100 percent aluminum, including a precision machined cast aluminum hub. Wheel inlet shall overlap an aerodynamic aluminum inlet cone to provide maximum performance and efficiency. Wheel shall be balanced in accordance with AMCA Standard 204-96, *Balance Quality and Vibration Levels for Fans*.
- D. Motor: Motor shall be heavy duty type with permanently lubricated sealed ball bearings and furnished at the specified voltage, phase and enclosure.
- E. Bearings: Bearings shall be designed and individually tested specifically for use in air handling applications. Construction shall be heavy duty regreasable ball type in a cast iron pillow block housing selected for a minimum L50 life in excess of 200,000 hours at maximum catalogued operating speed.
- F. Belts and Drives: Belts shall be oil and heat resistant, non-static type. Drives shall be precision machined cast iron type, keyed and securely attached to the wheel and motor shafts. Drives shall be sized for 150 percent of the installed motor horsepower. The variable pitch motor drive must be factory set to the specified fan RPM.
- G. Roof Curbs: 18 inch high galvanized steel with continuously welded seams, one inch insulation and curb bottom and factory installed door nailer strip. Curb shall be fabricated to accommodate roof pitch so fan is mounted on a horizontal level plain. Provide interior sound baffle for units where scheduled.

- H. Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor.
- I. Hinged Base: Welded hinged base with continuous piano hinge to provide access to fan inlet and interior ductwork.
- J. Grease Trough: Provide for collection of grease, including removable lid.
- K. Grease Terminator: Multi layer dual fiber, grease capture and containment system.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Secure roof exhaust fans with stainless steel lag screws to roof curb.
- C. Extend ducts to roof exhaust fans into roof curb. Counterflash duct to roof opening.
- D. Install flexible connections specified in Section 23 33 00 between fan inlet and ductwork (not applicable for roof mounted fans). Ensure metal bands of connectors are parallel with minimum one (1) inch flex between ductwork and fan while running.
- E. Provide sheaves required for final air balance.
- F. Do not operate fans for any purpose until ductwork is clean, bearings lubricated and fan has been test run under observation.

3.2 OWNER TRAINING BY INSTALLING CONTRACTOR

- A. At the completion of the project, the Installing Contractor shall provide training of Owner's staff. Training shall consist of on-site (hands on) training, which will show the location of all devices and the operation of all controls, devices, motors, etc. and maintenance and repair requirements. Prior to commencement of training, Contractor shall provide a minimum of two (2) hours of training for equipment provided under this Section of the contract.

END OF SECTION 233400

SECTION 233700 - AIR OUTLETS AND INLETS

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Diffusers.
- B. Registers/grilles.
- C. Louvers.
- D. Relief & Intake roof hoods.

1.2 REFERENCES

- A. ADC 1062 - Certification, Rating and Test Manual.
- B. AMCA 500 - Test Method for Louvers, Dampers and Shutters.
- C. ARI 650 - Air Outlets and Inlets.
- D. ASHRAE 70 - Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
- E. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.
- F. NFPA 70 - National Electrical Code.
- G. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.

1.3 SUBMITTALS

- A. Submit under provisions of the General Requirements.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.4 PROJECT RECORD DOCUMENTS

- A. Record actual locations of air outlets and inlets.

1.5 QUALITY ASSURANCE

- A. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
- B. Test and rate louver performance in accordance with AMCA 500.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Carnes.
- B. Krueger.
- C. Metalaire.
- D. Price.
- E. Titus.
- F. Tuttle and Baily.
- G. Owner Approved Equal.

2.2 ROUND CEILING DIFFUSERS

- A. Type: Round, adjustable pattern, stamped or spun diffuser to discharge air in 360 degree pattern, with sectorizing baffles where indicated. Diffuser collar shall project not more than one inch above ceiling. In plaster ceilings, provide plaster ring and ceiling plaque.
- B. Where indicated, the airflow discharge pattern shall be field adjustable from horizontal to vertical by extending or retracting the inner cones.
- C. Fabrication: 18 gauge steel with baked enamel finish selected by Architect.
- D. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.3 SQUARE/RECTANGULAR CEILING DIFFUSERS

- A. Type: Square, adjustable pattern, stamped, multi-core diffuser to discharge air in 360 degree pattern.
- B. Frame: Inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabrication: Steel with baked enamel finish selected by Architect.
- D. Accessories: Radial opposed blade damper and multi-louvered equalizing grid with damper adjustable from diffuser face.

2.4 ARCHITECTURAL SQUARE PANEL CEILING DIFFUSERS

- A. Architectural square panel ceiling diffusers shall be of the sizes and mounting types shown on the plans and outlet schedule.
- B. The diffuser shall have an 18 gauge steel face panel, which shall be a one piece assembly, removable by means of four positive locking posts. The exposed surface of the face panel shall be smooth, flat and free of visible fasteners. The face panel shall project 1/4" below the outside border of the diffuser back pan. Panels projecting more than 1/4" below the outside border are not acceptable.
- C. The back of the face panel shall have an aerodynamically shaped, rolled edge to ensure a tight horizontal discharge pattern. A single metal thickness on the edges of the face panel will not be accepted.
- D. Ceiling diffusers with 24" x 24" full face shall have no less than an 18" x 18" face panel size. Ceiling diffusers with a 12" x 12" full face shall have no less than 9" x 9" face panel size.
- E. The back pan shall be one piece precision die-stamped and shall include an integrally drawn inlet (welded-in inlets and corner joints are not acceptable).
- F. The diffuser back pan shall be constructed of 22 gauge steel. The diffuser neck shall have a minimum of 1-1/8" depth available for duct connection.
- G. The finish shall be aluminum colored paint as selected by the Architect. The finish shall be an anodic acrylic paint baked at 315 degrees F. for 30 minutes.
- H. The manufacturer shall provide published performance data for the square panel diffuser. The diffuser shall be tested in accordance with ANSI/ASHRAE Standard 70-1991.

2.5 SUPPLY REGISTERS/GRILLES

- A. Type: Aluminum border and individually adjustable blades, 3/4 inch blade spacing, single deflection.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.

- C. Factory baked enamel finish as selected by Architect.
- D. Damper: Aluminum opposed blade type, operable from face.

2.6 PERFORATED EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Steel or aluminum construction as scheduled.
- B. The face shall be perforated with 3/16" diameter holes to provide 51% free area.
- C. Factory baked enamel finish as selected by Architect.
- D. Damper: Steel or aluminum opposed blade.

2.7 RETURN GRILLES/REGISTERS

- A. Return grilles shall be 1/2" blade spacing with 0 degree fixed deflection blades. Blades shall be parallel to the long dimension of the grille or register.
- B. Construction shall be of steel or aluminum as scheduled with a 1-1/4" wide border on all sides. Screw holes shall be countersunk for a neat appearance.
- C. Deflection blades shall be contoured to a specifically designed and tested cross-section to meet published test data. Blades shall be firmly held in place by mullions from behind the grille and fixed in place by welding.
- D. The grille finish shall be baked anodic acrylic paint as selected by the Architect.
- E. Opposed blade volume damper shall be constructed of heavy gauge steel, operable from the face of the register.

2.8 WALL SUPPLY REGISTERS/GRILLES

- A. Type: Streamlined and individually adjustable air foil blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, horizontal face, double deflection.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- C. Fabrication: Steel with 20 gage minimum frame, with factory baked enamel finish selected by Architect.
- D. Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

2.9 HEAVY DUTY BAR RETURN GRILLES

- A. Type: Steel bar grilles, 1/2 inch blade spacing, 38 degree deflection.
- B. Frame: 1-1/4 inch margin with countersunk screw mounting.
- C. Fabrication: Steel bars with 14 gauge blades and 16 gauge borders with factory aluminum colored baked enamel finish as selected by the Architect.

2.10 LOUVERS

- A. Manufacturers:
 - 1. American Warming.
 - 2. Greenheck.
 - 3. Pottorff
 - 4. Ruskin Mfg.
 - 5. Vent Products.
 - 6. Owner Approved Equal.
- B. Type: 4 inch deep, drainable with blades on 37.5 degree slope with a drain gutter in each blade and downspouts in frame jambs and mullions, heavy channel frame, birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake.
- C. Fabrication: 12 gage thick extruded aluminum, welded assembly, with factory anodized finish, color to be selected by the Architect. Design shall incorporate structural supports required to withstand a wind load of 20 lbs. per sq. ft.
- D. Design Basis Performance (based on 48" x 48" Ruskin ELF6375DX):
 - 1. Free area: 55% minimum.
 - 2. Free area: 9.19 SF
 - 3. AMCA water penetration @ 1053 free area fpm: 0.01 oz/SF
 - 4. Pressure drop @ 1053 free area fpm: 0.18 in W.G.

2.11 ROOF HOODS

- A. Manufacturers:
 - 1. Cook.
 - 2. Carnes.
 - 3. Greenheck.
 - 4. Owner Approved Equal.
- B. Fabricate air inlet or exhaust hoods in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible.

- C. Fabricate of aluminum minimum 14 gage base and 14 gage hood; suitably reinforced; with hinged hood; birdscreen with 1/2 inch square mesh for exhaust and 3/4 inch for intake, and factory baked enamel finish. All vertical seams shall be continuously welded with lock formed seams on the hood ends. Hoods shall be stressed and sloped for drainage.
- D. Fabricate louver penthouses with mitered corners and reinforce with structural angles.
- E. Mount unit on minimum 18 inch high curb base with insulation between duct and curb.
- F. Make hood outlet area minimum of twice throat area.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- C. Install diffusers to ductwork with air tight connection.
- D. Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- E. Paint ductwork visible behind air outlets and inlets matte black.
- D. Backpaint louver frames with bituminous paint before installation.
- E. Secure louvers to wall openings with concealed cadmium plated or non-ferrous lag bolts 12 in. on center.
- F. Caulk louver frames watertight. Entire installation shall be watertight under all weather conditions.

END OF SECTION 233700

SECTION 234000 - AIR CLEANING DEVICES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Disposable panel filters.
- B. Filter frames.
- C. Filter gages.

1.2 REFERENCES

- A. ARI 850 - Commercial and Industrial Air Filter Equipment.
- B. ASHRAE 52 - Method of Testing Air Cleaning Devices Used in General Ventilation for Removing Particulate Matter.
- C. UL 900 - Test Performance of Air Filter Units.

1.3 PERFORMANCE TOLERANCES

- A. Conform to ARI 850 Section 7.4.
- B. Dust Spot Efficiency: Plus or minus 5 percent.

1.4 SUBMITTALS

- A. Submit under provisions of the general conditions and general requirements of the contract.
- B. Shop Drawings: Indicate filter assembly and filter frames, dimensions, motor locations, and electrical characteristics and connection requirements.
- C. Product Data: Provide data on filter media, filter performance data, filter assembly and filter frames, dimensions, motor locations and electrical characteristics and connection requirements.
- D. Manufacturer's Installation Instructions: Indicate assembly and change-out procedures.

1.5 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of the general conditions and general requirements of the contract.
- B. Operation and Maintenance Data: Include instructions for operation, changing, and periodic cleaning.

1.6 EXTRA MATERIALS

- A. Panel Filters:
 - 1. Provide one set of construction filters
 - 2. Provide one set of additional filters for occupancy.
 - 3. Provide two sets of attic stock filters.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. PANEL FILTERS
 - 1. American Air Filter.
 - 2. Tri-Dem.
 - 3. Farr.
 - 4. Cambridge
 - 5. Owner approved equal.

2.2 DISPOSABLE PANEL FILTERS

- A. Media: UL 900 Class 2, fiber blanket, factory sprayed with flameproof, non-drip, non-volatile adhesive, 30% efficient.
 - 1. Nominal Size: 12 x 24 inches or 24 x 24 inches.
 - 2. Thickness: 2 inch.
- B. Performance Rating:
 - 1. Face Velocity: 500 FPM.
 - 2. Initial Resistance: 0.15 inch WG.
 - 3. Recommended Final Resistance: 0.50 inches WG.
- C. Casing: Cardboard frame with perforated metal retainer.

2.3 FILTER FRAMES AND HOUSINGS

- A. General: Fabricate filter frames and supporting structures of 16 gage galvanized steel or extruded aluminum T-section construction with necessary gasketing between frames and walls.
- B. Standard Sizes: Provide for interchangeability of filter media of other manufacturers; for panel filters, size for 24 x 24 inches filter media, minimum 2 inches thick; for extended surface and high efficiency particulate air filters, provide for upstream mounting of panel filters.

2.4 FILTER GAGES

- A. Direct Reading Dial: 3-1/2 inch diameter magnahelic dial in metal case, vent valves, black figures on white background, front recalibration adjustment, range 0 – 3.0 inch WG, 3 percent of full scale accuracy.
- B. Accessories: Static pressure tips with integral compression fittings, 1/4 inch aluminum tubing, 2-way or 3-way vent valves.

PART 3 EXECUTION

3.1 FIELD INSTALLATION

- A. Install air-cleaning devices in accordance with manufacturer's instructions.
- B. Pleated Filters Only: Install filter gage static pressure tips upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum, in accessible position. Adjust and level.
- C. Do not operate fan system until filters (temporary and permanent) are in place. Pleated Filters Only: Replace temporary filters used during construction and testing, and replace with clean set.
- D. Provide filter gages on filter banks, installed with separate static pressure tips upstream and downstream of filters.
- E. All equipment being installed under this contract that utilizes air filter shall have new filter of this type furnished and installed after start-up. Provide an extra set of filters (attic stock) for each of the following:
 - 1. Rooftop units.
 - 2. Cabinet unit heaters.

END OF SECTION 234000

SECTION 236100 - REFRIGERANT PIPING AND SPECIALTIES

PART 1 GENERAL

1.1 WORK INCLUDED

- A. Piping.
- B. Refrigerant.
- C. Moisture and liquid indicators.
- D. Valves.
- E. Strainers.
- F. Check valves.
- G. Pressure relief valves.
- H. Filter-driers.
- I. Solenoid valves.
- J. Expansion valves.
- K. Receivers.
- L. Flexible connections.

1.2 RELATED SECTIONS

- A. Section 23 07 01 – Piping Insulation.
- B. Section 23 09 13 – HVAC Instrumentation and Controls.
- C. Section 23 09 93 – Sequence of Operation.
- D. Section 23 82 10 – Air Cooled Condensing Units.

1.3 REFERENCES

- A. ANSI/ARI 495 - Refrigerant Liquid Receivers.
- B. ANSI/ARI 710 - Liquid Line Dryers.
- C. ANSI/ARI 750 - Thermostatic Refrigerant Expansion Valves.
- D. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.
- E. ANSI/ASHRAE 34 - Number Designation of Refrigerants.
- F. ANSI/ASME B16.22 - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- G. ANSI/ASME B16.26 - Cast Copper Alloy Fittings For Flared Copper Tubes.
- H. ANSI/ASME B31.5 - Refrigeration Piping.
- I. ANSI/ASTM B88 - Seamless Copper Water Tube.
- J. ANSI/ASME B32 - Solder Metal.
- K. ASTM B280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- L. ANSI/AWS A5.8 - Brazing Filler Metal.
- M. ANSI/AWS D1.1 - Structural Welding Code, Steel.
- N. UL 429 - Electrically Operated Valves.

1.4 SYSTEM DESCRIPTION

- A. Where more than one piping system material is specified ensure system components are compatible and joined to ensure the integrity of the system is not jeopardized. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- B. Provide pipe hangers and supports in accordance with ASTM B31.5 and Section 23 05 29.
- C. Liquid Indicators:
 - 1. Use line size liquid indicators in main liquid line leaving condenser.
 - 2. If receiver is provided, install in liquid line leaving receiver.
 - 3. Use line size on leaving side of liquid solenoid valves.

D. Valves

1. Use service valves on suction and discharge of compressors.
2. Use gage taps at compressor inlet and outlet.
3. Use gage taps at hot gas bypass regulators, inlet and outlet.
4. Use check valves on compressor discharge.
5. Use check valves on condenser liquid lines on multiple condenser systems.

E. Refrigerant Charging Packed Angle Valve: Use in liquid line between receiver shut-off valve and expansion valve.

F. Strainers:

1. Use line size strainer upstream of each automatic valve.
2. Where multiple expansion valves with integral strainers are used, use single main liquid line strainer.
3. On steel piping systems, use strainer in suction line.
4. Use shut-off valve on each side of strainer.

G. Pressure Relief Valves: Use on ASME receivers and pipe to outdoors.

H. Permanent Filter-Driers:

1. Use in low temperature systems.
2. Use in systems utilizing hermetic compressors.
3. Use filter-driers for each solenoid valve.

I. Replaceable Cartridge Filter-Driers:

1. Use vertically in liquid line adjacent to receivers.
2. Use filter-driers for each solenoid valve.

J. Solenoid Valves:

1. Use in liquid line of systems operating with single pump-out or pump-down compressor control.
2. Use in liquid line of single or multiple evaporator systems.
3. Use in oil bleeder lines from flooded evaporators to stop flow of oil and refrigerant into the suction line when system shuts down.

K. Receivers:

1. Use on systems 5 tons and larger, sized to accommodate pump down charge.
2. Use on systems with long piping runs.

L. Flexible Connectors: Utilize at or near compressors where piping configuration does not absorb vibration.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirements.
- B. Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
- C. Contractor shall review all shop drawings prior to submitting them for Architect/ Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that contractor has not stamped with his review certification.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit under provisions of the General Requirements.
- B. Maintenance Data: Include instructions for changing cartridges, assembly views, spare parts lists.

1.7 REGULATORY REQUIREMENTS

- A. Conform to ANSI/ASME B31.5 for installation of piping system.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, protect and handle products to site under the General Requirements.
- B. Deliver and store piping and specialties in shipping containers with labeling in place.
- C. Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- D. Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

PART 2 PRODUCTS

2.1 PIPING

- A. Copper Tubing: ASTM B280, Type ACR hard drawn or annealed.
 - 1. Fittings: ANSI/ASME B16.22 wrought copper.
 - 2. Joints: Braze, AWS A5.8 BCuP silver/phosphorus/copper alloy with melting range 1190 to 1480 degree F.

B. Copper Tubing to 7/8 inch OD: ANSI/ASTM B88, Type K, annealed.

1. Fittings: ANSI/ASME B16.26 cast copper.
2. Joints: Flared.

2.2 MOISTURE AND LIQUID INDICATORS

A. Indicators: Single port type, UL listed, with copper or brass body, flared or solder ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum working pressure of 500 psig, and maximum temperature of 200 degrees F.

2.3 VALVES

A. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, solder or flared ends, with positive backseating; for maximum working pressure of 500 psig and maximum temperature of 275 degrees F.

B. Packed Angle Valves:

1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, solder or flared ends; for maximum working pressure of 500 psig and maximum temperature of 275 degrees F.

C. Service Valves:

1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or solder ends, for maximum pressure of 500 psig.

2.4 FILTER-DRIERS

A. Replaceable Cartridge Angle Type:

1. Shell: ARI 710, UL listed, brass, removable cap, for maximum working pressure of 350 psig.

2.5 SOLENOID VALVES

A. Valve: ARI 760, pilot operated, copper or brass body and internal parts, synthetic seat, stainless steel stem and plunger assembly, with flared, solder, or threaded ends; for maximum working pressure of 500 psig. Stem shall permit manual operation in case of coil failure.

B. Coil Assembly: UL listed, replaceable with molded electromagnetic coil, moisture and fungus proof, with surge protector and color coded lead wires, integral junction box.

PART 3 EXECUTION

3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- A. Install refrigeration piping and specialties in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and not interfere with use of space.
- D. Group piping whenever practical at common elevations and locations. Slope piping one percent in direction of oil return.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Inserts: Refer to Section 23 05 29.
- G. Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- H. Provide clearance for installation of insulation and access to valves and fittings.
- I. Provide access to concealed valves and fittings.
- J. Flood piping system with nitrogen when brazing.
- K. Where pipe support members are welded to structural building frame, brush clean, and apply one coat of zinc rich primer to welding.
- L. Prepare unfinished pipe, fittings, supports, and accessories ready for finish painting.
- M. Insulate piping and equipment; refer to Section 23 07 01.

- N. Follow ASHRAE 15 procedures for charging and purging of systems and for disposal of refrigerant.
- O. Provide replaceable cartridge filter-driers, with isolation valves and valved bypass.
- P. Locate expansion valve sensing bulb immediately downstream of evaporator on suction line.
- Q. Provide external equalizer piping on expansion valves with refrigerant distributor connected to evaporator.
- R. Install flexible connectors at right angles to axial movement of compressor, parallel to crankshaft.
- S. Fully charge completed system with refrigerant after testing.
- T. Provide electrical connection to solenoid valves.

3.3 FIELD QUALITY CONTROL

- A. Test refrigeration system in accordance with ASME B31.5.
- B. Pressure test system with dry nitrogen to 300 psig. Perform final tests at 27 inches vacuum and 300 psig using electronic leak detector. Test to no leakage.

3.4 REFRIGERATION PIPING DESIGN

- A. All refrigeration piping shall be designed by the mechanical contractor based on ASHRAE recommended guidelines and the following:
 - 1. Size liquid piping for a maximum 6.0 PSI pressure drop and maximum velocity of 360 FPM.
 - 2. Size suction lines for maximum 2.0 PSI pressure drop at full load. At the lowest stage of unloading/compressor operation; design to minimum velocities of 500 FPM in horizontal lines and 1000 FPM in vertical lines: Install traps at the base of all suction risers and provide double suction risers if required.
 - 3. Size hot gas lines for maximum 6.0 PSI pressure drop at full load. At the lowest stage of unloading/compressor operation; design to minimum velocities of 500 FPM in horizontal lines and 1000 FPM in vertical lines: Install traps at the base of all hot gas risers and provide double risers if required.
- B. Submit dimensioned shop drawings of all refrigeration piping to the engineer for review prior to fabrication.

3.5 REQUIRED COMPONENTS

A. Furnish and install a minimum of the following components for each refrigeration circuit:

1. Filter Dryer
2. Sight Glass / Moisture Indicator
3. Pressure relief valve.
4. Isolation valves at indoor and outdoor units.

B. Verify all requirements with equipment manufacturers.

END OF SECTION 236100

SECTION 237413 - PACKAGE ROOFTOP AIR CONDITIONING UNITS

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Package roof top unit.
- B. Heat Exchanger
- C. Refrigeration components.
- D. Variable Frequency Drive
- E. Unit operating controls.
- F. Roof mounting curb and base.
- G. Electrical power connections.

1.2 RELATED SECTIONS

- A. Section 23 09 13 – HVAC Instrumentation and Controls.
- B. Section 23 09 93 – Sequence of Operation.
- C. Section 23 11 26 – Fuel Piping.
- D. Section 23 31 00 – Ductwork.
- E. Section 23 40 00 – Air Cleaning Devices.

1.3 REFERENCES

- A. NFPA 90 A & B - Installation of Air Conditioning and Ventilation Systems and Installation of Warm Air Heating and Air Conditioning Systems.
- B. ANSI/ASHRAE 15 - Safety Code for Mechanical Refrigeration.
- C. ARI 360 - Commercial and Industrial Unitary Air Conditioning Equipment testing and rating standard.
- D. ANSI/ASHRAE 37 - Testing Unitary Air Conditioning and Heat Pump Equipment.

- E. ANSI/ASHRAE/IESNA 90.1-1999 - Energy Standard for New Buildings Except Low-Rise Residential Buildings.
- F. ANSI Z21.47/UL1995 - Unitary Air Conditioning Standard for safety requirements.
- G. California Energy Commission Administrative Code - Title 20/24 - Establishes the minimum efficiency requirements for HVAC equipment installed in new buildings in the State of California.
- H. ARI 210/240 - Unitary Air-Conditioning Equipment and Air- Source Heat Pump Equipment.
- I. ARI 270 - Sound Rating of Outdoor Unitary Equipment.
- J. ARI 370 - Sound Rating of Large Outdoor Refrigerating and Air Conditioning Equipment.
- K. ANSI/NFPA 70 - National Electric Code.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum five years experience.

1.5 SUBMITTALS

- A. Submit unit performance data including: capacity, nominal and operating performance.
- B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.
- C. Submit shop drawings indicating overall dimensions as well as installation, operation and services clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.
- D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.
- E. Shop drawings submitted for approval shall be accompanied by a copy of the purchase agreement between the Contractor and an authorized service representative of the manufacturer for check, test and start up and first year service.

1.6 DELIVERY, STORAGE AND PROTECTION

- A. Store and protect products under provisions of the General Requirements.
- B. Deliver and store unit in shipping containers with labeling in place.
- C. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building, it must be stored off the ground a minimum of six inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visquin. All piping will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and is completely protected with weatherproof covers.

1.7 WARRANTY

- A. Provide parts warranty for one year for parts and labor from start-up of equipment.
- B. Provide five year (parts only) extended warranty for compressors.
- C. Provide ten-year (parts only) heat exchanger limited warranty.

1.8 REGULATORY REQUIREMENTS

- A. Products requiring electrical connection: Listed and classified by Underwriters' Laboratories, Inc., as suitable for the purpose specified and indicated.
- B. Conform to International Mechanical Code.

1.9 EXTRA MATERIALS

- A. General conditions: - contract closeout.
- B. Provide two (2) sets of filters per unit.
- C. See Section 23 40 00 – Air cleaning devices for additional requirements.

PART 2 PRODUCTS

2.1 SUMMARY

- A. The contractor shall furnish and install package rooftop units as shown and scheduled on the contract documents. The units shall be installed in accordance with this specification and perform at the specified conditions as scheduled.

B. Approved Manufacturers

1. Aaon.
2. Carrier
3. McQuay
4. Trane
5. York
6. Owner Approved Equal

2.2 EQUIPMENT

A. General: Factory assembled, single-piece heating and cooling unit. Contained within the unit enclosure shall be all factory wiring, piping, controls, refrigerant charge (R-410A), and special features required prior to field start-up. Cooling capacity ratings shall be based on ARI Standard 210. Units shall consist of insulated weather-tight casing.

B. Unit Cabinet:

1. All cabinet walls, access doors, and roof shall be fabricated of double wall, impact resistant, rigid polyurethane foam panels.
2. Unit insulation shall have a minimum thermal resistance R-value of 13. Foam insulation shall have a minimum density of 2 pounds/cubic foot and shall be tested in accordance with ASTM D1929-11 for a minimum flash ignition temperature of 610°F.
3. Unit construction shall be double wall with G90 galvanized steel on both sides and a thermal break. Double wall construction with a thermal break prevents moisture accumulation on the insulation, provides a cleanable interior, prevents heat transfer through the panel, and prevents exterior condensation on the panel.
4. Unit shall be designed to reduce air leakage and infiltration through the cabinet. Cabinet leakage shall not exceed 1% of total airflow when tested at 3 times the minimum external static pressure provided in AHRI Standard 340/360. Panel deflection shall not exceed L/240 ratio at 125% of design static pressure, at a maximum 8 inches of positive or negative static pressure, to reduce air leakage. Deflection shall be measured at the midpoint of the panel height and width. Continuous sealing shall be included between panels and between access doors and openings to reduce air leakage. Piping and electrical conduit through cabinet panels shall include sealing to reduce air leakage.
5. Roof of the air tunnel shall be sloped to provide complete drainage. Cabinet shall have rain break overhangs above access doors.
6. Access to filters, dampers, cooling coils, heaters, exhaust fans, energy recovery wheels, compressors, and electrical and controls components shall be through hinged access doors with quarter turn, zinc cast, lockable handles. Full length stainless steel piano hinges shall be included on the doors.
7. Exterior paint finish shall be capable of withstanding at least 2,500 hours, with no visible corrosive effects, when tested in a salt spray and fog atmosphere in accordance with ASTM B 117-95 test procedure.

8. Units with cooling coils shall include double sloped 304 stainless steel drain pans.
9. Unit shall be provided with base discharge and return air openings. All openings through the base pan of the unit shall have upturned flanges of at least 1/2 inch in height around the opening.
10. Unit shall include lifting lugs on the top of the unit.
11. Unit base shall be fabricated of 1 inch thick double wall, impact resistant, rigid polyurethane foam panels.

C. Fans:

1. Evaporator Fan:

- a. Fan shall be direct drive.
 - b. Fan wheel shall be double-inlet type with forward-curved blades.
 - c. Bearings shall be sealed, permanently lubricated ball-bearing type for longer life and lower maintenance.
2. Evaporator fan shall be made from steel with a corrosion-resistant finish and shall be dynamically balanced.
 3. Condenser fan shall be of the direct-driven (with totally enclosed motors) propeller type and shall discharge air vertically.
 4. Condenser fan shall have aluminum blades riveted to corrosion-resistant steel spiders and shall be dynamically balanced.
 5. Induced-draft blower shall be of the direct-driven, single inlet, forward-curved centrifugal type, made from steel with a corrosion-resistant finish and shall be dynamically balanced.

D. Compressor(s):

1. Digital scroll-type.
2. Factory mounted on rubber grommets and internally spring mounted for vibration isolation.
3. On dual compressor units, electrically and mechanically independent circuits.

E. Coils:

1. Standard evaporator and condenser coils shall have aluminum lanced plate fins mechanically bonded to seamless internally grooved copper tubes with all joints brazed.
2. Dual compressor models shall have face-split type evaporator coil (circuit no. 1 on bottom).
3. Testing:
 - a. Evaporator and condenser coils shall be qualified to UL 1995 burst test at 2,200 psi.
 - b. Evaporator and condenser coils shall be leak-tested to 150 psig and pressure tested to 400 psig.

F. Refrigerant Components:

1. Refrigerant circuit components shall include:
 - a. Fixed orifice metering system.
 - b. Refrigerant filter drier.
 - c. Service gage connections on suction, discharge, and liquid lines.

G. Filter Section:

1. Standard filter section shall consist of factory-installed, low velocity, throwaway 2-in. thick fiberglass filters of commercially available sizes.
2. Filter face velocity shall not exceed 320 fpm at nominal airflows.
3. Filter section should use only one size filter.
4. Filters shall be accessible through an access panel with "no-tool" removal.
5. See Section 23 40 00 – Air Cleaning Devices for additional requirements.

H. Convenience Outlet

1. Factory installed, 115 volt, 15 amp, GFI Type, internally mounted factory wired to separate transformer internal to unit.
2. Outlet to be wired separately from RTU to allow operation when RTU is fused off.

I. Controls and Safeties:

1. Unit Controls:

- a. Unit shall be complete with self-contained low-voltage control circuit protected by a fuse on the 24-v transformer side.

2. Safeties:

- a. Unit shall incorporate a solid-state compressor protector which provides anti-cycle reset capability at the space thermostat, should any of the following standard safety devices trip and shut off compressor.

- 1) Compressor over temperature, over current.
- 2) Loss-of-charge/low-pressure switch.
- 3) Freeze-protection thermostat, evaporator coil.
- 4) High-pressure switch.
- 5) Automatic reset motor thermal overload protector.

The lockout protection shall be easily disconnected at the control board, if necessary.

- b. Heating section shall be provided with the following minimum protections:

- 1) High-temperature limit switches.
- 2) Induced draft motor speed sensor.
- 3) Flame rollout switch.
- 4) Flame proving controls.

J. Operating Characteristics:

1. Unit shall be capable of starting and running at 125 F ambient outdoor temperature, meeting maximum load criteria of ARI Standard 210/240 or 360 at $\pm 10\%$ voltage.
2. Compressor with standard controls shall be capable of operation down to 25 F ambient outdoor temperature.

K. Electrical Requirements:

1. All unit power wiring shall enter unit cabinet at a single factory-predrilled location.

L. Motors:

1. Compressor motors shall be cooled by refrigerant gas passing through motor windings and shall have line break thermal and current overload protection.
2. Evaporator-fan motor shall have permanently lubricated bearings and inherent automatic-reset thermal overload protection.
3. Totally enclosed condenser-fan motor shall have permanently lubricated bearings, and inherent automatic-reset thermal overload protection.
4. Induced-draft motor shall have permanently lubricated sealed bearings and inherent automatic-reset thermal overload protection.

M. Accessories:

1. Roof Curbs:

- a. 18" high roof curb. Formed galvanized steel with wood nailer strip and shall be capable of supporting entire unit weight.
- b. Permits installation and securing of ductwork to curb prior to mounting unit on the curb.

2. Integrated Economizers:

- a. Integrated integral modulating type capable of simultaneous economizer and compressor operation. During economizer operation, up to two compressors will operate.
- b. Includes all hardware and controls to provide cooling with outdoor air.
- c. Equipped with low-leakage dampers, not to exceed 2% leakage at 1 in. wg pressure differential.
- d. Capable of introducing up to 100% outdoor air.
- e. Designed to close damper(s) during loss-of-power situations with spring return built into motor.
- f. The Economizer shall have a gear-driven parallel blade design.

3. Variable Frequency Drive:

- a. Factory mounted and tested, see section 23 09 95 Variable Frequency Speed Control.

N. Unit-Mounted, Non-Fused Disconnect Switch:

1. Switch shall be factory-installed, internally mounted. NEC and UL approved non-fused switch shall provide unit power shutoff. Switch shall be accessible from outside the unit and shall provide power off lockout capability.

O. High-Static Indoor Fan Motor(s) and Drive(s):

1. High-static motor(s) and drive(s) shall be factory-installed to provide additional performance range as noted on schedule.

P. Condenser Coil Grille:

1. The grille protects the condenser coil from damage by large objects without increasing unit clearances.

Q. Power Exhaust Economizer:

1. Power exhaust shall be used in conjunction with economizer to provide system exhaust. The power exhaust shall be a factory installed with VFD for building pressure control.

R. Manufacturer shall include an interface to allow for control of rooftop unit by the Owner's Building Automation System.

S. Include programmable seven-day remote wall mounted thermostat to control unit.

T. Gas Fired Heating Section:

1. Completely assembled and factory installed heating system shall be integral to unit, UL or CSA approved specifically for outdoor applications for use downstream from refrigerant cooling coils. Threaded connection with plug or cap provided. Provide capability for gas piping through the side of the unit..
2. Heating section shall be factory run tested prior to shipment.
3. Gas Burner shall be forced combustion type power burner, negative pressure gas valve, manual shut-off, hot surface ignition, and flame sensing safety control.
4. Gas Burner Safety Controls: Provide safety controls for the proving of combustion air prior to ignition, and continuous flame supervision. Upon a failure to ignite, two attempts of ignition will occur before lockout of the ignition system.
5. Combustion blower shall be centrifugal type fan with built- in thermal overload protection on fan motor.
6. Heat Exchanger: Stainless steel, factory pressure and leak tested.
7. Limit controls: High temperature limit controls will shut off gas flow in the event of excessive temperatures resulting from restricted indoor airflow or loss of indoor airflow.

U. OPERATING CONTROLS

1. Provide factory-wired roof top units with 24 volt control circuit with control transformers, contactor pressure lugs or terminal block for power wiring. Contractor to provide field-installed unit-mounted disconnect switch. Units shall have single point power connections. Field wiring of zone controls to be NEC Class II.
2. Provide microprocessor unit-mounted control which when used with an electronic zone sensor provides proportional integral room control. This UCM shall perform all unit functions by making all heating, cooling and ventilating decisions through resident software logic.
3. Provide factory-installed indoor evaporator defrost control to prevent compressor slugging by interrupting compressor operation.

4. Provide an anti-cycle timing and minimum on/off between stages timing in the microprocessor.
5. Economizer Preferred Cooling (if supplied with economizer) - Compressor operation is integrated with economizer cycle to allow mechanical cooling when economizer is not adequate to satisfy zone requirements. Compressors are enabled if space temperature is recovering to cooling setpoint at a rate of less than 0.2 degrees per minute. Compressor low ambient lockout overrides this function.

V. Unit Controls:

1. Provide microprocessor-based controls for operation and diagnostics of all equipment functions including, but not limited to:
 - a. Fan Start/Stop
 - b. Heating Modulation
 - c. Compressor Sequencing
 - d. Economizer
 - e. Space Temperature Control
 - f. CO₂ Control Capability
2. Control Functions: Include unit scheduling, occupied/unoccupied mode, start-up and coast-down modes, nighttime free-cool purge mode, demand limiting, night setback, discharge air set point adjustment, timed override and alarm shutdown.
3. Provide capabilities for Boolean Processing and trend logs as well as “templated” reports and logs.

W. Building Management System:

1. Provide controller to match Owner’s control system, for BAS contractor to provide setpoints and monitor unit temperatures, statuses and alarms as follows:
 - a. Unit enabled
 - b. Unit disabled
 - c. Unit occupied
 - d. Unit unoccupied
 - e. Fan Status
 - f. Dirty Filter
 - g. Space Temperature
 - h. Space Temperature Setpoint
 - i. Discharge Air Temperature
 - j. Compressor Status (each)
 - k. Economizer Status
 - l. Minimum OA Setoint
2. RTU manufacture shall provide a SNVT list to the controls contractor for interface when requested by the controls contractor.
3. RTU manufacturer to provide one (1) site visit for assisting controls contractors with interface requirements.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Contractor shall verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Contractor shall verify that proper power supply is available.

3.2 INSTALLATION

- A. Contractor shall install in accordance with manufacturer's instructions.
- B. Mount units on factory built roof-mounting frame providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems.
- B. Provide initial start-up and shutdown during first year of operation, including routine servicing and checkout.

3.4 OWNER TRAINING BY INSTALLING CONTRACTOR

- A. At the completion of the project, the Installing Contractor shall provide training of Owner's staff. Training shall consist of on-site (hands-on) training which will show the location of all devices and the operation of all controls, devices, motors, etc. and maintenance and repair requirements. Prior to commencement of training, contractor shall provide Architect with a schedule of dates, times and agenda for each training session. Contractor shall provide a minimum of two (2) hours of training for equipment provided under this Section of the contract.

END OF SECTION 237413

SECTION 237423 - PACKAGED ROOFTOP MAKE-UP AIR UNITS FOR KITCHEN

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. An indirect-fired gas heating and ventilating unit, as indicated on the drawings shall be furnished. Orientation shall be horizontal (Down) or (side/front) discharge. Unit shall be factory assembled, tested and shipped as a complete package assembly, for outdoor mounting, consisting of the following:
 - 1. Gas furnace;
 - 2. Centrifugal blower (forward-curved double width/double inlet)
 - 3. Variable Frequency Drive
 - 4. Motor starter with thermal overload protection;
 - 5. Motor and drive assembly;
 - 6. Fuel burning and safety equipment;
 - 7. Temperature control system.
 - 8. Filters.

1.2 RELATED SECTIONS

- A. Section 23 09 13 – HVAC Instrumentation and Controls.
- B. Section 23 09 93 – Sequence of Operation.
- C. Section 23 11 26 – Fuel Piping.
- D. Section 23 31 00 – Ductwork.
- E. Section 23 40 00 – Air Cleaning Devices

1.3 REFERENCES

- A. American National Standards Institute/American Society of Heating, Refrigerating and Air Conditioning Engineers, ANSI/ASHRAE.
 - 1. ANSI/ASHRAE 90A; Energy Conservation in New Building Design.
- B. American National Standards Institute/National Fire Protection Association; ANSI/NFPA:
 - 1. ANSI/NFPA 54: National Fuel Gas Code.

C. National Fire Protection Association, NFPA:

1. NFPA 90A: Installation of Air Conditioning and Ventilating Systems.

D. Unit(s) assembly shall be tested in accordance with Standard, ANSI Z83.8-2006 and CSA 2.6-2006 and shall bear the ETL label. The duct furnace shall be certified by the American Gas Association and approved by the Canadian Gas Association.

E. International Mechanical Code.

1.4 SUBMITTALS FOR REVIEW

A. Submit under provisions of the General Requirements.

B. Shop Drawings: Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

C. Product Data: Provide capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.

D. Submit manufacturer's installation instructions. Indicate assembly, support details, connection requirements, and include start-up instructions.

1.5 OPERATION AND MAINTENANCE DATA

A. Submit under provisions of the General Requirements.

B. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.

C. The equipment manufacturer's bid/proposal shall include start-up services, Owner's schooling, operating manuals and warranty for parts and labor on equipment only. All other warranty services are by the installing contractor.

1.6 WARRANTY

A. Provide one (1) year warranty on all parts and labor associated with the purchase and installation of packaged kitchen ventilation unit from time of start-up. 10 years on heat exchanger.

1.7 EXTRA MATERIALS

A. Provide two additional set of filters. One set during construction and two sets for occupancy.

1.8 CONTRACTOR'S RESPONSIBILITY TO VERIFY ELECTRICAL REQUIREMENTS

- A. The mechanical and electrical drawings are coordinated based on the equipment scheduled on the drawings. The mechanical contractor shall verify and determine if electrical requirements for equal or substituted equipment are compatible with the electrical system shown on the plans. The mechanical contractor shall coordinate and pay for any electrical design and installation modifications required for the substituted equipment; at no additional cost to the Owner.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Aeon
B. McQuay
C. York
D. Owner Approved Equal

2.2 ROOFTOP HEATING AND VENTILATING KITCHEN HOOD MAKE UP AIR UNITS

- A. Housing
1. Unit housing shall be double wall constructed of 20 Gauge G-90 galvanized steel. The wall panels and roof panels shall be fabricated by forming double-standing, self-locking seams that require no additional support. The floor and wall panels shall be caulked air tight with a silicone caulk. All casing panels shall be attached with sheet-metal, screws or rivets which can be removed to field service large components. The unit base shall be suitable for curb or flat mount. The base shall be constructed of galvanized steel for improved rigidity. Base shall be structurally reinforced to accommodate the blower assembly and burner. Housing construction should be suitable for outdoor or indoor installation.
 2. An observation port shall be located on the furnace for observation of the main flame and pilot flame. All controls, gas valves, modulating controls and electrical components shall be mounted within the, burner vestibule. The burner vestibule shall be an integral part of the unit and not extend outside the exterior casing of the unit and not exposed to the main air stream.
 3. The vestibule full-size door shall provide easy access to controls and gas-train components. Blower door shall provide easy access to blower, motor and drives. Access doors shall be provided on both front and back side of unit providing full access to every part of the unit.
 4. The unit shall have a duct connection(s) with an area equal to or greater than that of the total area of all exhaust flues for the introduction of dedicated combustion air to the burner vestibule.

5. Outdoor unit shall be provided with high wind rain caps and be installed at the termination of the furnace discharge flues.
6. All gas valves and electrical safety-limits shall be mounted within the burner vestibule; wiring to these components shall be properly secured and away from all high temperature metal surfaces. The burner vestibule shall be an integral part of the unit and not extend outside the exterior casing of the unit and not exposed to the main air stream.
7. All furnace exhaust flues shall be of double-wall construction. All furnace exhaust flue connections and roof-penetration seams shall be sealed with High-Temp Fire-Barrier 2000+ type silicone caulking.
8. All electrical controls on the control board shall be mounted in an isolated, fully enclosed and insulated vestibule, completely separated from any combustion air, but accessible for servicing needs.
9. All doors shall be double wall 2" thick insulated.

B. Base

1. The base shall be constructed of galvanized steel for improved rigidity. Base shall be structurally reinforced to accommodate the blower assembly and burner.

C. Blower

1. Blower(s) shall be forward-curved, centrifugal, Class I or II, (depending on requirements of the application) double width, double inlet, constructed G-90 galvanized steel. Unit shall have a heavy-duty, solid-steel shaft. Wheels shall be balanced in two planes and done in accordance with AMCA standard 204-96, Balance Quality and Vibration Levels for Fans. The wheel blades shall be aerodynamically designed to minimize turbulence, increase efficiency and reduce noise. The wheel blades shall be securely attached to the wheel inlet ring. The wheel shall be firmly attached to the fan shaft with set screws and keys. The blower assembly shall be isolated from the fan structure with vibration isolators.
2. Blower capacity shall be CFM listed on schedules and drawings at 70 degrees F standard air for external static pressure listed on schedules and drawings.
3. External Static (ESP): The sum of duct loss plus duct component static- Example: louvers, diffusers. All blowers shall be tested and set at rated speed after being installed in the factory-assembled unit.

D. Motor and Motor Compartment

1. Motors shall be heavy-duty ball bearing type and furnished at the specified voltage, phase and enclosure. Motor mounting plate shall be constructed of heavy gauge galvanized steel and shall be designed to provide easy adjustment of belt tension.

E. Variable Frequency Drive

1. Factory mounted and tested, see section 23 09 95 Variable Frequency Speed Control.

F. Shafts and Bearings

1. Shafts shall be precision ground and polished. Heavy duty, pre-lubricated bearings shall be selected for a minimum (L50) life in excess of 200,000 hours of operation at maximum cataloged operating speed. They shall be designed for, and individually tested specifically for use in air handling applications.

G. Burner

1. Gas Burner: Stainless steel die-formed forced draft type burner with electronic modulation, adjustable combustion air supply, pressure regulator, gas valves, manual shut-off, direct-spark or glow coil ignition, flame sensing device, and automatic 100 percent shut-off pilot. In addition to standard gas train, manifold arrangement to include main gas high and low pressure switches, pilot gas high pressure switch, manual main and pilot shutoff valves, main and pilot line safety solenoid valves and a remote console with special alarm bell and push button alarm silencing.
2. Gas Burner Safety Controls: Hot surface ignition, limit time for establishment of flame, prevent opening of gas valve until pilot flame is proven, stop gas flow on ignition failure, energize blower motor, and after air flow proven and slight delay, allow gas valve to open.
3. High Limit Control: Temperature sensor with fixed stop at maximum permissible setting, de-energize burner on excessive bonnet temperature and energize burner when temperature drops to lower safe value.

Each Furnace shall have:

- a. A minimum turndown ratio of 10:1 for natural gas.
- b. Furnace heat exchanger shall be a bent-tube style design made entirely of type 409 stainless steel.
- c. Each furnace shall include a blocked vent safety airflow switch with high temperature silicone tubing operating off of absolute pressure measured inside of the power-vent blower housing.
- d. Each furnace shall include a high temperature auto-recycling limit with a maximum non-adjustable set-point of 200F.
- e. Each furnace shall include a manual reset high temperature flame roll out switch with a non-adjustable set-point of 325F.
- f. Each Furnace shall be accessible from both sides of unit.
- g. Each Furnace shall include a power-vent assembly for exhausting flue gases with a type PSC type motor that is securely mounted with rubber vibration isolators and easily accessible/removable for service.
- h. Every heat-exchanger shall have a manufacturer-backed 10-year pro-rated warranty.
- i. Every power-vent blower motor and housing shall have a standard 1-year manufacturer-backed warranty.

H. Inlet Dampers:

1. Manufacturer shall provide and install on unit a two-position, motor-operated damper with internal end switch to energize the blower-starter circuit, when damper is 80% open. Blades shall be a maximum of 6" wide 16 Gauge G-90 galvanized steel shall be made to guarantee the absence of noticeable vibration at design air velocities. Damper blades to be mounted on friction-free synthetic bearings. Damper edges shall have PVC coated polyester fabric mechanically locked into blade edge. Jamb seals to be flexible metal, compression type

I. Filters:

1. The filters shall be (2") thick, pleated panel filter with an ASHRAE efficiency of 30% and MERV 8, upstream of cooling coil.
2. Unit shall include a clogged filter switch.

J. Fresh-Air Inlet Hood/Filter Combination:

1. Shall be constructed of G-90 galvanized steel with birdscreen and (2") cleanable filters supported by internal slides mounted in the inlet face of the hood.

K. Roof Curb:

1. 18" curb shall be constructed of 18 ga. G-90 galvanized steel as a completed welded assembly.

L. Standard Gas Equipment:

1. Modulating gas valve.
2. On/off redundant gas valve.
3. Two solenoid valves.
4. Main gas shut off valve.
5. High gas pressure regulator.

N. Safety Controls to be included:

1. Motor starter with adjustable overloads.
2. Main gas regulator.
3. Main air-flow safety switch.
4. Two solenoid valves.
5. Electronic flame-safety relay.
6. High-temperature limit switch.
7. Unit mounted non-fused disconnect.
8. Combustion air-proving switch.
9. Flame roll-out switch.
10. High gas-pressure switches to open circuit to electronic flame-safety relay, if gas pressure is too high.
11. Low gas-pressure switch to open circuit to electronic flame safety relay, if gas pressure is too low.
12. Adjustable low temperature blower-safety control with bypass timer to shut down unit, if discharge temperature drops below setting

2.3 OPERATING CONTROLS

A. Factory Installed and Factory Provided Controller

1. Unit controller shall be capable of controlling all features and options of the unit. Controller shall be factory installed in the unit controls compartment and factory tested. Controller shall be capable of stand alone operation with unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling available without dependence on a building management system.
2. Controller shall have an onboard clock and calendar functions that allow for occupancy scheduling.
3. Controller shall include non-volatile memory to retain all programmed values without the use of a battery, in the event of a power failure.
4. Variable Air Volume Controller
 - a. Unit shall utilize a variable capacity compressor system and a variable speed supply fan system to modulate cooling and airflow as required to meet space temperature cooling loads and to save operating energy. Supply fan speed shall modulate based on supply air duct static pressure. Cooling capacity shall modulate based on supply air temperature.
5. Constant Volume Controller
 - a. Unit shall modulate cooling with constant airflow to meet space temperature cooling loads.
 - b. Unit shall modulate heating with constant airflow to meet space temperature heating loads. Modulating heating capacity shall modulate based on supply air temperature.
6. Unit configuration, setpoint adjustment, sensor status viewing, unit alarm viewing, and occupancy scheduling shall be accomplished with connection to interface module with LCD screen and input keypad, interface module with touch screen, or with connection to PC with free configuration software. Controller shall be capable of connection with other factory installed and factory provided unit controllers with individual unit configuration, setpoint adjustment, sensor status viewing, and occupancy scheduling available from a single unit. Connection between unit controllers shall be with a modular cable. Controller shall be capable of communicating and integrating with a LonWorks or BACnet network. [WattMaster Orion Controls System]

B. Remote Control Panel: ON/OFF switch, indicating lights for supply fan, exhaust fan and burner operation.

C. Interlocks:

1. Supply fan starts when exhaust fan is running.
2. Burner operation when flow switch located unit proves flow.
3. Interlock unit with ventilation hood operation.

- D. Fan Discharge Thermostat: Controls modulating gas valve to maintain constant supply air temperature.
- E. Refer to Contract Documents for detailed sequence of operation and control panel components.

2.4 WIRING AND ELECTRICAL

- A. A single point electrical connection shall be supplied. The control circuit voltage shall be 115 volts. A control transformer shall be provided, when required. The control wiring shall be carried in wire channel or conduit. Wiring in control enclosures shall be in accordance with the National Electrical Code and the local code, as it may affect the installation. Motor starter shall be provided. Starter shall be line voltage, definite purpose type.
- B. Unit(s) shall be complete with all items such as relays, starters, switches, safety controls, conduit and wire as previously mentioned, and as required for proper operation. All factory-mounted controls shall be factory prewired to the hood mounted unit VAV control panel EMS.
- C. Manufacture provided Variable Frequency Drive for main blower motor.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify existing conditions at the site prior to bidding or beginning work.
- B. Verify that roof is ready to receive work and opening dimensions are as indicated on shop drawings.
- C. Verify that proper power supply is available.

3.2 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with International Mechanical Code.
- C. Mount units on factory built roof mounting curb providing watertight enclosure to protect ductwork and utility services. Install roof mounting curb level.

3.3 MANUFACTURER'S FIELD SERVICES

- A. Prepare and start systems under provisions of the General Requirements.

3.4 FACTORY TESTED

- A. Unit(s) shall be operated, tested and set at the factory using job-site conditions for electrical and gas input. All operating and safety controls shall be tested and set at the factory. Adjustable, or fixed sheaves shall be set for proper RPM at specified conditions. Gas-pressure regulator shall be set for specified burning rate at specified inlet pressure

3.5 SERVICE AND PARTS

- A. The supplier shall furnish gas piping schematics, as built wiring connection and control-circuit diagrams, dimension sheets and a full description of the unit. Service manuals, showing service and maintenance requirements, shall be provided with unit.

3.6 OWNER TRAINING BY INSTALLING CONTRACTOR

- A. At the completion of the project, the Installing Contractor shall provide training for Owner's staff. Training shall consist of on-site (hands-on) training, which will show the location of all devices and the operation of all controls, devices, motors, etc. and maintenance and repair requirements. Prior to commencement of training, contractor shall provide Architect with a schedule of dates, times and agenda for each training session. Contractor shall provide a minimum of two (2) hours of training for equipment provided under this Section of the contract.

END OF SECTION 237423

SECTION 238300 - TERMINAL HEAT TRANSFER UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Electric suspended unit heater.
- B. Electric cabinet unit heater.

1.2 RELATED SECTIONS

- A. Section 26 05 03 - Equipment Wiring Systems: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.

1.3 REFERENCES

- A. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW

- A. Product Data: Provide typical catalog of information including arrangements.
- B. Shop Drawings:
 - 1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
 - 2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
 - 3. Indicate mechanical and electrical service locations and requirements.
- C. Submit under provisions of Division 1 General Requirements.
- D. Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
- E. Submit manufacturer's installation instructions. Indicate assembly, support details, connection requirements, and include start-up instructions.
- F. Contractor shall review all shop drawings prior to submitting them for Architect/ Engineer's review. Contractor shall stamp each shop drawing to certify that the has reviewed it. Engineer will not check shop drawings that contractor has not stamped with his review certification.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

- A. Project Record Documents: Record actual locations of components and locations of access doors in radiation cabinets required for access or valving.
- B. Operation and Maintenance Data: Include manufacturers descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listings.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owners name and registered with manufacturer.

1.6 REGULATORY REQUIREMENTS

- A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
- B. International Mechanical Code.

1.7 WARRANTY

- A. Equipment manufacturer shall provide one (1) year warranty (parts and labor) on their equipment. Installing Contractor will provide one (1) year warranty on all parts and labor associated with the installation of the equipment. See Division 1 Sections for other requirements.

1.8 DELIVERY, STORAGE AND HANDLING

- A. Store and protect products under provisions of Division 1 General Requirements.
- B. Deliver and store material in shipping containers with labeling in place.
- C. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building, it must be stored off the ground a minimum of six inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visquin. All piping will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and is completely protected with weatherproof covers.

1.9 PROJECT RECORD DOCUMENTS

- A. Submit record documents under provisions of Division 1 General Requirements.

1.10 OPERATION AND MAINTENANCE DATA

- A. Submit operation and maintenance data under provisions of Division 1 General Requirements.
- B. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data and parts listings.

1.11 EXTRA MATERIALS

- A. Provide three (3) sets of attic stock filters for each cabinet unit heater.

PART 2 - PRODUCTS

2.1 ELECTRIC SUSPENDED UNIT HEATERS

A. Acceptable Manufacturers:

- 1. Berko.
- 2. Indeeco.
- 3. Markel.
- 4. Trane.
- 5. Vulcan Radiator Corporation.
- 6. Owner approved equal.

B. Fabrication:

- 1. Casing: Casing fabricated of die-formed, heavy-gauge steel and finished in high gloss, baked enamel. Supply air shall be drawn through a stamped louver periphery evenly across the heating element, and discharged through an outward drawn venturi. Adjustable discharge louvers shall be provided to control the direction of airflow. A large, hinged access door shall extend the width of the heater and locked in position by quarter-turn fasteners. Heater and supply wiring diagram shall be permanently attached to the inside of the access door.
- 2. Elements: Elements shall be high mass, all steel tubular finned tube, copper brazed. Centrally located and installed in fixed element banks.
- 3. Motors: Motors shall be totally enclosed, all angle industrial rated. All units will utilize sealed bearings to assure permanent lubrication.
- 4. Fan Blades: Fan blades shall be of the axial flow-type designed for quiet efficient operation. Fan speed does not exceed 1,600 rpm.
- 5. Wiring: Heaters designed for a single circuit, with elements, motor and control circuits subdivided with factory wired fuses to conform to the National Electrical Code and Underwriter's Laboratory, Inc., Standard 1025. All three-phase heaters shall have balanced phases.
- 6. Thermostat with remote fan switch shall be provided by unit manufacturer for installation by BAS contractor. Thermostat shall be wall mounted with adjustable setpoint.

2.2 ELECTRIC CABINET UNIT HEATERS (WALL AND CEILING) HEAT ONLY

A. Acceptable Manufacturers:

1. Berko.
2. Indeeco.
3. Markel.
4. Trane.
5. Vulcan Radiator Corporation.
6. Owner approved equal.

B. Fabrication:

1. Electric Heat: The electric heat coils are Nichrome elements with an open-wire design. The electric heat coil operates at the same voltage as the unit, therefore requiring a single power connection to the unit.
2. All electric heat coils are UL approved and are interlocked with the fan motor switch. Therefore, electric heat operation is possible only when the fan is running. A transformer shall be supplied on any voltage unit, eliminating the need for field installation of a step-down transformer. A unit-mounted magnetic contactor shall be supplied on all voltages. A high temperature cutout with automatic reset shall be provided as an integral part of the elements to de-energize the electric heat in the event of an overheat condition.
3. Cabinet: 16 gauges steel with exposed corners and edges rounded easily removed panels, glass fiber insulation.
4. Finish: Factory applied baked enamel of color as selected by Architect on visible surfaces of enclosure or cabinet.
5. Fans: Centrifugal forward curved double width wheels, statically and dynamically balanced, direct driven.
6. Size and Capacity: As scheduled on the Drawings.
7. Filter: Easily removed one inch thick glass fiber throw-away type, located to filter air before coil to collect construction data.
8. Thermostat and remote fan switch shall be provided by unit manufacturer for installation by BAS contractor. Thermostat shall be wall mounted with adjustable setpoint.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings.
- B. Verify that required utilities are available, in proper location and ready for use.
- C. Beginning of installation means installer accepts existing surfaces.

3.2 INSTALLATION

A. Electric Suspended Unit Heater:

1. Install in accordance with manufacturer's instructions.
2. Hang units from building structure with steel hanger rods. Mount as high above the floor as possible to maintain greatest headroom.

B. Electric Cabinet/Unit Heaters:

1. Install in accordance with manufacturer's instructions.
2. Install a construction filter during construction. Install a permanent filter after building has been accepted as substantially complete.
3. Protect finished surfaces during construction.

3.3 CLEANING

- A. Clean work under provisions of Division 1 General Requirements.
- B. After construction is completed, include painting, clean exposed surfaces of units. Vacuum clean coils and inside cabinets.
- C. Touch-up marred or scratched surfaces of factory finished cabinets, using finish materials furnished by manufacturer.

3.4 OWNER TRAINING BY INSTALLING CONTRACTOR

- A. At the completion of the project, the Installing Contractor shall provide training of Owner's staff. Training shall consist of two parts. Part One will be a classroom situation which describes the equipment's operation, maintenance and repair requirements. Part Two will be on-site (hands-on) training which will show the location of all devices and the operation of all controls, devices, motors, etc. Prior to commencement of training, Contractor shall provide Architect/Engineer with a schedule of dates, times and agenda for each training session. This Contractor shall provide a minimum of two (2) hours of training for work installed under this Section of the contract.

END OF SECTION 238300

SECTION 238310 - HEAT PUMP HEAT RECOVERY SYSTEM

PART 1 – GENERAL

1.1 SYSTEM DESCRIPTION

- A. The variable capacity, heat pump heat recovery air conditioning system. The systems shall be simultaneous cooling and heating split system heat pumps.
- B. The system shall consist of outdoor unit(s), Branch Circuit Controller, multiple indoor units and Direct Digital Controls.
- C. Each indoor unit shall be independently controlled.

1.2 QUALITY ASSURANCE

- A. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
- B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
- C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
- D. A full charge of refrigerant for the condensing unit only shall be provided in the condensing unit.

1.3 RELATED SECTIONS

- A. Section 23 05 48 – Vibration Isolation.
- B. Section 23 09 93 –HVAC Controls and Sequence of Operation.
- C. Section 23 31 00 – Ductwork.
- D. Section 23 61 00 – Refrigerant Piping and Specialties.

1.4 SUBMITTALS

- A. Submit under provisions of the Division 1 General Requirements.
- B. Submittals shall be provided and shall include: Single-Line Diagrams; Dimensional, Electrical, and Capacity data; Piping and Electrical Connection Drawings.

- C. Include manufacturer installation instructions.
- D. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that Contractor has not stamped with his review certification.

1.5 QUALITY ASSURANCE

- A. Manufacturers Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.6 OPERATION AND MAINTENANCE DATA

- A. Include instructions for lubrication, motor and drive replacement, spare parts list and wiring diagrams under provisions of the General Requirements for inclusion into close-out documents.

1.7 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to site under provisions of Division 1 General Requirements.
- B. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building it must be stored off the ground a minimum of 6 inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visquin. All duct openings will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and completely protected with weatherproof covers.

1.8 WARRANTY

- A. Equipment manufacturer shall provide a two (2) year warranty (parts and labor) on their equipment. Installing Contractor will provide one (1) year warranty on all parts and labor associated with the installation of the equipment. See the General Requirements for other requirements.
- B. Provide seven year warranty (parts) for compressor only.

1.9 EXTRA MATERIALS

- A. Provide three (3) sets of attic stock filters per unit.

PART 2 - PRODUCTS

2.1 APPROVED MANUFACTURERS

- A. Carrier.
- B. LG.
- C. Mitsubishi.
- D. Panasonic.
- E. Owner Approved Equal.

2.2 GENERAL VRF SYSTEM DESCRIPTION

- A. All components of the VRF System shall be by one manufacturer. The equipment shall include all required components required for a fully functional system.
- B. All components on the VRF System controls shall be addressable.
- C. Each fan / refrigerant coil unit shall be capable of operating in any mode independently of other indoor units or groups. Each unit shall be independently controlled unless otherwise indicated on the Drawings. The sum of the connected capacity to a compressor unit shall range from 50% to 130% of the compressor unit capacity.
- D. The system shall be capable of performing continuous operation when an individual indoor unit is being serviced or power to indoor unit is disconnected.
- E. Refrigerant: R-410A.
- F. Operating Temperature:

Cooling: 14F DB to 122F DB
Heating: -13F WB to 61F WB

2.3 EQUIPMENT MANUFACTURER TO PROVIDE CERTIFIED DOCUMENTATION FOR APPROVAL BY ENGINEER OF UNIT TESTED HEATING CAPACITY AT -10F.(DESIGN CONDITION)

- A. Refrigerant Lines:
 - 1. All refrigerant lines from the air-source unit to the control valve box and to the fan / refrigerant coil units shall be insulated in accordance with insulation specifications.
 - 2. Provide pre-insulated line sets constructed of ACR copper for piping between control box and fan units or hard pipe and insulation in accordance to specifications, manufacturer's recommendations, and local codes.

3. Provide hard copper pipe in accordance to specifications, manufacturer's recommendations, and local codes to control boxes from compressor units.
4. The outdoor unit shall be capable of operating with up to 3280 equivalent length feet of interconnecting liquid line refrigerant pipe in the network.
5. The outdoor unit shall be capable of operating with up to 656 actual feet or 738 equivalent length feet of liquid line refrigerant pipe spanning between outdoor unit and furthest indoor unit.

2.4 AIR-SOURCE HEAT RECOVERY CONDENSING UNIT

- A. Description: Air-source module with cabinet, compressors, controller, heat exchangers, pipe connections, condensate drain pipe connections, and refrigerant pipe connections.
- B. Sound: Each compressor module shall have a sound level no higher than 60 dBA.
- C. Defrost Operation
 1. The outdoor unit(s) shall be capable of auto defrost operation to melt accumulated frost off the outdoor unit heat exchanger. The defrost cycle control shall be based on outdoor ambient temperatures and outdoor unit heat exchanger temperatures.
 - a. Continuous heating defrost
 - 1) During first two defrost cycles the unit shall allow heating mode indoor unit fans to stay "on" in low speed continuing to heat.
 - 2) Complete Defrost
 - a) The third defrost cycle shall switch all outdoor units to defrost mode to fully melt and clear frost, snow or ice accumulations off the outdoor coil while turning "off" heating mode indoor unit fans to maintain efficient performance.
- D. Cabinet and Frame: Welded steel, braced for rigidity, and supporting compressors and other mechanical equipment and fittings.
 1. Doors and Access Panels: Galvanized steel with polyurethane gaskets, hinges, and concealed fastening devices.
 2. Finish of Exterior Surfaces: Baked-on, textured vinyl enamel; or powder coat.
 3. Base: Welded tubular steel, with adjustable legs and vibration isolation pads.
 4. Unit Frames: Condensing unit frame quantity shall match what is shown on drawings.
 5. Unit Capacity: Condensing unit tonnage shall match what is shown in schedule.

E. Oil Management

1. The system shall have a Hi-POR (High Pressure Oil Return) to ensure a consistent film of oil on all moving parts at low speed. Oil is returned to compressor through a separate oil injection pipe.
 - a. The system shall be provided with a centrifugal oil separator designed to extract oil from the oil/refrigerant gas stream leaving the compressor and return the extracted oil to the compressor oil sump.
 - b. The system shall have an oil level sensor in the compressor to provide direct oil level sensing.
 - c. The system shall only initiate an oil return cycle if the oil level is too low.

F. Refrigeration System:

1. Compressors: ALL Inverter-driven, Hermetic scroll; internal motor overload protection, crankcase heater, manual-reset high-pressure switch, and phase failure/reversal.
2. There shall be an accumulator with refrigerant level sensors and controls.
3. The Compressor shall use a factory charge of Polyvinyl Ether (PVE) oil.
4. Air-Source Heat Exchanger Coil:
 - a. Construction: The outdoor unit shall have a factory built coil comprised of aluminum fins mechanical bonded on copper tubing.
 - b. Maximum pressure rating: Min. 551 psig
 - c. Cabinet shall have coil guard.
 - d. The unit shall have a 3 row heat exchanger.

G. Electrical:

1. Power supply: 208 volt/3-phase/ 60 Hz or 480 volts / 3-phase / 60 Hz. See drawings.

2.5 HEAT RECOVERY UNIT (HRU)

- A. HR unit shall be designed and manufactured by the same manufacturer of VRF indoor units and Air source units.
- B. HR unit casing shall be made with galvanized steel.
- C. HR unit shall require 208-230V/1-phase/60Hz power supply.
- D. HR Unit shall be an intermediate refrigerant control device between the water source unit and the indoor units to control the systems simultaneous cooling and heating operation.
- E. HR unit shall be engineered to work with a have a three pipe VRF system comprising of:
 1. High Pressure Vapor Pipe
 2. Low Pressure Vapor Pipe
 3. Liquid Pipe

- F. HR unit shall be designed to be piped in series with the use of Y-branch or header fittings.
- G. Each port shall be capable of operating in cooling or heating independently regardless of the operating mode of any other port on the HR unit or in the system.
- H. Each port shall be capable of connecting from 2, 3 or 4 indoor units to a maximum nominal capacity of 54MBh.
- I. Maximum nominal capacity per HR unit shall not exceed 16 tons.
- J. HR unit shall be internally piped, wired, assembled and run tested at the factory.
- K. HR unit shall be designed for installation in a conditioned environment.
- L. HR unit shall have a liquid bypass valve.
- M. HR unit shall have (2) two-position solenoid valves per port.
- N. HR unit shall have a balancing valve to control the pressure between the high pressure and low pressure pipe during mode switching.
- O. HR unit shall have an electronic expansion valve for subcooling.
- P. HR unit shall not require a condensate drain. The contractor is responsible for any additional costs for provision and installation of the condensate management system if required.
- Q. HR unit shall be internally insulated.
- R. All field refrigerant lines between water source unit and HR unit and from HR unit to indoor unit shall be field insulated.
- S. The HR unit shall not exceed a net weight of 53 lbs.
- T. The system shall be designed to accommodate 16 HR units connected to Heat Recovery units piped in single series string.
- U. A single series pipe string of 1 to 16 HR units shall be capable of serving indoor units with a total nominal capacity of 192 MBH
- V. Physical size of the HR boxes shall not exceed what is shown on plans.

2.6 INDOOR UNIT (4-WAY CASSETTE WITH GRILLE)

A. General:

1. The unit shall be a cassette style indoor unit that recesses into the ceiling with a ceiling grille and shall have a modulating linear expansion device. The unit shall be used with the outdoor unit and BC Controller. The unit shall support individual control using DDC controllers.
2. Performance shall be based on 67° FWB, 80° FDB for the indoor unit and 95°FDB, 75°FWB for the outdoor unit.

B. Indoor Unit: The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:

1. The cabinet shall be space saving ceiling-recessed cassette.
2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
3. Branch ducting shall be allowed from cabinet.
4. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

D. Fan:

1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
3. The indoor fan shall consist of four (4) speeds, Low, Mid1, Mid2, and High, two of which may be selected by the room controller.
4. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
5. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.

E. Filter:

1. Return air shall be filtered by means of a long-life washable permanent filter.

F. Coil:

1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
2. The tubing shall have inner grooves for high efficiency heat exchange.
3. All tube joints shall be brazed with phos-copper or silver alloy.
4. The coils shall be pressure tested at the factory.

5. A condensate pan and drain shall be provided under the coil.
6. The condensate lift mechanism shall be able to raise drain water 33 inches above the condensate pan.
7. Both refrigerant lines to the indoor units shall be insulated.

G. Electrical:

1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz).

H. Controls:

1. This unit shall use controls provided by the manufacturer to perform functions necessary to operate the system. Please refer to 2.7 of this guide specification for details on controllers and other control options.

2.7 CONTROLS

A. Controller:

1. General: The physical controllers shall be plastic material with a neutral color. Each remote controller, at a minimum, shall have a LCD (Liquid Crystal Display) that shows room temperature, set point, and fan speed.
2. Provide BACnet or LON Controller to match Owners control system. The controller shall allow remote control and monitoring of all indoor and outdoor units.

B. Electrical Characteristics

1. General: The electrical voltage from each circuit board to the controls shall be 12 volts DC. The voltage may fluctuate up or down depending on communication packets being sent and received.
2. Wiring: Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit then to the BC controller and outdoor unit. Control wiring shall run from the indoor unit terminal block to the controller associated with that unit.
3. Wiring size: Wiring shall be 2-conductor 16 AWG or 18 AWG stranded wire with a shield, as defined by the Design Tool AutoCAD output.
4. Shielding the cable: The wire shall be 2-conductor, twisted pair shielded and connected to the appropriate terminals within the indoor units and outdoor unit as well as the BC controller.

C. Remote Controllers

1. The remote controllers shall operate indoor units. The wiring for the remote controllers shall be simple, non-polar, two-wire connections. All remote controllers shall be wall-mounted and contain a microprocessor that constantly monitors operation to maintain smooth indoor unit operation. Set temperature shall be adjusted in increments of 1°F or 2°F, depending on the systems and controllers. In the event of an abnormality, the remote controller shall display a four-digit error code and the indoor unit address.

PART 3 - EXECUTION

3.1 INSTALLATION OF UNITS

A. General

1. Install air conditioning unit in accordance with manufacturer's installation instructions. Install unit plumb and level, firmly anchored in location indicated, and maintain manufacturer's recommended clearances.

B. Electrical Wiring

1. Install and connect electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturers electrical connection diagram submittal to electrical contractor.

C. Piping Connections

1. Install and connect devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturers piping connection diagram submittal to piping contractor.
2. Provide isolation valves at each unit.

D. Drain Water Piping

1. Connect drains to air conditioning unit. Provide pitch and trap as manufacturer's instructions and local codes require.

E. Examination

1. Verify that proper power supply is available.

F. Installation

1. Install in accordance with manufacturer's instructions.
2. Install in accordance with NFPA 90A.
3. Mount condensing units on 18" high platform curb or concrete base. See Section 23 05 48 – Vibration Isolation for additional requirements.
4. See Section 23 05 40 – Vibration Isolation for additional requirements for hanging fan coil / heat pump.
5. Provide additional unistrut structural as required by field conditions.

G. Manufacturer's Field Services

1. Prepare and provide initial start-up of systems.

3.2 OWNER TRAINING BY EQUIPMENT MANUFACTURER

- A. At the completion of the project, the Installing Contractor shall provide training for the Owner's staff. Training shall consist of two parts. Part One is a classroom situation which describes the equipment's operation, maintenance and repair requirements. Part Two will be on-site (hands-on) training which will show the location of all devices and the operation and maintenance of all controls, devices, etc.

END OF SECTION 238310

SECTION 260500 - BASIC ELECTRICAL REQUIREMENTS

PART 1 – GENERAL

1.1 WORK INCLUDED

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and the General Requirement Specification, apply to this and the other sections of Division 23.
- B. The Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Descriptions.
- B. Quality assurance.
- C. Codes.
- D. Approvals.
- E. Permits and inspections.
- F. Fees.
- G. Submittals.
- H. Instruction.
- I. Overtime
- J. Alternates
- K. Guarantees.
- L. Warranty.
- M. Products
- N. Execution.

1.3 RELATED SECTIONS

- A. Substitutions: Refer to the General Requirements and 26 Sections.
- B. Shop Drawings: Refer to the General Requirements and 26 Sections.
- C. Operation and Maintenance Data: Refer to the General Requirements and 26 Sections.
- D. Coordination with Other Trades: Refer to the General Requirements, 23, and 26 Sections.

1.4 DEFINITIONS

- A. Provide all required products and execution for a complete and fully operational Electrical System. Such work includes, but is not limited to, that which is identified on the contract documents. For the purpose of this specification, the following terms are defined:
 - 1. "Contract documents" include the most current project drawings and specification.
 - 2. "Provide" includes furnishing and installation.
 - 3. "Furnish" includes purchasing and transporting new equipment, as specified, to the job site.
 - 4. "Install" includes mounting or setting equipment in place, in specified location, making all required electrical connections for a working product.
 - 5. "Electrical System" includes all distribution of power, lighting, fire protection, life safety, communications, security, special systems, and any other information, electrical in nature, identified on the Contract Documents, from the point(s) of service to utilization device(s).
 - 6. "Connecting" means providing a power source, overcurrent devices, raceways, conductors, terminations, insulation supports, and other materials and equipment required for the operation and control of the relevant operation.
- B. Provide materials, equipment, installation or testing identified on the drawings but not specified herein; or that which is specified herein, but not identified on the drawings shall be provided at no additional cost to the Owner.
- C. Provide materials or equipment including minor items, accessories, or devices reasonably inferable as necessary for the completion and proper operation of any systems or products identified on the Contract Documents.

1.5 QUALITY ASSURANCE

- A. Discovery of any conflicting design information or any design intentions which are not readily interpreted shall be referred to the Architect/Engineer for further description or illustration prior to any product selection or execution of work.
- B. Discovery of any materials or equipment which are damaged, unsuitable, incompatible, or non-compliant with any applicable codes, laws, ordinances, or other regulations shall be brought to the direct attention of the Architect/Engineer.

- C. Generally, the Drawings establish the location, quantity and relationship of the parts of the work, and the specifications define the type and quality of materials and workmanship. Work shown in the drawings and not mentioned in the specifications, or required by the specifications and not shown on the drawings, shall be provided as if fully provided for in both. In the case of conflicts between the drawings and specifications, or within either document, the Architect/Engineer shall determine the intent. In such cases, in general, the more stringent requirement concerning greater quantity, quality, and/or resulting in a higher cost shall govern without further cost to the Owner.
- D. The equipment list contained in this specification includes only the major equipment requirements. Verify the completeness and suitability of device to meet the intent of the specifications. Any additional equipment required, even if not specifically mentioned herein, shall be provided without claim for additional payment; it being understood that a complete operating system, satisfactory to the Engineer and the Owner, is required in all cases.

1.6 REGULATORY REQUIREMENTS

- A. Where governing codes indicate the Drawings and Specifications do not comply with the minimum requirements of applicable codes, the Contractor shall either notify the Architect/Engineer in writing during the bidding period identifying the revisions required to meet code requirements or provide an installation which will comply with the code requirements.
- B. All material, equipment, installation and testing should be in accordance with all applicable codes, laws, and ordinances of Federal, State and local governing bodies having jurisdiction.
- C. In case of differences between building codes, Federal and State laws, local ordinances and utility company regulations and the Contract Documents, the most stringent shall govern.
- D. Where any materials, equipment or installation is not in compliance with the more stringent of the applicable codes, laws, ordinances, regulations and contract documents, they shall be entirely removed, replaced, modified or otherwise corrected at no additional cost to the Owner.
- E. Materials, equipment, installation and testing shall conform to the latest editions of the applicable following codes:
 - 1. NEC National Electrical Code.
 - 2. State of Illinois Plumbing Code.
 - 3. NFPA 72 National Fire Protection Association
 - 4. IBC International Building Code.

- F. All product materials and work shall comply with all local codes, including but not limited to the following codes and standards as applicable, in addition to any codes and standards referenced within individual specification sections. These codes and standards shall apply to all Division 26 Sections as applicable.
1. ANSI American National Standards Institute.
 2. ASTM American Society for Testing Materials.
 3. CBM Certified Ballast Manufacturers.
 4. ETL Electrical Testing Laboratories.
 5. IEEE Institute of Electrical and Electronic Engineers.
 6. NBS National Bureau of Standards.
 7. NEMA National Electrical Manufacturer's Association.
 8. NFPA National Fire Protection Association.
 9. OSHA Occupation Safety and Health Act.
 10. UL Underwriters Laboratories.
 11. ADA Americans with Disabilities Act.
 12. NEC National Electrical Code.
 13. IBC International Building Code.
 14. IEC International Electrical Code.
 15. IFC International Fire Code.
 16. IECC International Energy Conservation Code 2012
- G. Where a UL standard is available, the equipment supplied for the project shall be UL listed and shall bear the UL label.
- H. Notify the Architect/Engineer of any materials or apparatus believed to be inadequate, unsuitable, in violation of laws, ordinances, rules or regulations of authorities having jurisdiction.
- I. In every installation where regulations of electric utility, telephone and cable TV companies apply, conformance with their regulations is mandatory and any costs involved shall be included in the Contract, with the exception of extra facility and other charges which are directly paid by the Owner.

1.7 APPROVALS

- A. Prepare shop drawings and obtain approvals from inspection authorities for emergency and exit lighting, fire alarm and life safety systems, and other electrical installations requiring specific approval.
- B. Prepare shop drawings and obtain approvals from governmental agencies and utility companies for applicable electrical installations requiring approval.
- C. Copies of the final approved drawings shall be delivered to the Architect/Engineer. Approvals shall be obtained before commencement of related work.

1.8 PERMIT AND INSPECTION

- A. Permit: Obtain and pay for all permits, bonds, license, tap-in fees, etc. Required by the City, State, or other authority having jurisdiction over the work.
- B. Inspections: Arrange and pay for all inspections required by the above when they become due as part of the work of sections affected. Conceal no work until approved by these governing authorities.

1.9 FEES

- A. Pay fees and other charges incidental to electrical work and obtain and pay for required insurance, permits, licenses, inspections and taxes. Arrange for required inspections and delivery certificates and approvals for same to the Architect/Engineer.

1.10 SUBMITTALS

- A. Shop Drawings: As soon as practical and before any material or equipment is purchased, the Contractor shall submit shop drawings. A complete list in one category (example: all fixtures) of all shop drawings catalog cuts, material lists, etc. are to be submitted by this Contractor at one time. No consideration will be given to partial shop drawings submitted from time to time.
 - 1. Extended time for submitting special shop drawings may be requested; however, any extension of time approved does not relieve this Contractor of his responsibility of executing his work in accordance with this contract.
 - 2. Any listed materials, fixtures, apparatus, or equipment that are not in accordance with specifications requirements can and will be rejected for use in this installation and construction. Substitutions will not be permitted.
 - 3. Any materials, fixtures, apparatus or equipment installed without stamped or written approval shall be removed by the Contractor and replaced with specified equipment at the direction of the Architect/Engineer and without recourse for additional compensation.
 - 4. Review of shop drawings does not relieve the Contractor from any responsibility for deviation from the Contract Documents unless the deviation is specifically identified on the shop drawings.
 - 5. Prior to ordering any switchboard, distribution panels, panelboards, or transformers, the contractor shall submit dimension drawings showing the switchboard will fit in the location shown on the drawings. In the event of conflicts, the contractor shall request a written clarification from the Architect/Engineer.
- B. Coordination and Installation Drawings:
 - 1. In addition to the preparation and submittal of Shop Drawings and product data for manufactured electrical equipment and materials, prepare and maintain in current status, a complete set of detailed, completely circuited, and dimensioned electrical coordination and record drawings for electrical work included under the Contract.

2. Coordination and installation drawings shall be made at the Contractor's expense on basic floor plan background. Electronic copies of the electrical drawings may be purchased from the Engineer for \$250.00 a copy.
 3. Coordination and installation drawings shall be CAD drawings compatible with AutoCAD Version 2006 on the same size and with the same border lines and title blocks as the Architect/ Engineer's Drawings, with the Contractor's name added.
 4. Coordinate electrical work with the work of all other trades affecting the electrical work and in preparing the coordination drawings; coordinate the work of other trades in order to avoid possible installation conflicts, which includes but is not limited to mechanical equipment and architectural design elements. In the event of conflicts, interferences or discrepancies that are discovered during the coordination phase of the project, the contractor shall request a written clarification from the Architect/Engineer. If conflicts, interferences or discrepancies arise after the coordination phase of the project and no written clarification was requested, then the work shall be removed, replaced, modified or otherwise corrected at no additional cost to the owner.
 5. Record drawings shall indicate the electrical installation exactly as constructed and shall be periodically revised to reflect all changes, including those required by the Architect/Engineer, those which are or have been found necessary in the field and those which may be suggested by the Contractor and accepted by the Architect/Engineer. Drawings shall be revised when considered necessary by the Architect/Engineer or the Contractor in order to facilitate proper coordination.
 6. If, in the opinion of the Architect/Engineer, the drawings are in acceptable condition after each has been finally revised, they may be submitted as the field record drawings.
 7. Electrical contractor shall verify total connected load/HP with mechanical contractor prior to the installation of conduit and wiring of any mechanical or plumbing equipment. If any work is installed prior to verifying the load/HP of the mechanical or plumbing equipment, the contractor shall remove, replace, modify or otherwise correct the work at no additional cost to the Owner. Make any changes to overcurrent devices or feeder size per the local authority having jurisdiction.
 8. Provide "as-built" drawings.
- C. Operation and Maintenance Data: Refer to the General Requirements and Division 26 Sections. Submit four copies of maintenance manuals in hardbound covers containing approved shop drawings and manufacturer's repair manuals, guarantees, operating instructions, wiring diagram and part lists.
- 1.11 OPERATION AND MAINTENANCE INSTRUCTION
- A. Provide operation and maintenance instruction for equipment and systems.
 - B. Allow for 40 manhours of instruction time for electrical distribution system, emergency system, fire alarm system, communication systems, etc.

1.12 OVERTIME WORK

- A. All construction work shall be done on regular working hours and days, unless otherwise specified. If overtime work, other than specified, is required on the project, it shall be performed as indicated.
- B. System shutdown shall occur during off business hours and shall be done on over-time basis.
- C. The base bid shall include overtime work specified. No compensation shall be made for other work done on overtime basis, unless authorized.

1.13 ALTERNATES

- A. Accepted alternates, if any, may affect portions of the Base Bid Work.
- B. Acceptance of alternates shall include provisions necessary to alter, adjust or otherwise modify work affected by the alteration.
- C. Shop drawings shall include alternate work and shall reflect changes necessitated to other work.

1.14 GUARANTEE

- A. Electrical work shall be guaranteed for both materials and labor for a period of one year.
- B. On-the-premises maintenance shall be provided at no cost to the purchaser for one year from the date of an operational and accepted installation unless damage is caused by misuse or abuse.
- C. Guarantee all wiring and equipment to be free from inherent and mechanical defects due to workmanship and materials used for the period of one full year from date of operational and accepted installation. Replacement of all or part of the equipment and/or correction of such defects, including labor, shall be rendered without cost to the Owner with the guarantee period.
- D. Manufacturer's equipment guarantees or warranties for periods of more than one year shall be included in the Operation and Maintenance Data.

1.15 WARRANTY

- A. Warranty period shall be one year after final acceptance of the system. Repairs or replacements made under the warranty shall bear an additional 1-year warranty dated from final acceptance of the repair or replacement. The Owner shall receive the benefit of all warranties furnished by manufacturers.

1.16 PROJECT/SITE CONDITIONS

- A. Carefully examine the contract documents, visit the site, and thoroughly become familiar with the local conditions relating to the work prior to bidding. Failure to do so will not relieve the contractor of the obligations of the Contract.
- B. Install Work in locations shown on Drawings, unless prevented by Project conditions.
- C. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Architect/Engineer before proceeding.

1.17 CONTRACTOR'S RESPONSIBILITY TO VERIFY EQUIPMENT DIMENSIONS

- A. The drawings, schedules and specifications have been prepared using one manufacturer for each piece of equipment as the basis for dimensional design. If the Contractor purchases equipment listed as a specified Acceptable Manufacturer but is not the scheduled manufacturer used for the base design, the Contractor shall be responsible for checking all the dimensions of the equipment to verify that it will fit in the space shown on the Drawings. Minor deviations in dimensions will be permitted, provided the ratings meet what was shown on the drawings and equipment will physically fit into the space allocated with suitable access around equipment for operation and maintenance on the equipment.
- B. Contractor and/or manufacturer shall verify that the capacity and duty specified meets the characteristics of the equipment he submits for review.
- C. If equipment is submitted for review and does not meet the physical size or arrangement of what was scheduled and specified, Contractor shall pay for all alternations required to accommodate such equipment at no additional cost to the Owner. Contractor shall also pay all costs for additional work required by other Contractors, Owner, Architect or Engineer to make changes which would allow the equipment to fit in the space.

1.18 CONTRACTOR'S RESPONSIBILITY TO VERIFY EXISTING CONDITIONS AND OPENINGS

- A. Contractor shall field verify the size of existing openings, windows, doors, corridors, rooms, etc. for access of the new equipment into the existing building. If openings are too small for access, then Contractor shall provide new or enlarged openings, at his own expense, to facilitate entrance into existing space or building. Contractor may elect to order the equipment disassembled and/or with split housing for entrance into the existing space or building. Contractor shall reassemble equipment after it is in the space at his own expense.

PART 2 – PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Proposal shall be based upon the furnishing of all materials and equipment as specified, which in every case shall be new and, where not specifically referred to by manufacturer's name, of the best grade and quality available.
- B. Equipment and material shall be without blemish or defect and shall not be used for temporary light or power purposes, including lamps, without the Architect/ Engineer's written authorization.
- C. Items of equipment of one generic type (such as fuses), except conduit, conduit fittings, outlet boxes, wiring and cable, shall be the product of one manufacturer throughout, unless otherwise indicated or accepted by the Architect/Engineer.
- D. Where two or more makes or kinds of materials or equipment are specified, indicate which of these choices will be used. This information shall be included with the list of manufacturers for equipment and materials to be submitted to the Architect/Engineer.
- E. Manufacturers of equipment shall be firms regularly engaged in manufacturing factory-fabricated systems and equipment whose products have been in satisfactory use in similar service for not less than 5 years.

2.2 MANUFACTURERS NAMEPLATES

- A. Each major electrical component such as switchgear, transformers, motor control centers, panelboards, circuit breakers, disconnect switches, etc. shall have the manufacturer's name, address, catalog number, model number, rating, and any other required specified markings on a plate or label located inside the cover or otherwise inconspicuously but readily accessible.

PART 3 – EXECUTION

3.1 DELIVERY AND STORAGE

- A. Receive, handle, and store electrical items and materials at the project site. Materials and electrical items shall be so placed that they are protected from damage and deterioration.
- B. Existing equipment which is to be reused shall be cleaned and protected against damage. Equipment which is removed and stored for reuse shall be stacked, boxed or crated in such a manner as to prevent damage. The cost to repair/replace this equipment due to damage incurred during its removal, storage or reinstallation shall be borne by the Contractor.
- C. The Contractor shall bear full responsibility for equipment judged unacceptable due to his failure to comply with these specifications.

3.2 INSTALLATION

- A. The Drawings for work under Division 26 are diagrammatic and are intended to convey the scope of work and indicate the general arrangement of conduit, boxes, equipment, fixtures and other work included in the Contract.
- B. Location of items required by the Drawings or specifications not definitely fixed by dimensions are approximate only and exact locations necessary to secure the best conditions and results shall be determined at the site and shall be subject to the approval of the Architect/Engineer.
- C. Follow Drawings in laying out work, check drawings of other trades to verify spaces in which work will be installed, and maintain maximum headroom and space conditions at all points.
 - 1. Where headroom or space conditions appear inadequate, the Architect/Engineer shall be notified before proceeding with installation.
 - 2. Minor conduit rerouting and changes shall be made at no additional cost to the Owner.
- D. Perform all work with skilled mechanics of the particular trade involved in a neat and workmanlike manner.
- E. Perform all work in cooperation with other trades and schedule.
- F. Perform all work in accordance with the manufacturer's recommendations.
- G. Furnish other trades advance information on locations and sizes of frames, boxes, sleeves and openings needed for the work, and also furnish information and shop drawings necessary to permit trades affected to install their work properly and without delay.
- H. Where there is evidence that work of one trade will interfere with the work of other trades, all trades shall assist in working out space allocations to make satisfactory adjustments and shall be prepared to submit and revise coordinated shop drawings.
- I. With the approval of the Architect/Engineer and without additional cost to the Owner, make minor modifications in the work as required by structural interferences, by interferences with work of other trades or for proper execution of the work.
- J. Work installed before coordinating with other trades so as to cause interference with the work of such other trades shall be changed to correct such condition without additional cost to the Owner and as directed by the Architect/Engineer.
- K. Architect/Engineer reserves the right to change location of electrical equipment or device within 10'-0" radius before work is installed without extra charge.
- L. Electrical Contractor shall cooperate with other trades and coordinate work so that conflicts with other work are eliminated.

- M. Equipment shall be installed with adequate space allowed for removal, repair or changes to equipment. Ready accessibility to removable parts of equipment and to wiring shall be provided without moving other equipment which is to be installed or which is in place. Electrical Contractor shall verify measurements. Discrepancies shall be brought to the Architect/Engineer's attention for interpretation.
- N. Determine temporary openings in the buildings that will be required for the admission of apparatus furnished under this Division, and notify the Architect/Engineer accordingly. In the event of failure to give sufficient notice in time to arrange for these openings during construction, assume all costs of providing such openings thereafter.
- O. Location of electrical outlets, lighting fixture, lighting panels, cabinets, equipment, etc. is approximate and exact locations shall be determined at the project.
- P. Electrical Contractor shall refer to contract documents for details, reflected ceiling plans, and large scale drawings.
- Q. Apparatus, lighting fixtures, material or work not shown on the drawings, but mentioned in the project specifications, or vice versa or any included accessories such as wiring, relays, switches, transformers (line voltage or low voltage), etc., necessary to make the work complete and ready for operating, even though not specified or shown on the electrical drawings shall be furnished and installed without additional expenses to the Owner. It is the Contractor's responsibility prior to bids to review all project documents.
- R. Verify final locations for rough-ins with field measurements of the actual equipment to be connected. Refer to equipment specifications in Division 2 through 26 for rough-in requirements.
- S. Equipment specified under other divisions and requiring electrical supply shall be erected, aligned, leveled and prepared for operation. Provide required controls and accessories along with installation instructions, diagrams, dimensions and supervision of installation and start-up. Provide the required electrical rough-ins and connections and confirm the electrical controls and accessories furnished under the specifications for the other divisions. Install those controls and accessories not located in the mechanical piping and ductwork. Provide additional electrical controls, accessories, fittings and devices not specified under the equipment but required for a finished, operating job. Make all final electrical connections. Participate in the start-up and test procedure.
- T. Where surface mounted conduit or surface mounted raceway is installed on new or existing walls, the electrical contractor shall paint the surface mounted conduit or surface mounted raceway to match the new or existing wall.
- U. Electrical Contractor shall weatherproof all openings and penetrations through foundations and exterior walls created by fixtures and conduits to prevent moisture from entering through.
- V. Contractor shall furnish other trades advance information and/or shop drawings on locations and sizes of conduits, raceways, equipment, frames, boxes, sleeves and openings, etc. needed for their work to install their work properly and without delay.

- W. Contractor shall provide sleeves in beams, floors, columns and walls as shown on the drawings, as required by job site conditions, and/or as specified, when installing their work. All beams and columns which are required to be sleeved shall be cut and reinforced as required by field conditions and locations and sizes shall be checked and approved by Architect before contractor cuts any structural building member.
- X. Contractor shall refer to the architectural and structural contract drawings (before submitting their bids) to familiarize themselves with the extent of the general contractors work, ceiling heights and clearance for installing their work.
- Y. Contractor shall install all auxiliary supporting steel as required for the supporting of their conduit, fixtures, devices, equipment, etc. All supporting steel for items above a suspended ceiling shall be from new building structure members only. All supports in the existing building shall be from walls. No connection to wood, roof deck or structure is allowed.
- Z. The locations shown for all lighting fixtures and ceiling mounted electrical equipment are diagrammatic. Exact location shall be determined from the reflected ceiling plans and/or on the job site by the construction manager. It shall be the contractor's responsibility to maintain code required spacing for items such as fire alarm devices.
- AA. Contractor shall be required to maintain the fire rated integrity of floors and/or wall partitions. All penetrations through fire rated building elements shall be effectively sealed using approved materials and methods.
- BB. Unless indicated otherwise, the Architect/Engineer makes no representation as to whether or not any hazardous or contaminated materials (including but not limited to asbestos, PCB's, contaminated soils, etc.) are present within the existing building or on the site. Work shown on the drawings and/or indicated in the specifications shall not be construed to call for contact with any of these materials. If these materials are encountered or suspected, the contractor shall not disturb them and shall contact the architect/engineer immediately.
- CC. Contractor shall store all materials and equipment shipped to the site on a protected area. If material is stored outside the building, it must be stored off the ground a minimum of six inches (6") set on 6 x 6 planks and/or wood pallets. All material and equipment must be completely covered with waterproof tarps or visquin. All conduit will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and completely protected with weatherproof covers.
- DD. This contractor shall be responsible for furnishing all labor and material required to patch all openings in existing floors, walls, ceilings and fire separations created by the removal of this trades material and equipment where these openings are not to be reused.

3.3 PROTECTION

- A. Protect conduit and wireway openings against the entrance of foreign matter by means of plugs or caps. Cover fixtures, materials, equipment and devices or otherwise protect against damage from any cause, both before and after installation. Fixtures, materials, equipment, or device damaged prior to final acceptance of the work shall be restored to their original condition or replaced, all at no additional cost to Owner.
- B. Equipment shall be inherently safe and moving parts shall be covered with guards.

3.4 COOPERATION

- A. Where jurisdictional rules require the assistance of electrical mechanics in the moving and setting of electrically power equipment, provide such assistance.
- B. Where work covered by this section connects to equipment furnished under other sections, verify electrical work involved in the field and make proper connection to such equipment.

3.5 CUTTING AND PATCHING

- A. Do drilling, cutting, fitting and patching necessary for the installation of conduits, wireways, and other electrical equipment, and provide supports necessary for same and for bracing and anchorage of work. No cutting of structural work or of fireproofing shall be done without the written consent of the Architect/Engineer.
- B. Conduits passing through roofs or other surfaces exposed to weather shall be properly flashed as specified in roofing and waterproofing sections. This flashing work shall be paid for as part of the electrical work.

3.6 WALL CHASES

- A. Provide templates or details of wall chases, where conduits, pull boxes, cabinets, and other items of equipment are to be concealed or recessed, before the work of other trades is performed in the respective areas. Show exact locations and sizes of such equipment.

3.7 SLEEVES AND OPENINGS

- A. Provide sleeves and openings for exposed wires, cables, and wireways where they pass through walls and floors.
- B. Sleeves for individual cables shall be hot-dip galvanized inside and outside. Sleeve shall be equal in gauge to heavy wall steel conduit and extended 3 inches above finished surface or wall.
- C. Furnish complete dimensioned drawings of openings required through walls and floors, for conduits, or busways, or wireways, before the work of other sections is performed in the respective areas.

- D. Installation of 3 inch high concrete curbs around openings through concrete slabs in electrical closets and other openings, shall be provided under Division 3.
- E. Pack or fill sleeves and openings after the completed work is in place. Filling shall comply with U.L., match rating of original construction and shall provide a waterproof and fireproof packing to prevent leakage of liquid, smoke, or fire through the sleeve or opening.

3.8 EQUIPMENT NOISE LIMITATION

- A. Noise levels of electrical devices and equipment shall be within acceptable limits as established by NEMA or other valid noise rating agencies. Noise levels shall be subject to the Architect/Engineer's acceptance, based on practical and reasonable consideration of occupancy requirements.
- B. Check and tighten the fastenings of sheet metal plates, covers, doors, and trims to prevent vibration isolation and chatter under normal conditions of use.
- C. When located elsewhere than in high-noise-level equipment rooms, the enclosures of solenoid-operated switching devices and other noise-producing device shall have anti-vibration mountings and non-combustible sound-absorbing linings.
- D. Reactors, dimmers, lamp ballasts, and solenoids shall be designed and rated for "quiet" operation.
- E. Remove and replace any individual electrical item or device that is found to produce a sound energy output exceeding that of other identical devices installed at the project.

3.9 EXCAVATING AND BACKFILLING

- A. Excavating, bracing and shoring, testing disposition of excess, excavated material, provision of borrow, and placing of backfill shall be in accordance with Division 33 Utilities Excavating and Backfilling.

3.10 EXECUTION, CORRELATION AND INTENT OF DOCUMENTS

- A. In the event that conflicts, if any, cannot be settled promptly and amicably between the affected trades, with work proceeding in a workmanlike manner, then the Architect/Engineer shall decide which work is to be relocated and his judgment shall be final and binding on this Contractor.

3.11 ADJUSTMENTS

- A. The primary adjustments of the system(s) shall be accomplished by the Contractor to the complete satisfaction of the Owner and Architect/Engineer at the time of completion of the installation.

3.12 ACCESS PANELS

- A. Provide access panels as required. The access panels shall comply with Division 8.

3.13 TESTING

- A. General: Furnish meters, instruments, cable connections, equipment or apparatus necessary for making all tests.
- B. Insulation Tests:
1. After being pulled in place and before being connected, test all service and feeder cables with 1000 volt, 60 Hz insulation tester for one minute to determine that conductor insulation resistance to ground is not less than that recommended by the manufacturer. Test all branch circuit conductors for lighting, receptacle and miscellaneous loads prior to connection of loads. Tests shall not register less than one megohm to ground during an insulation test as described above for service and feeder cables. Remove, replace and retest all cable failing insulation test.
 2. Measure insulation resistance of electrical wiring with a self-contained instrument such as direct-indicating ohmmeter of the generator battery or electronic type.
 3. When using any type of d-c voltage source, it is essential that the output voltage is steady to prevent fluctuations in charging current. Where protective resistors are used in test instruments, take into account their effect on the magnitude of the voltage applied to the insulation under test. Properly maintain the instrument used in insulation resistant testing. Make periodic checks to insure that rated voltage is delivered and that the instrument is in calibration.
 4. Unless otherwise specified, the insulation resistance shall be approximately one megohm for each 1000 volts of operating voltage with a minimum value of one megohm.
- C. Test all motors under load, with ammeter readings taken in each phase and the RPM of motors recorded at the time. Test all motors for correct direction of rotation.
- D. Documentation: Keep records of all tests, in tabulated, permanent, reproducible form, completely indexed and explained, indicating the specific test performed, environmental conditions such as temperature and humidity, date of performance, results obtained, corrective actions taken (if any), final results, and comments, if required. Copies of all tests shall be delivered to the Architect/Engineer prior to this final project review.

3.15 MOUNTING HEIGHTS

- A. Mounting heights of electrical items shall be as listed below, unless otherwise specified, or by the Architect/Engineer's field instructions. Dimensions are above finished floor, unless otherwise indicated. In areas where codes require different mounting heights, as in hazardous areas, comply with code requirements.

1. General Receptacles - 18" to C.L.
2. Outdoor Receptacles - 24" to C.L.
3. General Tele and Data Outlets - 18" to C.L.
4. General Toggle Switches - 44" to C.L.
5. Fire Alarm Pull Stations - 44" to C.L.
6. Security and Intercom Call Stations - 44" to C.L.
7. Clock and Paging Speaker Outlets - 84" to C.L.
8. Fire Alarm AudioVisual Devices - 80" to C.L.
9. Corridor Wall Sconces ($\geq 4"$ deep) - 66" to C.L.
10. Exit Signs - 90" to C.L.
11. Volume Controls 44" to C.L.
12. T.V. Outlets 80" to C.L.
12. Individual Disconnects and Starters - 60" to C.L.
13. Grouped Disconnects and Starters $\geq 12"$ to C.L.
 $\leq 72"$ to C.L.
14. Panelboard Overcurrent Devices $\geq 12"$ to C.L.
 $\leq 72"$ to C.L.

END OF SECTION 260500

SECTION 260503 - EQUIPMENT WIRING

PART 1 – GENERAL

1.1 SECTION INCLUDES

- A. Electrical connections to equipment.

1.2 RELATED SECTIONS

- A. Section 26 05 32 - Conduit.
- B. Section 26 05 19 - Building Wire and Cable.
- C. Section 26 05 33 - Boxes.

1.3 REFERENCES

- A. Section 01090 - Reference Standards: Requirements for references and standards.
- B. NEMA WD 1 - General Purpose Wiring Devices.
- C. NEMA WD 6 - Wiring Devices - Dimensional Requirements.
- D. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW

- A. Submit under provisions of the General Requirements.

1.5 SUBMITTALS FOR INFORMATION

- A. Submit under provisions of the General Requirements.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of local electrical code.
- B. Products: Listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.7 COORDINATION

- A. Section 26 05 00 - Basic Electrical Requirements.
- B. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
- C. Determine connection locations and requirements.
- D. Sequence rough-in of electrical connections to coordinate with installation of equipment.
- E. Sequence electrical connections to coordinate with start-up of equipment.

PART 2 – PRODUCTS

Not Used.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Section 26 05 00 - Basic Electrical Requirements: Verification of existing conditions prior to beginning work.
- B. Verify that equipment is ready for electrical connection, wiring, and energization.

3.2 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to match attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- J. Seal roof penetrations properly and as recommended by roofing manufacturer.

3.3 MECHANICAL EQUIPMENT SCHEDULE

- A. As soon as practical and before any material or equipment is purchased or installed, the contractor shall submit for review, the mechanical equipment connection schedule for all mechanical equipment, completely filled in. The mechanical contractor shall stamp the mechanical equipment schedule to certify that he has coordinated and reviewed it. Any material or equipment installed without stamped or written approval of the mechanical equipment connection schedule shall be removed, modified or otherwise corrected at no additional cost to the Owner.

B.

MECHANICAL EQUIPMENT CONNECTION SCHEDULE						
EQUIPMENT DESIGNATION TAG	LOAD			BREAKER SIZE	FUSE SIZE	CONDUIT AND WIRE SIZE
	VOLTS	PHASE	H.P.			
AIR SUPPLY UNIT						
ROOF TOP UNIT						
AIR COOLED CONDENSING UNIT						
CHILLER						
HOT WATER BOILER						
HOT WATER PUMP						
BOILER CIRCULATION PUMP						
CHILLED WATER PUMP						
COIL BOOSTER PUMP						
SINGLE PHASE EXHAUST FANS						
THREE PHASE EXHAUST FANS						
FAN POWERED BOX						
CABINET UNIT HEATER						
SUSPENDED UNIT HEATER						
UNIT VENTILATOR						
FIRE PUMP						
JOCKEY PUMP						
DOMESTIC WATER PUMP						
KITCHEN MAKE-UP UNIT						
ELEVATOR						
DECK ELEVATOR						
ALL GYM EQUIPMENT						

END OF SECTION 260503

SECTION 260519 - BUILDING WIRE AND CABLE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specification Sections, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Building wire and cable.
- B. Wiring connectors and connections.

1.3 RELATED SECTIONS

- A. Section 260553 - Electrical Identification.
- B. Section 260526 - Grounding and Bonding.

1.4 REFERENCES

- A. NECA Standard of Installation (National Electrical Contractors Association).
- B. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).
- C. NFPA 70 - National Electrical Code.

1.5 SUBMITTALS

- A. Submit under provisions of The General Requirement Specification Sections and Section 260500.
- B. Product Data: Provide for each cable assembly type.
- C. Test Reports: Indicate procedures and values obtained.

- D. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements.
- E. Project Record Documents: Record actual locations of components and circuits.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of local electrical code, unless otherwise specified.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.8 COORDINATION

- A. Coordinate under provisions of the General Requirement Specification Sections and Section 260500.
- B. Field Measurements: Verify that field measurements are as shown on Drawings.
- C. Where wire and cable routing is shown on Drawings, it is approximate unless dimensioned. Include wire and cable lengths within 10 ft of length where shown.
- D. Where wire and cable destination is indicated and routing is not shown on Drawings, determine exact routing and lengths required.

PART 2 – PRODUCTS

2.1 BUILDING WIRE

- A. Manufacturers:
 - 1. American Insulated Wire Corp.
 - 2. Cerro.
 - 3. Collyer.
 - 4. Capitol Wire and Cable.
 - 5. Okonite.
 - 6. Senetor.
 - 7. South Wire.
 - 8. Triangle.
 - 9. Owner Approved Equal.

B. Description: Single conductor insulated copper wire.

1. AWG No. 12 minimum, unless otherwise specified.
2. AWG No. 10 and smaller may be solid or stranded, unless otherwise specified.
3. AWG No. 8 and larger shall be stranded.
4. AWG No. 14 stranded, for control and signal wire, unless otherwise specified.
5. Provide wire and cable suitable for the temperature, conditions and location where indicated.
6. Conductivity: Copper conductors shall have a conductivity of not less than 98% at 20°C (68°F). Conductor resistance values shall be in accordance with the values in NEMA WC 8.
7. Jackets: Factory-applied nylon or PVC external jacketed wires and cables for pulls in raceways over 100-feet in length, for pulls in raceways with more than three equivalent 90° bends, for pulls in conduits underground or under slabs on grade, and where indicated.

C. Insulation: 600 volts NFPA 70 Types as follows:

1.	Wire <u>Location</u>	Line/Load terminations on OCP devices rated <u>from 15A thru 600A</u>	Line/Load Terminations on 100% rated OCP <u>devices</u>
	Interior Locations	THHN/THWN XHHW	<45°C ambient XHHW >45°C ambient
	Exposed Exterior	THHN/THWN	XHHW damp locations XHHW-2 wet locations
	Concealed in Slab	THHN/THWN XHHW	<45°C ambient N/A >45°C ambient
	Below Slab	THHN/THWN	XHHW-2
	Below Grade	THHN/THWN	XHHW-2

2.2 WIRING CONNECTORS

A. Solderless Insulated Mechanical Connectors:

1. Manufacturers:
 - a. Burndy DUC.
 - b. Dossert GTC.
 - c. OZ/Gedney XTPC.
 - d. Thomas & Betts CTC.
 - e. Owner Approved Equal.

2. Provide parallel clamp connector with insulating cover.
3. Connector shall be constructed of an all copper alloy with bolted tangential plates which will receive the clamping pressure and redistribute the pressure uniformly over the entire surface of the clamping mechanism.
4. Insulating cover shall be of the same manufacturer as the connectors and shall have cable openings suitable for the cable insulation being installed. Where insulating covers do not completely seal taps, tape the installation. The insulating cover shall not kink or crimp the cable insulation when cover is completely closed.

B. Spring Wire Connectors:

1. Manufacturers:
 - a. Thomas & Betts PT.
 - b. 3M Scotchloc.
 - c. Owner Approved Equal.

C. Compression Connectors:

1. Manufacturers:
 - a. Burndy Hydent.
 - b. Thomas & Betts 54000.
 - c. Owner Approved Equal.
2. One-hole lugs for AWG No. 4/0 and smaller.
3. Two-hole lugs for AWG No. 250 kcmil and larger.
4. Feeders 1200 Amps and larger shall include cable limiter type lugs at each end of each phase conductor.

2.3 ADDITIONAL ACCESSORIES

- A. In the event that conduit and wire sizes increase beyond the motor or equipment manufacturer's normal provisions for conduit and wire terminations, due to voltage-drop or other considerations in motor branch-circuit designs, provide necessary auxiliary termination facilities with adequate boxes, lugs, terminals, and other components as may be required. Consult with the suppliers of motors and other items to insure that the equipment is furnished with suitable components to accept the required conduits and wires.
- B. Riser cables shall have cable supports as required by code.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that raceway installation is complete and supported.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.
- B. Install wiring in conduits buried in plaster or in poured concrete after the encasing medium is set and dry.

3.3 INSTALLATION

- A. Route wire and cable as required to meet Project Conditions.
- B. Install cable in accordance with the NECA "Standard of Installation."
- C. Pull all conductors into raceway at same time.
- D. Use pulling means including fish tape, cable, rope and basket weave wire/cable grips which will not damage cables or raceways.
- E. Feeders shall be installed as continuous conductors without splices whenever possible. Where feeder splices are required, the contractor shall submit a request for approval in writing to the engineer indicating the feeder and splice location. Where splices are installed without written approval, the engineer reserves the right to have the contractor replace the spliced conductors with continuous conductors at no additional cost to the Owner.
- F. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
 - 1. Cable lubricants shall be less than 6 percent solid residue after drying for 24 hours at 105°C. Cable lubricants shall not contain any waxes, greases, polyakylene glycol oils, or silicones. Manufacturer: Polywater J by American Polywater Corp.
- G. Protect exposed cable from damage. Install exposed cable, parallel and perpendicular to surfaces, or exposed structural members, and follow surface contours, where possible.
- H. Support signal cables above accessible ceiling, using cable ties to support cables from structure. Do not rest cable on ceiling grid.

- I. Use suitable cable fittings, connectors, and supports.
 - 1. Cable supports shall be as required by Code and shall be compatible with the wire and cable type and the associated conduit size.
 - a. Manufacturer: OZ/Gedney or Thomas & Betts.
 - b. Owner Approved Equal.
- J. Increase conductor size as required due to availability. Minimum feeder conductor sizes are shown on Drawings. If increased, be responsible for associated feeder conduit size and increased ground conductor size per NEC.
- K. Provide conductors of the same size from the protective device to the last load.
- L. Make conductor length identical for parallel feeders.
- M. Support conductors in vertical raceways. One cable support shall be provided at the top or as close to the top as practical, plus a support for each additional interval of spacing per Table 300-19a of the NEC.
- N. Provide slack wire for all future connections with ends of wires taped and blank box covers installed.
- O. Do not bend cables, either permanently or temporarily during installation, to radii less than that recommended by the manufacturer.
- P. Use conductors with 90°C insulation when wiring is within seven feet of, passing over or attached to the following:
 - 1. Boilers.
 - 2. Hot water heaters.
 - 3. Other heat producing equipment.
- Q. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- R. Splices, Taps and Terminations
 - 1. Make splices and taps in wiring #10 AWG and smaller mechanically and electrically secure with mechanical pressure type splicing devices.
 - 2. Make splices and taps of conductors #8 AWG or larger and all splices in motor terminal boxes using compression connectors requiring the use of compression tools for securing the conductors in the connectors. Termination of conductors at all distribution equipment, except transformers, shall be made using mechanical lugs. Connectors shall be of high conductivity, corrosion-resistant material and have actual contact area that shall provide at least the current carrying capacity of the wire or cable. For conductors #1/0 and larger, connector lugs shall be of the two-hole type. Connector lugs shall be bolted to bussing using Belleville washers in combination with flat washers and nuts.

3. Each conductor lug or bus shall be individually made with separate lug and/or bolt as required for the termination.
 4. Provide insulated connectors for splices and taps with a self-fusing rubber insulating tape that is non-corrosive to the connector and the conductor. Insulation tape shall have a minimum of 350 volts per mil dielectric strength. Friction or vinyl tape shall be applied directly over rubber insulating tape equal to 3M Scotch 88 type.
- S. Tighten electrical connectors and terminals, including screws and bolts, in accordance with manufacturer's published torque tightening values. Where manufacturer's torquing requirements are not indicated, tighten connector and terminals to comply with tightening torques specified in UL Standards 486A and B.
- T. Identify and color code wire and cable under provisions of Section 260553. Identify each conductor with its circuit number or other designation indicated. Wire color coding shall be as follows or as required by local codes:

Normal Power

120/208 Volts:
Phase A – Black
Phase B – Red
Phase C – Blue
Neutral – White
Ground – Green

277/480 Volts:
Phase A – Yellow
Phase B – Brown
Phase C – Orange
Neutral – Gray
Ground – Green

Powered from TVSS Panel

120/208 Volts:
Phase A - Purple
Phase B - Pink
Phase C - Tan
Neutral – White with Gray Stripe
Ground – Green with Orange Stripe

3.4 MAXIMUM BRANCH CIRCUIT LENGTHS

- A. The following indicates maximum installed length a circuit can have and still maintain an adequate voltage level at the last point of use for 20 amp circuit. If the 20 amp circuit length exceeds the length listed, use the next larger wire sized. Multiple circuit runs in the same raceway shall have all conductors sizes the same based on worst case circuit lengths. Conductor sizes indicated on the drawings are for informational purposes only and must be confirmed by actual field condition distances.

3.5 BRANCH CIRCUIT LENGTH (IN FEET)

Wire Size	2 Wire 120 V	2 Wire 277 V	1 Phase 208V	1 Phase 480 V	3 Phase 208 V	3 Phase 480 Volt
12	0 to 61'	0 to 141'	0 to 105'	0 to 244'	0 to 122'	0 to 282'
10	62' to 97'	142' to 224'	106' to 168'	245' to 388'	123' to 194'	283' to 449'
8	98' to 154'	225' to 357'	169' to 267'	389' to 618'	195' to 309'	450' to 714'
6	155' to 246'	358' to 567'	268' to 426'	619' to 983'	310' to 491'	715' to 1135'

3.6 FIELD QUALITY CONTROL

- A. Testing: Upon installation of wires and cables and before electrical circuitry has been energized, demonstrate product capability and compliance with requirements.
 1. Procedures: Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification, Section 7.3.1. Certify compliance with test parameters.
- B. Correct malfunctioning products at site, where possible, and retest to demonstrate compliance; otherwise remove and replace with new units, and retest.
- C. Inspection: Inspect wire and cable for physical damage and proper connection.
- D. Insulation Resistance Test: Prior to energization of circuitry, check installed wires and cables with megohm meter to ensure insulation resistance requirements are fulfilled.
- E. Continuity Test: Perform continuity test on all power and equipment branch circuit conductors. Verify proper phasing connections. Correct if necessary.
- F. Branch Circuits with Receptacles: Branch circuit receptacle wiring shall be tested using a Daniel Woodhead Co. circuit tester Model #1750.
- G. Torque Test: Torque test conductor connections and terminations to manufacturer's recommended values.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specification Sections, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Grounding electrodes and conductors.
- B. Equipment grounding conductors.
- C. Bonding.

1.3 REFERENCES

- A. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (International Electrical Testing Association).
- B. Local Electrical Code.

1.4 SUBMITTALS

- A. Submit under provisions of the General Requirements and Section 260500.
- B. Product Data: Provide for grounding electrodes and connections.
- C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

- E. Project Record Documents: Record actual locations of components and grounding electrodes.
- F. Certificate of Compliance: Submit detailed drawings including grounding details and material specifications to the authority having jurisdiction. Indicate approval of installation by authority having jurisdiction.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of local electrical code.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.7 COORDINATION

- A. Coordinate under provisions of the General Requirements and Section 260500.

PART 2 – PRODUCTS

2.1 GROUNDING SYSTEM

- A. Description: Complete grounding system of ground ring and rod electrodes, with connections to metal underground water pipe and building frame.
- B. Grounding System Resistance: 1-5 ohms.

2.2 ROD ELECTRODES

- A. Manufacturers:
 - 1. Harger Lightning Protection, Inc.
 - 2. Thompson Lightning Protection, Inc.
 - 3. Independent Protection Co., Inc.
 - 4. Owner Approved Equal.

- B. Material: Copper.
- C. Diameter: 3/4 inch.
- D. Length: 10 feet.

2.3 MECHANICAL CONNECTORS

- A. Manufacturers:
 - 1. Appleton.
 - 2. OZ/Gedney.
 - 3. Thomas & Betts.
 - 4. Harger Lightning Protection, Inc.
 - 5. Thompson Lightning Protection, Inc.
 - 6. Independent Protection Co., Inc.
 - 7. Owner Approved Equal.
- B. Material: Bronze.

2.4 WIRE

- A. Material: Stranded copper.
- B. Grounding Electrode Conductor: Size to meet local code requirements.
- C. Grounding Conductors: Size to meet electrical code requirements. Green insulated, 600 volt minimum, stranded copper within raceway.

2.5 GROUNDING BUSHINGS

- A. Manufacturers:
 - 1. Appleton GIB-50L.
 - 2. OZ/Gedney IBC-50L.
 - 3. Thomas & Betts 3870.
 - 4. Owner Approved Equal.
- B. Material: Malleable iron, threaded, with insulated liner and solderless lug.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify conditions under provisions of the General Requirement Specification Sections.
- B. Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 INSTALLATION

- A. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground. Drive rod electrodes into permanent moisture where soil conditions permit. Rod spacing shall be minimum two and one half rod lengths to nearest electrode.
- B. Install bare copper wire in foundation footing where indicated.
- C. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated.
- D. Provide bonding to meet Regulatory Requirements.
- E. Bond together metal components including supports, elevator rails, pipes, and ducts not attached to grounded structure.
- F. Provide isolated grounding conductor for circuits as indicated.
- G. Provide a separate ground conductor in each feeder and branch circuit wiring.
 - 1. The Equipotential Grounding System shall consist of grounding and bonding conductors connected to ground bars arranged to minimize potential differences between exposed conductive surfaces of electrical and non-electrical equipment.
 - 2. All bonding and grounding conductors shall be installed in one continuous length, without splice, to ground bar.
 - 3. Minimum size:
 - a) No. 12 AWG to receptacles, light switches, and light fixtures.
- H. Equipment Ground Bus: Provide ground bus within each switchboard, motor control center, and panelboard.
- I. Isolated Ground Bus: Provide ground bus insulated from enclosure within panelboards as indicated.

- J. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- K. Flexible Conduit Connections: Provide separate, insulated ground bonding-jumper conductor within each flexible conduit.
- L. Interface with site grounding system installed under the General Requirement Specification Sections.
- M. Bond together metal sides not attached to grounded structure; bond to ground.
- N. Bond together reinforcing sheet and metal accessories in pool and fountain structures.
- O. Install transient suppression plate where indicated.
- P. Install ground grid under access floors where indicated. Construct bare copper wire grid and bond each access floor pedestal to grid.
- Q. Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid.
- R. Provide isolated grounding conductor for circuits as indicated.
- S. Provide grounding and bonding in patient care areas to meet requirements of NFPA 99 and local electrical code.
- T. Provide grounding and bonding in data processing areas to meet requirements of local electrical code.
- U. Interface with lightning protection system installed under Section 264100.
- V. Provide red plastic sign at main water service meter indicating "main ground location".

END OF SECTION 260526

SECTION 260529 - SUPPORTING DEVICES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Conduit and equipment supports.
- B. Anchors and fasteners.
- C. Vibration Isolation.
- D. Equipment Bases.

1.3 RELATED SECTIONS.

- A. Section 260526 - Grounding and Bonding.

1.4 REFERENCES

- A. NECA - National Electrical Contractors Association.
- B. National Electrical Code.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirements and Section 260500.
- B. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of local electrical code, unless otherwise specified.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.8 COORDINATION

- A. Coordinate under provisions of the General Requirement Specification Sections and Section 260500.

PART 2 – PRODUCTS

2.1 PRODUCT REQUIREMENTS

- A. Materials and Finishes: Provide adequate corrosion resistance.
- B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products. Design of supports and methods of fastening to building structures shall be acceptable to the Architect/Engineer.
- C. Anchors and Fasteners: For point of attachment weight of 100 pounds or less.
 - 1. Concrete Structural Elements: Use precast insert system, expansion anchors, and preset inserts.
 - 2. Steel Structural Elements: Use beam clamps.
 - 3. Concrete Surfaces: Use self-drilling anchors and expansion anchors.
 - 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts.
 - 5. Solid Masonry Walls: Use expansion anchors and preset inserts.
 - 6. Sheet Metal: Use sheet metal screws.
 - 7. Wood Elements: Use wood screws.
- D. Anchors and Fasteners: For point of attachment weight of 100 pounds or more, obtain direction and approval from Architect/Engineer.

2.2 STEEL CHANNEL

A. Manufacturer:

1. B-Line.
2. Unistrut.
3. Allied.
4. Owner Approved Equal.

B. Description: Galvanized steel with baked enamel finish.

2.3 VIBRATION ISOLATION

- A. Suspended vibration producing equipment shall have spring elements in the hanger rods or isolation pads under the equipment.

2.4 EQUIPMENT BASES

- A. Provide 4" high concrete pads for floor mounted electrical equipment. The edge of the concrete pads shall have 1/4" chamfer. The pad dimensions shall be at least one inch greater on each side than the floor dimensions of the electrical equipment.
- B. Concrete pads shall include steel reinforcing and necessary bolts, anchors, etc. Where concrete pad is set directly on concrete floor, dowels in floor to tie base to floor shall be provided.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
- C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- D. Do not use ceiling system components for support.
- E. Connections to vibration producing equipment shall be made with flexible conduit.
- F. Obtain permission from Architect/Engineer before using spring steel clamps.
- G. Obtain permission from Architect/Engineer before using powder-actuated anchors.
- H. Obtain permission from Architect/Engineer before drilling or cutting structural members.

- I. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- J. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- K. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.
- L. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
- M. Support surface or pendant lighting fixtures:
 - 1. From an outlet box by means of an interposed metal strap, where weight is less than 5 pounds.
 - 2. From an outlet box by means of a hickey or other direct threaded connection, where weight is from 5 to 50 pounds.
 - 3. Directly from structural slab, deck, or framing member, where weight exceeds 50 pounds.
- N. Support Recessed Lighting Fixtures:
 - 1. From ceiling suspension members, where weight is less than 60 pounds.
 - 2. Directly from structural slab, deck, or framing member, where weight is 60 pounds or more.
- O. Provide cushioned, swivel type hangers with appropriate outlet boxes for pendant fixtures in mechanical areas. Such hangers shall have a support rating at least twice that of the load supported.
- P. Provide weight-distributing facilities, where required, so as not to exceed the load-bearing capabilities of floors or walls that bear the weight of, or support, electrical items.
- Q. Exposed parts of hangers and supports shall be painted with one coat of rust-inhibiting primer.
- R. Equipment shall not be held in place by its own dead weight. Provide base anchor fasteners in each case.
- S. Vertical raceway shall be supported with spring type hangers.

END OF SECTION 260529

SECTION 260532 - CONDUIT

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specification Sections, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Metal conduit.
- B. Flexible metal conduit.
- C. Liquidtight flexible metal conduit.
- D. Electrical metallic tubing.
- E. Nonmetal conduit.
- F. Fittings and conduit bodies.

1.3 RELATED SECTIONS

- A. Section 260533 - Boxes.
- B. Section 260526 - Grounding and Bonding.
- C. Section 260529 - Supporting Devices.
- D. Section 260553 - Electrical Identification.

1.4 REFERENCES

- A. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
- B. ANSI C80.3 - Electrical Metallic Tubing, Zinc Coated.
- C. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
- D. Local Electrical Code.

- E. NECA "Standard of Installation."
- F. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
- G. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirement Specification Sections and Section 260500.
- B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, fittings, and conduit bodies.
- C. Project Record Documents: Accurately record actual routing of conduits 1 1/4 inches and larger.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of local electrical code.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.8 COORDINATION

- A. Coordinate under provisions of the General Requirement Specification Sections and Section 260500.
- B. Design Requirements: Conduit Size per local electrical code.
- C. Field Measurements: Verify that field measurements are as shown on Drawings.
- D. Field Locations: Verify routing and termination locations of conduit prior to rough-in.
- E. Where conduit routing is shown on Drawings, it is in approximate locations unless dimensioned. Include conduit lengths within 10 ft of length where shown.
- F. Where conduit destination is indicated and routing is not shown on Drawings, determine exact routing and lengths required.

1.9 DELIVERY, STORAGE, PROTECTION, AND HANDLING

- A. Accept Products and inspect for damage.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.
- D. Conduit that shows corrosion within the guarantee period shall be replaced.

PART 2 – PRODUCTS

2.1 CONDUIT SCHEDULE

A. Conduit Location	From 0 V up thru 50V	Above 50V up thru 250V	Above 250V up thru 600V
Above an Accessible Ceiling	$\leq 2 \frac{1}{2}$ " EMT ≥ 3 " IMC	$\leq 2 \frac{1}{2}$ " EMT ≥ 3 " IMC	$\leq 2 \frac{1}{2}$ " EMT ≥ 3 " IMC
Concealed in Walls	$\leq 2 \frac{1}{2}$ " EMT ≥ 3 " IMC	$\leq 2 \frac{1}{2}$ " EMT ≥ 3 " IMC	$\leq 2 \frac{1}{2}$ " EMT ≥ 3 " IMC
Exposed Interior	$\leq 2 \frac{1}{2}$ " EMT ≥ 3 " IMC	$\leq 2 \frac{1}{2}$ " EMT ≥ 3 " IMC	$\leq 2 \frac{1}{2}$ " EMT ≥ 3 " IMC
Concealed in Slab	≤ 1 " EMT $\geq 1 \frac{1}{4}$ " IMC	≤ 1 " EMT $\geq 1 \frac{1}{4}$ " IMC	≤ 1 " EMT $\geq 1 \frac{1}{4}$ " IMC
Below Slab	IMC/PVC	IMC/PVC	IMC/PVC
Hazardous Areas	IMC	IMC	HWG
Exposed Exterior	HWG	HWG	HWG
Below Grade	HWG/PVC	HWG/PVC	HWG/PVC

* All voltages are line-to-line or line-to-neutral.

2.2 CONDUIT REQUIREMENTS

- A. Minimum Size: 3/4 inch except conduits to switches and receptacles having 5 or less #12 conductors shall be 1/2" C unless noted otherwise. All remaining conduits shall be minimum of 3/4" including conduits for telephone, data, any other control, intercom device, etc.
- B. Conduit installed below grade at exterior locations may be Schedule 40 PVC when encased within a 3 inch concrete enclosure.
- C. Flexible conduit connections to recessed lighting fixtures shall be made with UL approved flexible steel conduit, except where UL listed liquid tight flexible conduit is required by code, such as in air plenums, etc.
- D. Final connections to motors shall be made through UL listed liquid tight flexible steel conduits, 1/2 inch minimum size unless otherwise indicated.
- E. Flexible connections, where required, shall be made with flexible metallic tubing 1/2 inch minimum size or sized in accordance with code, except in areas where such connections will be exposed to oil, grease, water, or where installed out of doors. In those areas of adverse exposure, flexible connections shall be made with UL listed liquid tight flexible steel conduit. Grounding conductors with green colored insulation shall be extended through all flexible connections including fixture "whips", and fastened to terminals within the first junction boxes on either side of the flexible length. Refer to Section 265100 for flexible connections to lighting fixtures

2.3 METAL CONDUIT

- A. Manufacturers:
 - 1. Allied.
 - 2. LTV/Republic.
 - 3. Steelduct.
 - 4. Wheatland.
 - 5. Owner Approved Equal.
- B. Rigid Steel Conduit: ANSI C80.1; hot dipped galvanized or electro-galvanized steel.
- C. Intermediate Metal Conduit (IMC): Rigid steel.
- D. Fittings and Conduit Bodies: ANSI/NEMA FB 1; all steel fittings of threaded joints.

2.4 FLEXIBLE METAL CONDUIT

- A. Description: Interlocked galvanized steel construction.
- B. Fittings: ANSI/NEMA FB 1; steel or malleable iron.
- C. Minimum Size: 1/2 inch (13 mm), unless otherwise specified.

2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. Anaconda.
2. American Brass.
3. Electri-Flex Company.
4. Owner Approved Equal.

B. Description: Interlocked galvanized steel construction with UL PVC jacket.

C. Fittings: ANSI/NEMA FB 1; steel or malleable iron.

2.6 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied.
2. LTV/Republic.
3. Steelduct.
4. Wheatland.
5. Owner Approved Equal.

B. Description: ANSI C80.3; hot dipped or electro-galvanized tubing.

2.7 EMT FITTINGS AND CONDUIT BODIES

A. Manufacturers:

1. Appleton.
2. Crouse Hinds/Midwest.
3. OZ/Gedney.
4. Racor.
5. Steel City.
6. T&B
7. Owner Approved Equal.

B. Description: ANSI/NEMA FB 1; steel or malleable iron, compression type with insulated throat.

1. Set-screw type fittings are not acceptable.
2. Die-cast fittings of pot metal are not acceptable.

2.8 NONMETALLIC CONDUIT

A. Manufacturers:

1. Carlon.
2. Sedco.
3. Owner Approved Equal.

B. Description: NEMA TC 2; Schedule 40 PVC, type EB for concrete encasement.

C. Fittings and Conduit Bodies: NEMA TC 3; material to match conduit.

2.9 EXPANSION FITTINGS

A. Provide a suitable expansion fitting in each concealed or exposed electrical raceway crossing a building expansion joint. Fittings shall be complete with bonding jumper and clamps.

B. Manufacturers: OZ/Gedney, Crouse-Hinds and Appleton.

2.10 BUSHINGS

A. Bushings for conduits 1 inch and smaller shall be self-extinguishing thermoplastic grounding type – 150 degrees C. and insulating type.

B. Bushings for conduits 1 ¼ inch and larger shall be malleable iron body with 150 degree C. insulating ring and shall be grounding type. Insulating material shall be locked in place and non-removable.

PART 3 – EXECUTION

3.1 INSTALLATION - CONDUIT

A. Install conduit in accordance with NECA "Standard of Installation."

B. Install nonmetallic conduit in accordance with manufacturer's instructions.

C. Arrange conduit to maintain headroom and present neat appearance.

D. Route conduit parallel and perpendicular to walls.

E. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

F. Route conduit in and under slab from point-to-point.

G. Do not cross conduits in slab.

- H. Maintain adequate clearance, minimum of 12 inches, between conduit and piping.
- I. Maintain 12 inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.
- J. Cut conduit square using saw or pipecutter; de-burr cut ends.
- K. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate bends in metal conduit larger than 2 inch size, or provide factory elbows.
- L. Provide suitable pull string in each empty conduit except sleeves and nipples.
- M. Ground and bond conduit under provisions of Section 260526.
- N. Identify conduit under provisions of Section 260553.
- O. In general, conduits shall be run concealed. Where exposed conduit runs are shown or required, they shall be run parallel to building construction and shall be suitably supported at required intervals.
- P. Conduits run to and from cabinets shall be run neatly, in accurate manner, and shall emerge from the floors and ceilings at right angles thereto.
- Q. Conduit stub-ups and stub-downs shall be arranged in a neat and orderly manner and shall emerge at right angles to floors or ceilings.
- R. In equipment spaces, such as fan rooms, plenums, etc., conduits and outlets may be exposed, but shall avoid interference with ventilating ducts, piping, etc.
- S. Exposed conduit installed on or adjacent to ventilating ducts shall be installed after the ducts are in place, and shall be run from ceiling or wall junction boxes in such manner as to retain accessibility to junction box covers and to permit future removal or replacement of ducts.
- T. Non-metallic conduit changes of direction shall be made by use of large radius bends, sweeps, or offsets.
- U. Steel conduit bends of same size as the non-metallic conduit shall be used to terminate non-metallic conduit underground runs above ground.
- V. Steel conduit sections of the same size as the non-metallic conduit shall be used to terminate non-metallic conduit runs in handholes, power pits, building line, etc. Length of steel conduit sections shall extend a minimum of 5 feet from outside face of handhole, or power pit, building line, etc.
- W. All underground conduit shall be water-tight using water-tight compounds and fittings.

3.2 INSTALLATION - FITTINGS

- A. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- B. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- C. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- D. Provide conduit seals for conduits and ducts entering/exiting hazardous locations.
- E. Provide suitable fittings to accommodate expansion and deflection where conduit crosses expansion joints and in each uninterrupted run of horizontal or vertical conduit in excess of 100 feet. Fittings shall be complete with bonding jumpers and clamps.
- F. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- G. Double locknuts shall be used at termination of IMC and HWG conduit in knock-out openings.
- H. Ends of conduits shall be equipped with insulating bushings for 1 inch and smaller and insulated metallic bushings for 1-1/4 inches and larger. Ends of conduit shall be temporarily capped prior to installation and during construction to exclude foreign material.
- I. Joints in conduit run underground or in slabs on ground shall be made watertight with copper base anti-corrosive conductive compound.
- J. Provide wall flanges and gasketing on conduits entering fan housings to minimize air leakage at points of penetration of housing.
- K. No running threads shall be cut or used.
- L. Transitions between non-metallic and steel conduit shall be made by means of conduit manufacturer's standard adapters.

3.3 INSTALLATION - SUPPORTS

- A. Arrange supports to prevent misalignment during wiring installation.
- B. Conduit embedded in underground concrete shall be adequately supported to prevent movement during concrete placement. Compact gravel fill and soil below underground conduit or support conduit with suitable separators and chairs prior to placing concrete.

- C. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Group related conduits; support using conduit rack. Construct rack using steel channel.
- E. Fasten conduit supports to building structure and surfaces under provisions of Section 260529.
- F. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports
- G. Do not attach conduit to ceiling support wires.
- H. Bring conduit to shoulder of fittings; fasten securely.
- I. Conduit risers shall be rigidly supported on the building structure, using appropriate supports only.
- J. Installation of conduit in concrete structure shall conform to the requirements of ACI 318.
- K. Sizes and spacing of conduits run in concrete shall be reviewed by the Architect/Engineer. Conduit shall not be reactive with the concrete. Conduit shall not cross-over one another.
- L. Conduit embedded in concrete structure shall have a minimum cover of 1 inch to parallel concrete surface, or as otherwise specified. Parallel conduit runs within concrete shall have not less than 4 inches clear space between conduits, or spacing equal to 2 outside diameters, whichever is greater.
- M. Conduit embedded in concrete shall be located by the trades concerned, between the bottom and top reinforcement. Conduit parallel to reinforcing steel shall not be supported by or tied directly to the steel. It shall be supported on bar chairs or support bars provided solely for that purpose.
- N. Conduits and other electrical items shall not be fastened to or supported from ventilating ducts, but shall be separately supported. The method of supporting and details of the supporting members shall be reviewed by the Architect/Engineer. In no case shall screws penetrate the sheet metal of the ducts.
- O. Exposed conduits run on surfaces shall be supported according to code and within 3 feet of each outlet, junction box, or cabinet, by galvanized malleable conduit clamps and clamp backs. Suspended conduits shall be supported every 5 feet by conduit hangers and round rods, or where 2 or more conduits are run parallel, by trapeze hangers suitably braced to prevent swaying.
- P. Screws for exposed work shall be stainless steel.
- Q. Cadmium plated steel screws may be used for interior unexposed dry locations only.

- R. All trenching, coring, backfilling and compacting for the electrical installation is by the electrical contractor. All excess debris from trenching and coring shall be removed from the site by the electrical contractor.
- S. All underground site work conduit shall be minimum 36" below finished grade or below frost line whichever is deepest. Unless noted otherwise, underground conduits shall be PVC Schedule 40. Galvanized rigid steel conduits will be used under concrete areas and thru footing, foundation, etc.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods under the provisions of the General Requirements.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.

END OF SECTION 260532

SECTION 260533 - BOXES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specification Sections, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Wall and ceiling outlet boxes.
- B. Floor boxes.
- C. Pull and junction boxes.

1.3 RELATED SECTIONS

- A. Section 260925 - Wiring Devices.
- B. Section 260526 - Grounding and Bonding.
- C. Section 260529 - Supporting Devices.
- D. Section 260553 - Electrical Identification

1.4 REFERENCES

- A. NECA (National Electrical Contractor's Association) Standard of Installation.
- B. NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- C. NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
- E. Local electrical code.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirement Specification Sections and Sections 260500.
- B. Product Data: Provide for outlet boxes and floor boxes.
- C. Project Record Documents: Record actual locations and mounting heights of outlet boxes, floor boxes, junction boxes, and pull boxes.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of local electrical code.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.8 COORDINATION

- A. Coordinate under provisions of the General Requirement Specification Sections and Section 260500.
- B. Field Measurements: Verify that field measurements are as shown on Drawings.
- C. Field Locations: Verify locations of boxes prior to installation.

PART 2 – PRODUCTS

2.1 OUTLET BOXES

- A. Manufacturers:
 - 1. Appleton
 - 2. Raco
 - 3. Steel City
 - 4. Owner Approved Equal.

- B. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel with knockouts.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
 - 2. Concrete Ceiling Boxes: Concrete type.
- C. Cast Boxes: NEMA FB 1, Type FD, cast ferrous alloy. Provide gasketed cover and threaded hubs.
- D. Wall Plates for Finished Areas: As specified in Section 262726.

2.2 FLOOR BOXES

- A. Manufacturers:
 - 1. Hubbell
 - 2. Steel City
 - 3. Walker
 - 4. Owner Approved Equal.
- B. Floor Boxes: NEMA OS 1, fully adjustable, 1-1/2 inches deep.
- C. Material: Formed steel.
- D. Shape: Rectangular.
- E. Service Fittings: As specified in Section 262726.

2.3 FIRE RATED POKE THROUGH DEVICES

- A. Manufacturers
 - 1. Hubbell or approved equal.
- B. Description: Must be flush with floor and utilize a 4" core. Must meet a 4-hour fire rating and must meet or exceed UL514A Scrub Water Requirements. Provide IG receptacle and IG wiring where poke-through is used for an IG outlet.
- C. Poke Through Devices shall be required to have at least two 1" EMT trade size conduit stems to feed power, communication and audio visual applications.
- D. Hubbell part numbers or owner approved equal:
 - 1. SIPTFIT
 - 2. S1CFCXXX (CARPET FLANGE)
 - 3. S1TFCXXX (TILE FLANGE)
 - 4. Appropriate device subplate part number SISXXXX

2.4 PULL AND JUNCTION BOXES

A. Sheet Metal Boxes: NEMA OS 1.

1. Material: Hot-dipped galvanized steel.
2. Covers: Secured with stainless steel screws.
3. Finish: Paint interior and exterior with rust-inhibitive paint.
4. Gaskets: Provide in accordance with applicable Code.

B. Hinged Enclosures: As specified.

C. Surface Mounted Cast Metal Box: NEMA 250, flat-flanged, surface mounted junction box:

1. Material: Galvanized cast iron.
2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.

D. In-Ground Cast Metal Box: NEMA 250, Type 6, flanged, recessed cover box for flush mounting:

1. Material: Galvanized cast iron.
2. Cover: Nonskid cover with neoprene gasket and stainless steel cover screws.

E. Fiberglass Handholes: Die molded glass fiber hand holes:

1. Cable Entrance: Pre-cut 6 inch x 6 inch cable entrance at center bottom of each side.
2. Cover: Glass fiber weatherproof cover with nonskid finish.

PART 3 – EXECUTION

3.1 EXAMINATION

- #### A. Verify locations and mounting heights of floor boxes and outlets prior to rough-in.

3.2 INSTALLATION

- #### A. Install boxes in accordance with NECA "Standard of Installation."
- #### B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- #### C. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- #### D. Electrical boxes are shown on Drawings in approximate locations unless dimensioned. Adjust box location up to 10 feet if required to accommodate intended purpose.
- #### E. Box sizes shall not be smaller than that required by Code for the number and size of wires and/or conduits to be installed.

- F. Orient boxes to accommodate wiring devices oriented as specified in Section 262726.
- G. Maintain headroom and present neat mechanical appearance.
- H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- J. Plenum Ceiling Areas: Install boxes in accordance with applicable Code.
- K. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in the General Requirements.
- L. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- M. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- N. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- O. Outlet boxes for toggle switches shall be located on the strike side of the door.
- P. Use flush mounting outlet box in finished areas.
- Q. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- R. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in acoustic rated walls.
- S. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- T. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- U. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- V. Use adjustable steel channel fasteners for hung ceiling outlet box.
- W. Do not fasten boxes to ceiling support wires.
- X. Support boxes independently of conduit.
- Y. Use gang box where more than one device is mounted together. Do not use sectional box.

- Z. Use gang box with plaster ring for single device outlets.
- AA. Use cast outlet box in exterior locations and wet locations.
- BB. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- CC. Set floor boxes level.

3.3 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate installation of outlet box for equipment connected under Section 260503.

3.4 ADJUSTING

- A. Adjust installed work under the provisions of the General Requirements.
- B. Adjust floor box flush with finish flooring material.
- C. Adjust flush-mounting outlets to make front flush with finished wall material.
- D. Install knockout closures in unused box openings.

3.5 CLEANING

- A. Clean installed work under the provisions of the General Requirements Specification Sections.
- B. Clean interior of boxes to remove dust, debris, and other material.
- C. Clean exposed surfaces and restore finish.

END OF SECTION 260533

SECTION 260539 - SURFACE RACEWAYS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirements, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Surface metal raceways.
- B. Multi-outlet assemblies.
- C. Wireways.

1.3 RELATED SECTIONS

- A. Section 26 27 23 - Wiring Devices: Receptacles.

1.4 REFERENCES

- A. NECA (National Electrical Contractor's Association) Standard of Installation.
- B. NEMA WD 6 - Wiring Device Configurations.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirements and Section and 26 05 00.
- B. Product Data: Provide for surface metal raceways, multi-outlet assemblies, wireways, finishes, and accessories.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
- D. Project Record Documents: Record actual locations of surface raceway and record actual circuiting arrangements in project record documents.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of local electrical code, unless otherwise specified.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.8 COORDINATION

- A. Coordinate under provisions of the General Requirements and Section 26 05 00.
- B. Field Meetings: Coordinate within pre-installation meeting.
- C. Field Measurements: Verify that field measurements are as shown on Drawings.

PART 2 – PRODUCTS

2.1 SURFACE METAL RACEWAY

- A. Manufacturers:
 - 1. Wiremold, Mono-Systems, Hubbell or owner approved equal.
- B. Description: Steel channel with fitted cover, suitable for use as surface metal raceway.
- C. Size: As required.
- D. Finish: Buff enamel
- E. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories.

2.2 MULTIOUTLET ASSEMBLY

- A. Manufacturers:
 - 1. Wiremold Series 4000, Hubbell 4000 Series or owner approved equal.
- B. Multioutlet Assembly: Steel channel with fitted cover with pre-wired receptacles, suitable for use as multioutlet assembly.
- C. Size: As required.
- D. Receptacles: NEMA WD 6, type 5-20R, single receptacle.
- E. Receptacle Spacing: 30" O.C. unless otherwise indicated on drawings.
- F. Receptacle Color: Ivory or orange as indicated on drawings.
- G. Finish: Buff enamel.
- H. Fittings: Furnish manufacturer's standard couplings, elbows, outlet and device boxes, and connectors.

2.3 WIREWAY

- A. Manufacturers:
 - 1. Wiremold, or owner approved equal
- B. Description: General purpose type wireway.
- C. Knockouts: Manufacturer's standard.
- D. Size: As required to accommodate number of wires.
- E. Cover: Screw cover.
- F. Connector: Flanged.
- G. Fittings: Lay-in type with removable top, bottom, and side; captive screws.
- H. Finish: Rust inhibiting primer coating with gray enamel finish.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install Products in accordance with manufacturer's instructions.
- B. Use flat-head screws, clips, and straps to fasten raceway channel to surfaces. Mount plumb and level.
- C. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.
- D. Wireway Supports: Provide steel channel.
- E. Close ends of wireway and unused conduit openings.
- F. Ground and bond raceway and wireway.

END OF SECTION 260539

SECTION 260553 - ELECTRICAL IDENTIFICATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit and Pullbox markers.
- D. Directories.
- E. Signs and Diagrams.

1.3 RELATED SECTIONS

- A. Division 09 - Painting.

1.4 REFERENCES

- A. National Electrical Code.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirements and Section 260500.
- B. Product Data: Provide for nameplates, labels, and markers.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of Product.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of local electrical code, unless otherwise specified.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 NAMEPLATES

- A. Normal System Nameplates: Engraved three-layer laminated plastic, black letters on white background, identification as shown.
 - 1. Size: 1 1/4 inch by 3 inch minimum.
 - 2. Location: Each normal electrical distribution and control equipment enclosure: switchboards, motor control centers, panelboards, transformers, motor starters, disconnect switches, circuit breakers, contactors, relay panels, control panels, Cable TV, and associated apparatus. Communications control cabinets.
- B. Letter Size:
 - 1. Use 3/16 inch height lettering for identifying equipment and loads.
- C. Identification: Engraving marking.
 - 1. Switchboard, distribution panel: Equipment name and load device names.
 - 2. Branch circuit panelboard, relay panel, control panel, control cabinet: name.
 - 3. Transformer: name, primary and secondary voltage, service from.
 - 4. Motor starter, disconnect switch, individual circuit breaker, contactor: name, equipment served, service from.

2.2 LABELS

- A. Labels: Engraved device plates for individual wall switches, receptacles, and other electrical devices as shown.
- B. Locations: special purpose switches, receptacles, and other electrical devices.
- C. Identification: Engraved device covers.
 - 1. Individual switches and receptacles: use or as indicated on drawings.
 - 2. 480 Volt System: 480

2.3 WIRE AND CABLE MARKERS

- A. Description: Tape type wire markers.
- B. Locations: Each conductor at panelboard gutters, pull boxes, and each load connection.
- C. Legend:
 - 1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
- D. Color: As indicated in Section 260519.

2.4 BUS IDENTIFICATION

- A. Description: Stamped phase identification letters.
- B. Location: Switchboard, motor control center, and panelboard bus, in readily visible locations.

2.5 CONDUIT MARKERS

- A. Description: Alkyd stenciled paint.
- B. Location: Each power conduit, except branch lighting and receptacle conduits, longer than 6 feet.
- C. Spacing: At intermediate pull boxes, enclosures, etc.
- D. Legend:
 - 1. 208 Volt System: 208 – panel name – panel number.
 - 2. 480 Volt System: 480 – panel name – panel number.

2.6 FEEDER INTERMEDIATED BOX MARKERS

- A. Description: Alkyd stenciled paint.
- B. Location: On pull box, splice box, and junction box covers.
- C. Color:
 - 1. Grounding System: Green cover.
 - 2. Fire Alarm System: Red cover.

2.7 PANELBOARD DIRECTORIES

- A. Description: Type written directory of branch circuit loads.
- B. Location: At branch circuit panelboards.
- C. Legend: circuit number - load location and description.

PART 3 - EXECUTION

3.1 PREPARATION

- A. De-grease and clean surfaces to receive nameplates and labels.

3.2 APPLICATION

- A. Install nameplate and label parallel to equipment lines.
- B. Secure nameplate to equipment front using screws or rivets.
- C. Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.

END OF SECTION 260553

SECTION 260810 - ELECTRICAL DEMOLITION FOR REMODELING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions and Supplementary Conditions of the Contract of the General Requirement Specifications, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Electrical demolition: The work specified in this section includes providing labor, material, equipment, and services necessary for electrical demolition as shown on the drawings and as herein specified to accommodate new construction. The project includes demolition, relocation and replacement of existing electrical equipment, feeders, branch wiring, signal cables, etc. with new work. Contractor shall remove, reinstall or relocate that portion of the existing equipment, system, wiring, fixtures and drawings which are a part of or which applies to the electrical trade.
- B. Selective demolition including:
 - 1. Non-destructive removal of materials and equipment for reuse or salvage as indicated.
 - 2. Dismantling electrical materials and equipment made obsolete by these installations.

1.3 RELATED SECTIONS

- A. Section 260500 – Basic Electrical Provisions.

1.4 REQUIREMENTS

- A. Contractor shall provide caution and warning signs at all hazardous areas and at all door entries to construction rooms and areas during the entire construction period per IEPA law and regulations.

1.5 SEQUENCING

- A. Sequence the Work in the following order:
 - 1. Complete new or temporary system as specified.
 - 2. Cut-over to new or temporary system.
 - a. Schedule with Owner at least one week in advance.
 - b.
 - 3. Remove items specified.

1.6 SCHEDULING

- A. Schedule work to coincide with other trades and project schedule.
- B. Cease operations immediately when structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

1.7 COORDINATION

- A. Conduct demolition to minimize interference with adjacent and occupied building areas.
- B. Coordinate demolition work with the construction manager and other related trades.
- C. Coordinate and sequence demolition so as not to cause shutdown of operation of surrounding areas.
- D. Shut-down periods:
 - 1. Arrange timing of shut-down periods of system, service with Owner. Do not shut down any service, without prior written approval.
 - 2. Keep shut-down period to minimum or use intermittent period as directed by the Owner.
 - 3. Maintain life-safety system in full operation in occupied facilities, or provide notice minimum 15 working days in advance.

1.8 MAINTAIN CONTINUITY OF SERVICE

- A. Any downtime time period shall be at the convenience of the Owner and approved by the General Contractor. Contractor shall give a minimum of 15 working days prior written notice to the General Contractor in advance of any desired shutdown. Prior written notice shall include a schedule for downtime, work to be performed. All downtime period shall be on weekends or off hours with exact time period approved in advance in writing by the General Contractor. Coordinate an overall schedule that is to be submitted and approved by the General Contractor.

- B. An electrician shall be on the premises when any trade is working in close proximity to live equipment or within electric rooms during renovation by any trade.
- C. All premium time, overtime, labor, material and equipment costs required to accomplish the above shall be included in the Contractor's bid proposal.

1.9 PROTECTION

- A. Perform removal of equipment and related components, in such manner as to eliminate hazards to persons and property; to minimize interference with use of adjacent areas, utilities and structures or interruption of use of such utilities; and to provide free passage to and from such adjacent areas of structures.
- B. Provide safeguards, including warning signs, barricades, temporary fences, warning lights, and other similar items that are required for protection of all personnel during demolition and removal operations.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify field measurements and circuiting arrangements.
- B. Verify that abandoned wiring and equipment serve only abandoned facilities.
- C. Demolition Drawings are based on casual field observation and existing record documents. Contractor may purchase a copy of existing record documents for reference during bidding or construction. Report discrepancies to Architect/Engineer before disturbing existing installation. Verify existing conditions before performing any work.
- D. Beginning of demolition means installer accepts existing conditions.

- E. Where work is concealed above ceiling spaces which are to be removed, cut opening in ceiling and examine condition above the ceiling. If work requires certain devices to remain and the ceiling is supporting the device, contractor shall support device adequately from floor slab above, prior to ceiling demolition or at his option, remove the device and reinstall completely.
- F. Contractor shall verify existing circuit feeding each receptacle in demolition and remodeled area and document in the panelboard directory on record drawings. Contractor shall identify to Architect/ Engineer any wiring in poor condition or overload condition which exists.

3.2 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
- B. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- C. Existing Electrical Service: Maintain existing system in service until new system is ready for installation. Obtain permission from Owner at least 15 working days before completely disabling system. If outage lasts more than 24 hours, Contractor shall provide and install a generator for temporary service. Temporary service shall be provided until new service is in operation. Refer to Division 1 for temporary power. Make temporary connections to maintain service in areas adjacent to work area while switchovers are completed.
- D. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Notify Owner and local fire service at least 24 hours before partially or completely disabling system. Minimize outage duration. Make connections to maintain service in existing areas not to be remodeled.
- E. Existing central intercom/speaker systems: Maintain existing system in service until new or upgraded systems are accepted. Disable system only to make switchover and connections. Notify Owner at least 24 hours before partially or completely disabling systems. Minimize outage durations. Make temporary connections to maintain service in areas adjacent to work area.
- F. Existing Clock/Bell System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify Owner and Architect/Engineer at least 24 hours before partially or completely disabling system. Minimize outage duration. Make connection to maintain service in existing areas not to be remodeled.
- G. Existing Security/Camera System: Maintain existing system in service. Disable system only to make switchovers and connections. Notify Owner and Architect/Engineer at least 24 hours before partially or completely disabling system. Minimize outage duration. Make connection to maintain service in areas not to be remodeled.
- H. Coordinate utility service outages with Utility Company.

- I. Existing Suspended Ceiling System: Disconnect and remove light fixtures, fire alarm devices, speakers and conduit, etc. to facilitate demolition work.
- J. Protect adjacent materials that are to remain. Install and maintain dust and noise barriers to keep dirt, dust and noise from being transmitted to adjacent areas. Remove protection and barriers after demolition operations are complete.
- K. Locate, identify, and protect electrical services passing through demolition areas and serving other areas outside the demolition limits. Maintain services to areas outside demolition lines. When services must be interrupted or relocated, install temporary and/or permanent services for affected areas. Services originating within demolition limits and serving areas outside demolition limits shall be maintained.

3.3 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Demolish and extend existing electrical work under provisions of the General Requirement Specification Sections and this Section.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes to source of supply. Cut concealed conduit flush with walls and floors, and patch surfaces. Remove conduit within walls to be removed. Provide cap on abandoned conduits on each end. If the existing concealed conduits are in conflict with new work remove them.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets which are not removed.
- F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- H. Disconnect and remove abandoned panelboard and distribution equipment.
- I. Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- J. Extend existing installations and provide alterations using acceptable materials and methods compatible with existing electrical installations and in accordance with the equipment manufacturers recommendations.
- K. Remove, demount, and disconnect existing electrical materials and equipment indicated to be moved and salvaged, and deliver materials and equipment to the location designated for storage. Salvaged material shall be stacked, boxed or crated in such a manner as to prevent damage.

- L. Any existing circuits or equipment not shown on drawings and which are logically expected to be continued in service and which may be interrupted or disturbed during construction shall be reconnected in an approved manner. Check and maintain continuity for all existing devices/equipment to remain. In addition, any existing circuits or equipment which may require relocation or rerouting as a result of the work of this project shall be done by the this Contractor with no additional compensation. Provide blank cover plates on empty outlets which are to remain.
- M. Provide new lighting switch(es) so each lighting area affected by new work shall be controlled locally.
- N. Provide code required disconnects to existing and relocated, equipment when affected by new work.
- O. Where existing equipment, devices and fixtures are to remain but are affected by new work such as replacement of ductwork and piping, reconditioning of walls, ceilings, roofs and floors of relaminating of counters, cabinets and casework, disconnect these items and add extension rings, clean and reinstall same in line with new walls, ceilings and surfaces. Note that certain work (such as replacement of piping, ductwork, etc) may be outside the limit to direct renovation. Electrical contractor shall review drawings of other trades for such work and incorporate that in his scope of work. Provide all necessary materials and labor and rewire in accordance with present code requirements.
- P. Owner shall have the option of selecting any or all of the items, including copper wiring, which are designated to be removed by the contractor as salvage for the Owner. Contractor shall remove such items with extreme care and return such items to the Owner. Any equipment which the Owner does not want will become the property of the contractor and promptly removed from the site.
- Q. All cutting and patching, relocating of any equipment, lighting fixtures, conduit, piping, etc., necessary for any work under this contract will be by the respective contractors unless noted otherwise in the architectural sections.
- R. Reference shall be given to Owner to keep any removed device, fixture or equipment. If Owner does not want to keep any of them, dispose them as required.
- S. Ballasts manufactured prior to 1980 containing PCB's and lamps containing mercury shall be disposed of by a federal or state E.P.A. approved method and in accordance with specifications.
- T. HID and fluorescent lamps containing mercury shall be disposed of by a federal or state E.P.A. approved method and in accordance with specifications.
- U. Before disconnecting, verify with Owner removal or relocation of all existing devices/equipment. No additional cost will be permitted for lack of such verification.
- V. All existing outlet, junction boxes, conduit and wire which is supported by the existing ceiling system will be resupported to the building construction. New wiring and outlets will be supported from the building construction.

- W. This contractor shall coordinate all his work with the other contractors at the job site before removing existing electrical and installing new items.
- X. Equipment removal in certain locations may require the installation of a junction box to reconnect circuits that remain in operation. Extend conduit and wiring as required to maintain power to remaining equipment.
- Y. It is the intent of the electrical demolition drawing(s) to indicate areas in which electrical equipment, conduit, lighting fixtures, devices, etc. are to be removed to allow for the renovation phase of construction. The electrical demolition plan is for reference purposes only and it is not intended to be the sole source of existing conditions.
- Z. Electrical Contractor shall be responsible for his own clean-up throughout the course of the demolition work. In the event he fails to provide such clean-up the Architect/Engineer will direct the clean-up to be performed by another contractor and the electrical contractor will be back-charged as deemed appropriate by Architect/Engineer.
- AA. The contractor performing the demolition work, shall remove no more than 8" of building material around each device being demolished.
- BB. Disconnect all electrical connections to mechanical, plumbing and architectural equipment for removal by others. Remove all starters, disconnect switches and related conduit and wiring serving such equipment which is indicated to be removed. Refer to mechanical, plumbing and architectural drawings for exact requirements.
- CC. It shall be the contractors option to reuse existing concealed conduit and flush mounted backboxes where applicable. If existing conduit and/or backboxes are utilized it shall be the electrical contractor's responsibility to provide additional supports and fittings required to conform to the specification.
- DD. Remove all exposed abandoned and exposed non-required conduits together with their associated wires. Remove inaccessible conduits together with all their wires if they are in conflict with renovation work.

3.4 CLEANING AND REPAIR

- A. Clean and repair existing materials and equipment which remain or are to be reused.
- B. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised, existing circuiting arrangement and room numbers served.

- C. Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace lamps, ballasts, and broken electrical parts.
- D. Cabinets and Cover Plates: Where existing cabinets and cover plates are to be used for installation of new panelboard interiors, contractor shall clean exposed surfaces and paint area near cabinet and cover plates, removed from panelboard, to match existing condition. Contractor shall replace cabinet or coverplate if necessary to accommodate new work.

3.5 FLOOR AND WALL OPENINGS

- A. Opening through floors and walls where piping or equipment has been removed shall be sealed to maintain any fire ratings and to seal off cold, smoke and toxic fumes. Use appropriate sealing materials and methods to maintain existing rating of the floor and wall.

3.6 DAMAGE TO OTHER WORK

- A. The Contractor shall be held responsible for any damage caused to existing installations not pertinent to the Contract. The cost of repairs to such damaged work shall be charged against the Contractor.

3.7 CLEAN-UP

- A. On completion of work of this section and after removal of all debris, site shall be left in clean condition satisfactory to the Construction Manager. Clean-up shall include off the premises disposal of all items and materials not required to remain the property of the Contractor as well as all debris and rubbish resulting from demolition operations.
- B. Debris, including brick, asphalt, concrete, stone and similar materials shall become property of Contractor and shall be disposed of by the Contractor, off the property. Remove concrete foundations, conduits, anchor bolts, and all appurtenances.

3.8 INSTALLATION

- A. Install relocated materials and equipment under the provisions of the General Requirement Specification Sections.

END OF SECTION 260810

SECTION 260923 - OCCUPANCY SENSORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement of the Specifications, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 16 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Occupancy sensors.
- B. Power pack.

1.3 RELATED SECTIONS

- A. Section 26 05 33 - Boxes.

1.4 REFERENCES

- A. Underwriters Laboratories Inc. – UL508, UL916.
- B. ISO 9001 Quality Standard
- C. NOM Certification Mark
- D. American National Standards Institute
- E. Institute of Electrical and Electronic Engineers

1.5 SUBMITTALS

- A. Submit manufacturer's standard catalog data giving all application, wiring, and installation information on basic components. Provide test data and/or samples as required to demonstrate conformance with PART 2 of this specification.
- B. Submit a lighting plan clearly marked by manufacturer showing proper product, location and orientation of each sensor

- C. Submit any interconnection diagrams per major subsystem showing proper wiring.
- D. Shall include a load schedule which indicates the actual connected load and load type per circuit, circuits and their respective control zones, circuits that are on emergency (if applicable), and the capacity, phase, and corresponding circuit numbers (per the electrical drawings).
- E. Shall include all exceptions taken to the Specification.

1.6 APPROVALS

- A. Prior approval is required for alternate proposals. For pre-approval, provide all the information listed under Submittals a minimum of ten (10) working days prior to initial bid date.
- B. Complete Catalog data, specifications, and technical information on alternate equipment must be furnished to the Architect and Owner at least ten business days in advance of the bid date.

1.7 QUALITY ASSURANCE

- A. Manufacturer shall have a minimum of 10 years continuous experience with occupancy sensors.
- B. Occupancy sensors shall be UL, CUL or NOM listed (where appropriate). Manufacturer shall provide evidence of compliance on request.
- C. Manufacturer shall have their quality system registered to the ISO 9001 Quality Standard, including in-house engineering for all product design activities. Due to the exclusion of the Design Control element, ISO 9002 Registration is not acceptable.
- D. All devices shall be covered by a minimum one-year warranty.

1.8 PROJECT/SITE CONDITIONS

- A. Lighting controls shall operate in an ambient temperature range of 0°C (32°F) to 40°C (104°F) and less than 90% non-condensing relative humidity without the requirement of a regularly scheduled maintenance program.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Lutron.
- B. Hubbell.
- C. Leviton.
- D. Wattstopper.
- E. Owner Approved Equal.

2.2 CEILING MOUNTED OCCUPANCY SENSOR

- A. The sensor shall be manufactured by a firm having a minimum of five years of experience in the sensor and lighting control industry.
- B. Sensors and related relays shall be compatible with the specific lighting types controlled.
- C. All sensors shall be of the same manufacturer, mixing brands of sensors is not acceptable.
- D. All sensors and related equipment shall have a five year warranty.
- E. All sensors and control modules shall be listed by Underwriters Laboratories.
- F. Sensor shall incorporate ultrasonic and infrared technologies in a single unit for corridor or rooms. For washroom and stair only ultrasonic type sensor shall be used.
- G. Sensor shall be Class 2, low voltage; capable of mounting in the ceiling for maximum coverage.
- H. Sensor shall use internal microprocessor for motion signal analysis and automatic self-adjustment.
- I. Sensor shall have automatic self-adjustment algorithm which adjusts timer and sensitivity settings to maximize performance and minimize energy usage.
- J. Sensor shall have manual time-out adjustment from 8 minutes to 32 minutes and automatic time-out from 8 minutes to 100 minutes.
- K. Sensor shall have test time-out setting of 8 seconds, with automatic return to 8 minutes after one hour if sensor is left in test mode.
- L. Sensor's microprocessor shall automatically reduce either PIR or ultrasonic sensitivity in response to false on condition.

- M. Sensor microprocessor will automatically monitor PIR background threshold signal level and makes corresponding sensitivity adjustments automatically.
- N. Sensor microprocessor algorithm shall incorporate automatic adaptation to continuous airflow.
- O. Infrared lens shall have 360 degree field of view. Two types of lens shall be available, standard and extra dense.
- P. Sensor shall have a variety of mask inserts for PIR coverage rejection to prevent false tripping.
- Q. Sensor shall have a rugged plastic housing, white in color.
- R. Transducers shall be protected from tampering.
- S. Sensor shall have manual adjustments for timer and sensitivities and override switches to force manual adjustment mode.
- T. Sensor shall have adjustable sensitivity from 0% to 100% for both ultrasonic and infrared.
- U. Controls shall be behind cover to resist tampering. All adjustments shall be accessible from the front of the sensor.
- V. Sensor shall be available with a photocell adjustment from 20 to 3,000 Lux.
- W. Sensor shall provide internal operating status and settings confirmation via LED motion lamp indicator.
- X. Sensor shall have two (if 180 degree) or three (if 360 degree) real time LED motion indicators visible from the front of the unit: Red = Infrared; green = ultrasonic.
- Y. Sensor shall be available with a set of form 1C isolated dry relay contacts for interfacing sensor to auxiliary systems. Relay shall provide common, normally open and normally closed connections.

2.3 WALL MOUNTED OCCUPANCY SENSOR

- A. Sensor shall utilize active ultrasonics to detect motion.
- B. Sensor shall have two ultrasonic transmitters and one receiver, each 18mm in diameter, and shall operate at 32.768kHz.
- C. Sensor shall incorporate an inrush current limiter circuit to protect the relay contacts.
- D. Sensor shall utilize a dry relay contact for control of the lighting load.
- E. Sensor shall have a time out adjustment from 8 seconds to 32 minutes. Timer shall be linear and controlled by a timer chip.

- F. Sensor shall have automatic sensitivity adjustment and be microprocessor controlled.
- G. Sensor shall have automatic gain setback to reduce the sensitivity after the sensor has turned off the lighting to prevent false tripping.
- H. Sensor shall have transmitter control adjustments to prevent false tripping from hallway traffic.
- I. Sensor shall have a 180 degree field of view, coverage up to 800 square feet, and shall detect six inches of hand movement towards the sensor at a distance of 22 feet. Sensor shall detect body motion towards the sensor at a distance of 32 feet.
- J. Sensor shall operate at 120VAC and 277VAC.
- K. Sensor shall have automatic on/off controls and also a manual override switch to disconnect power to the lighting load.
- L. Sensor shall have a real time motion indicator on the front of the unit.
- M. Sensor shall mount to a single or double gang switch box.
- N. Sensor shall have a high impact injection molded housing.
- O. Sensor shall be available with a second isolated dry relay for control of a second circuit. Relay shall be rated for 600 watts at 120VAC and 1400 watts at 277VAC. Applications shall include restroom fans.
- P. Sensor for restroom application shall be tamper resistant, incorporation a recessed automatic to off switch.

2.4 OCCUPANCY SENSOR POWER/CONTROL PACK

- A. Control module shall consist of a DC power supply and a dry contact relay for switching a lighting load.
- B. Control module shall be available in versions to accept 120, 230, 277 and 347VAC line voltages.
- C. Output shall be 24VDC nominal, and shall be inherently safe, low voltage, limited power output (Class 2).
- D. Output shall supply 100mA current, in addition to current consumed internally to operate internal relay.
- E. Relay shall utilize normally open, silver alloy dry contacts, and shall be rated for a 20A ballast load at 120V, 230V, 277V and 347V.
- F. Relay function shall not require more than 5 mA control current to operate.

- G. Control module shall have line voltage wiring, consisting of input voltage and relay contact connections, exiting from one end, and low voltage DC connections, consisting of ground, power, and control wires, exiting from the other end.
- H. Control module shall be sized to fit inside a standard 4" X 4" junction box.
- I. Control module shall be equipped with a ½ " EMT threaded male fitting on the line voltage end, such that it may be mounted to the outside of a junction box with the line voltage wiring internal to the box and the low voltage wiring external.
- J. Slave module shall be available for switching additional circuits. Slave module has same
- K. construction and specifications as control module except without power supply function.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. It shall be the contractor's responsibility to locate and aim sensory in the correct location required for a complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room.
- B. Contractor shall furnish all equipment, labor, system setup and other services necessary for the proper installation of the products/system as indicated on the drawings and specified herein.
- C. Devices shall be installed utilizing manufacturer's recommended application, wiring and installation instructions.
- D. Proper judgment shall be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitation or interference of structural components. The contractor shall also provide at the owner's facility, the training necessary to familiarize the owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

3.2 FIELD QUALITY CONTROL

- A. Locate sensor such that it provides the best coverage.
- B. Adjust settings per manufacturer's recommendations.

END OF SECTION 260923

SECTION 262413 - FUSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Fuses.
- B. Spare fuse cabinet.

1.3 REFERENCES

- A. Local Electric Code.
- B. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.4 SUBMITTALS

- A. Submit under provisions of the General Requirements and Section 260500.
- B. Product Data: Provide data sheets showing electrical characteristics including time-current curves.
- C. Manufacturers Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
- D. Project Record Documents: Record actual fuse sizes in project record documents.
- E. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.6 REGULATORY REQUIREMENTS

- A. Conform to requirements of local electrical code.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.7 COORDINATION

- A. Coordinate under provisions of the General Requirements and Section 260500.

1.8 EXTRA MATERIALS

- A. Provide two fuse pullers.
- B. Provide spare fuses as specified.

PART 2 - PRODUCTS

2.1 FUSES

- A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
- B. Voltage: Provide fuses with voltage rating suitable for circuit phase-to-phase voltage.
- C. Interrupting Rating: 200,000 rms amperes.
- D. Coordination: Provide fuses for properly coordinated system of overcurrent protection.

2.2 MOTOR AND DRY TYPE TRANSFORMER LOAD FUSES

- A. Description: 600 amperes and smaller, 250 volts or less, Class RK5.
 - 1. Manufacturers (RK5):
 - a. Bussmann Fusetron FRN-R
 - b. Gould Shawmut.
 - c. Owner Approved Equal.

B. Description: 601 amperes and larger, 250 volts or less, Class L.

1. Manufacturers (L):

- a. Bussmann KRP-C
- b. Gould Shawmut
- c. Owner Approved Equal.

C. Description: 600 amperes and smaller, 600 volts or less, Class RK5.

1. Manufacturers (RK5):

- a. Bussmann Fusetron FRS-R
- b. Gould Shawmut
- c. Owner Approved Equal.

2. Manufacturers (J):

- a. Bussmann Low Peak LPJ
- b. Gould Shawmut
- c. Owner Approved Equal.

D. Description: 601 amperes and larger, 600 volts or less, Class L.

1. Manufacturers (L):

- a. Bussmann KRP-C
- b. Gould Shawmut
- c. Owner Approved Equal.

2.3 LIGHTING AND HEATING LOAD FUSES

A. Description: 600 amperes and smaller, 250 volts or less, Class RK1, RK5.

1. Manufacturers (RK5-time delay):

- a. Bussmann Fusetron FRN-R
- b. Gould Shawmut
- c. Owner Approved Equal.

2. Manufacturers (J-time delay):

- a. Bussman LPJ
- b. Gould Shawmut
- c. Owner Approved Equal.

- B. Description: 601 amperes and larger, 250 volts or less, Class L.
1. Manufacturers (L-time delay):
 - a. Bussmann KRP-C
 - b. Gould Shawmut
 - c. Owner Approved Equal.
 2. Manufacturers (L-non-time delay):
 - a. Bussmann KTU
 - b. Gould Shawmut
 - c. Owner Approved Equal.
- C. Description: 600 amperes and smaller, 600 volts or less, Class RK1, RK5.
1. Manufacturers (RK1-time delay):
 - a. Bussmann Low Peak LPS-RK
 - b. Gould Shawmut
 - c. Owner Approved Equal.
 2. Manufacturers (RK5-time delay):
 - a. Bussmann Fusetron FRS-R
 - b. Gould Shawmut
 - c. Owner Approved Equal.
 3. Manufacturers (J-time delay):
 - a. Bussmann LPJ
 - b. Gould Shawmut
 - c. Owner Approved Equal.
- D. Description: 601 amperes and larger, 600 volts or less, Class L.
1. Manufacturers (L-time delay):
 - a. Bussmann KRP-C
 - b. Gould Shawmut
 - c. Owner Approved Equal.
 2. Manufacturers (L-non-time delay):
 - a. Bussmann KTU
 - b. Gould Shawmut
 - c. Owner Approved Equal.

2.4 SPARE FUSE CABINET

- A. Description: Wall-mounted lockable metal cabinet, with hinged cover suitably sized to store spare fuses and fuse pullers specified.
- B. Identification: Stencil alkyd paint on front cover - "SPARE FUSES".
- C. Provide spare fuses.
 - 1. Fuses 100 ampere or smaller: Provide one standard spare package of each size, type, and ampere rating as actually installed on the job.
 - 2. Fuses over 100 amperes: Provide 6 spare fuses of each size, type and ampere rating as actually installed in switchboards, distribution panels, motor control centers, and fused disconnect switches.
- D. Cabinet shall contain a typewritten list of fuse types, amperages, and quantities furnished as spares. List shall include the names, addresses, and telephone numbers of at least 2 local electrical supply firms which stock such fuses.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fuses in accordance with manufacturer's instructions.
- B. Install fuse with label oriented such that manufacturer, type, and size are easily read.
- C. Install spare fuse cabinet in main electrical area.
- D. Do not install parallel sets of fuses for any single phase.
- E. Replace fuses blown during construction and during testing.

END OF SECTION 262413

SECTION 26 24 15 - SWITCHBOARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and Division 1 of the Specifications, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Switchboards.
- B. Switchboard accessories.

1.3 RELATED SECTIONS

- A. Section 26 05 26 - Grounding and Bonding.
- B. Section 26 05 29 - Supporting Devices
- C. Section 26 05 53 - Electrical Identification.

1.4 REFERENCES

- A. NECA - (National Electrical Contractors Association) Standard of Installation.
- B. NEMA AB 1 - Molded Case Circuit Breakers.
- C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- D. NEMA PB 2 - Dead Front Switchboards.
- E. NEMA PB 2.1 - Instructions for Safe Handling, Installation, Operation and Maintenance of Deadfront Switchboards Rated 600 Volts or Less.
- F. National Electrical Code.

- G. UL 98 - Performance Requirements, 30-1200 amp switches.
- H. 489 – Molded Case Circuit Breakers.
- I. UL 891 – Dead front Switchboards.

1.5 SUBMITTALS

- A. Submit under provisions of Division 1 and Section 26 05 00.
- B. Product Data: Provide electrical characteristics including voltage, frame size and trip ratings, fault current withstand ratings, and time-current curves of all equipment and components. Provide manufactures written recommendations for storage and protection, and installation and field test requirements.
- C. Shop Drawings: Indicate utility metering transformer compartment location and dimensions; outline and support point dimensions; front and side views of enclosure; overall dimensions; conduit entrance locations; overcurrent protective devices arrangement and sizes; nameplate legends; electrical ratings; size, number, and ampacity of bus bars per phase, neutral, and ground; switchboard bus diagrams indicating connections and instrument details; and concrete pad dimensions.
- D. Test Reports: Indicate results of factory production tests.
- E. Manufacturers Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
- F. Project Record Documents: Record actual locations of switchboards in project record documents.
- G. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended procedures and intervals for maintenance including bus connection tightening and cleaning of equipment.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum fifteen years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of National Electrical Code, unless otherwise specified.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.8 COORDINATION

- A. Coordinate under provisions of Division 1 General Requirements and Section 26 05 00.
- B. Field Measurements: Verify that field measurements are as shown on Drawings. Contractor shall make necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in local electrical code. If the switchboard can not fit in the indicated space, the contractor shall obtain that from another specified manufacturer.
- C. Field Locations: Verify locations of switchboards prior to rough-in.

1.9 DELIVERY, STORAGE, PROTECTION, AND HANDLING

- A. Deliver in 48 inch maximum width shipping splits, individually wrapped for protection and mounted on shipping skids. Coordinate maximum shipping sizes with the electrical contractor.
- B. Contractor shall store, protect and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals.
- C. Contractor shall inspect and report concealed damage to carrier within 48 hours.
- D. Contractor shall store in a clean, dry space. Cover with heavy canvas or plastic to keep out dirt, water, construction debris and traffic. Heat enclosures to prevent condensation.
- E. Contractor shall handle in accordance with manufacturer's recommendations to avoid damaging equipment, installed devices, and finish.

1.10 EXTRA MATERIALS

- A. Submit extra materials under provisions of Division 1 General Requirements and 26 05 00.

PART 2 - PRODUCTS

2.1 SWITCHBOARDS

- A. Switchboard shall have front access only.
- B. Load balance.
 - 1. Load balance: Distribute loads for maximum of 10 percent difference.
- C. Switchboard, and associated circuit breakers, shall be of the same manufacturer.

D. Switchboard Manufacturers:

1. Cutler-Hammer/Westinghouse
2. GE.
3. Square D
4. Siemens.
5. Owner Approved Equal.

E. Circuit Breaker and Switch Manufacturers:

1. Cutler-Hammer/Westinghouse
2. GE.
3. Square D
4. Siemens.
5. Owner Approved Equal.

2.2 COMPONENTS

A. Refer to Contract Documents for actual layout and location of equipment and components; current ratings of devices, bus bars, and components; voltage ratings of devices, components and assemblies; interrupting and withstand of devices, buses and components and other required details.

B. Standard Features:

1. Switchboards shall be fully self-supporting structures with vertical sections bolted together to form required arrangement.
2. Switchboard(s) shall be NEMA 1 deadfront construction.
3. Switchboard frame shall be die formed, 12 gauge steel with reinforced corner gussets. Frame shall be rigidly bolted to support cover plates (code gauge steel), bus bars and installed devices during shipment and installation.
4. All sections may be rolled, moved or lifted into position. Switchboards shall be capable of being bolted directly to the floor without the use of floor sills.
5. All switchboard sections shall have open bottoms and removable top plate(s) to install conduit.
6. Switchboard sections shall be front access only, and rear aligned for placement against a wall.
7. Switchboards shall be UL listed to accept a combination of circuit breakers and fusible switches, factory or field installed.
8. Provide hinged doors over metering compartments and individually mounted device compartments. All doors shall have concealed hinges and be fastened by hex head bolts.
9. Switchboard protective devices shall be furnished as listed on drawings and specified herein, including interconnections, instrumentation and control wiring. Switchboards and devices shall be rated for voltage and frequency listed on the drawings.
10. Switchboard current ratings, including all devices, shall be based on a maximum ambient temperature of 25 degrees C per UL Standard 891. With no derating required, temperature rise of switchboards and devices shall not exceed 65 degrees C in a 25 degree C ambient environment.

11. Switchboard Service Entrance sections shall comply with UL Service Entrance requirements including a UL service entrance label, incoming line isolation barriers, and a removable neutral bond to switchboard ground for solidly grounded wye systems
12. Switchboard shall be of service entrance type.

C. Bus Bars:

1. Bus bars shall be copper. The bus bars shall be standard density rated for 1000 amperes per square inch copper. The neutral bus shall have the same ampacity as the phase bus.
2. Bus bars shall be mounted on high impact, non-tracking insulated supports. Joints in the vertical bus are not permitted.
3. Bus bars shall be braced to withstand mechanical forces exerted during short circuit conditions as indicated in drawings, but in no case less than 65KA RMS SYM.
4. Bus joints shall be bolted with high tensile steel. Welded connections are unacceptable. Contact area shall be fully overlapping. Minimum length of contact shall be with the width of the smallest bus.
5. Ground Bus shall be sized to meet UL 891. Ground bus shall extend full length of switchboard.
6. Neutral bus shall be connected to ground bus with removable link. Neutral bus shall be extended through full length of switchboard.
7. A-B-C bus arrangement (left to right, top to bottom, front to rear) shall be used throughout to assure convenient and safe testing and maintenance. Where special circuitry precludes this arrangement, bus bars shall be labeled.
8. All feeder device line and load connection straps shall be rated to carry current rating of device frame (not trip rating).
9. The main incoming bus bars shall be rated for the main protection device frame size or main incoming conductors, if there is no main device.
10. Main horizontal bus bars shall be fully rated and arranged for future extensions.
11. The phase shall be extended through each section at full capacity.

D. Line and Load Terminations: Copper lugs suitable for the conductor sizes indicated.

1. Provide one-hole lugs for 4/0 AWG and smaller.
2. Provide two-hole lugs for 250 kcmil and larger.

E. Main and Feeder Devices

1. Main device shall be individually mounted, insulated case circuit breaker when 1200 amp. or above or group mounted molded case circuit breaker when below 1200 amp. Provide device as specified in appropriate article below.
2. Feeder devices shall be group mounted molded case circuit breakers when it is 1200 amp or below. Provide devices as specified in appropriate article below.
3. All circuit protective devices shall have 65,000 amp minimum symmetrical current interrupting capacity or as listed on the contract drawings whichever is highest.

F. Molded Case Circuit Breakers

1. Molded case circuit breaker shall have minimum of 65,000 amp symmetrical current interrupting capacity or as listed on the contract drawings whichever is highest.
2. Furnish GE Spectra RMSTM Molded Case Circuit Breakers or equal. Thermal magnetic molded case circuit breakers may be provided for trip ratings 150 amps and below.
3. Group mounted breakers shall be modular mounted. The module shall be electrically connected to the switchboard bus by spring reinforced jaws. Mechanical connections to panel frame shall be separate from electrical connections. Mechanical connections shall be self aligning, spring loaded locking devices. Locking device handle shall be able to be bolted to each side of the device to prevent accidental release of electrical connection.
4. Circuit breaker frames shall be constructed of a high-strength, molded, glass-reinforced polyester case and cover. Breakers shall have an overcenter, toggle handle-operated, trip free mechanism with quick mate, quick break action independent of the speed of the toggle handle operation. The design shall provide common tripping of all poles. Breakers shall be suitable for reverse feeding.
5. Breakers shall have ON and OFF position clearly marked on escutcheon. Breakers shall include a trip-to-test means on the escutcheon for manual tripping the breaker and exercising the mechanism and trip latch.
6. Breakers shall include factory installed mechanical lugs. Lugs shall be UL listed and rated 75 or 60/75 degrees C. as appropriate.
7. Breakers larger than 150 amps shall use digital true RMS or equal sensing trip units and a rating plug to determine the breaker trip rating.
8. Circuit breakers with trip ratings 800 and greater shall be UL listed as 100 percent continuous duty rated.

G. Insulated Case Circuit Breakers

1. Insulated case circuit breakers shall be GE type Power Break II or equal. Breakers shall be individually mounted.
2. Insulated case circuit breakers 2000 amp and below shall be manually operated.
3. Breakers shall be constructed of a high dielectric strength, glass reinforced insulating case. The interrupting mechanism shall be arc chutes. Steel vent grids shall be used to suppress arcs and cool vented gases. Interphase barriers shall isolate completely each pole.
4. Breakers shall contain a true two-step stored energy operating mechanism which shall provide quick make, quick break operation with maximum five cycle closing time. Breakers shall be trip free at all times. Common tripping of all poles shall be standard.
5. Insulated Case circuit breakers shall be rated to carry 100 percent of their frame ampacity continuously.
6. A charging handle, close push-button, open push-button, and Off/On/Charger indicator shall be located on the breaker escutcheon and shall be visible with the breaker compartment door closed.
7. Where drawout breakers are specified, the drawout design shall permit the breaker to be withdrawn from an engaged position, to a test position, and to a disengaged position.

2.3 MICROPROCESSOR BASED MONITORS

- A. Description: Microprocessor based circuit monitor for monitoring and display of the following functions with accuracy in percent of full scale:
 - 1. AC amperes in each phase - 1%.
 - 2. AC voltage line-to-line and line-to-neutral - 1%.
 - 3. Watts - 2%
 - 4. Vars - 2%
 - 5. Frequency - 0.5%
 - 6. Watt Demand - 2%

2.4 METERING TRANSFORMERS

- A. All instrument transformers shall be UL listed and classified as indicated on drawings.
- B. Current transformers shall be as shown on drawings with burden and accuracy to support connected meters and relays as required by ANSI/IEEE C57.13.
- C. Potential transformers shall be as shown on drawings with burden and accuracy to support connected meters and relays as required by ANSI/IEEE C57.13.

2.5 FINISH

- A. All steel surfaces shall be chemically cleaned prior to painting.
- B. Exterior paint color shall be ANSI 6 Light Gray over phosphate – type rust inhibitor.

2.6 ACCESSORIES

- A. Molded Case Circuit Breaker Accessories:
 - 1. Provide breaker accessories, UL listed for factory or field installation and common to all breaker frame sizes as indicated below.
 - a. shunt trip
 - b. undervoltage release.
 - c. auxiliary switch with 2 form “C” contacts
 - d. bell alarm

PART 3 - EXECUTION

3.1 PREPARATION

- A. Shop inspect and test switchboard according to NEMA standards.
- B. Provide uniform and leveled concrete equipment base for equipment installation.
- C. Verify area to assure there is enough clearance to install switchboard.

3.2 INSTALLATION

- A. Install switchboard in accordance with manufactures instructions, and NEMA and NECA standards.
- B. Tighten accessible bus connections and mechanical fasteners after placing switchboard.
- C. Make connections including incoming line side, outgoing load side, metering, and controls.
- D. Provide engraved plastic nameplates under the provisions of Section 26 05 53.
- E. Ground and bond switchboard enclosure according to Section 26 05 26.

3.3 FIELD QUALITY CONTROL

- A. Inspect and test switchboard in accordance with NETA ATS.

3.4 ADJUSTING

- A. Adjust all operating mechanisms for free mechanical movement.
- B. Tighten bolted bus connections in accordance with manufacturer's instructions.

3.5 CLEANING

- A. Clean installed work under the provisions of Division 1 General Requirements.
- B. Clean interior of cabinets and enclosures to remove dust, debris, and other material.
- C. Clean surfaces and touch up scratched or marred surfaces to match original finish.

END OF SECTION 262415

SECTION 262416 - PANELBOARDS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Power panelboards.
- B. Branch circuit panelboards.

1.3 RELATED SECTIONS

- A. Section 260526 - Grounding and Bonding.
- B. Section 260553 - Electrical Identification.
- C. Section 262420 - Transient Voltage Surge Suppression.

1.4 DEFINITIONS

- A. Lighting and Appliance Panelboard: A panelboard with thermal magnetic circuit breaker branches, bolt-on type only, designed for heavy commercial use, operating at 600 V and below, 3-phase versions, equipped as either surface or flush mounting. Panelboard shall have more than 10% of its overcurrent devices rated 30 amperes or less for which neutral connections are provided.
- B. Power Panelboard: A panelboard with thermal magnetic circuit breakers or fusible switches, bolt-in type, designed for heavy commercial use, operating at 600V and below, 3-phase version, equipped as surface mounting with cabled connections between sections. Panelboard shall have less than 10% of its concurrent devices rated 30 amperes or less for which neutral connections are provided.
- C. Overcurrent Protective Devices – a circuit breaker pole or single fuse. Example: a 2-pole device is considered 2 protective devices.

1.5 REFERENCES

- A. ANSI 61.
- B. ANSI/NEMA KS 1, Enclosed and Miscellaneous Distribution Equipment Switches (600 volts).
- C. ANSI/NEMA PB 1, Panelboards.
- D. ANSI/NFPA 70, National Electrical Code.
- E. ASTM – American Society of Testing Materials.
- F. CSA C22.2 No. 29, Panelboards and Enclosed Panelboards.
- G. CSA C22.2 No. 5.1, Molded Case Circuit Breakers.
- H. Federal Specification W-C-375, Rev. B, Amend. 1, Circuit Breakers, Molded Case; Branch Circuit and Service.
- I. Federal Specification W-P 115, Rev. C, Panel, Power Distribution.
- J. NEMA AB1, Molded Case Circuit Breakers and Molded Case Switches.
- K. NEMA PB 1.1, General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.
- L. UL 489, Molded-Case Circuit Breakers and Circuit-Breaker Enclosures.
- M. UL 50, Enclosures for Electrical Equipment.
- N. UL 67, Panelboards.
- O. UL 943, Ground-Fault Circuit-Interrupters.

1.6 SUBMITTALS

- A. Submit under provisions of the General Requirements and Section 260500.
- B. Product Data: Provide for fusible switches and circuit breakers.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- D. Manufacturers Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.

- E. Project Record Documents: Record actual locations of panelboards and record actual circuiting arrangements in project record documents.
- F. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum twenty years experience.

1.8 REGULATORY REQUIREMENTS

- A. Conform to requirements of NFPA 70, unless otherwise specified.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.9 COORDINATION

- A. Coordinate under provisions of the General Requirements and Section 260500.
- B. Field Measurements: Verify that field measurements are as shown on Drawings.
- C. Field Locations: Verify locations of panelboards prior to rough-in.

1.10 DELIVERY, STORAGE, PROTECTION, AND HANDLING

- A. Deliver, store, protect and handle products in accordance with recommended practices in manufacturer's Installation and Maintenance Manuals.
- B. Deliver each lighting panelboard in individual shipping cases for ease of handling. Each panelboard shall be wrapped for protection.
- C. Inspect and report concealed damage to carrier within specified time.
- D. Store in a clean, dry space. Maintain factory protective or cover with heavy canvas or plastic to keep out dirt, water, construction debris, and traffic. (Heat enclosures to prevent condensation).
- E. Handle in accordance with NEMA and manufacturer's written instructions to avoid damaging equipment, installed devices and finish.

1.11 OPERATION AND MAINTENANCE DATA

- A. Manufacturer shall provide copies of installation, operation and maintenance procedures to Owner in accordance with general requirements of the General Requirements and Division 26.
- B. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.

1.12 FIELD MEASUREMENTS

- A. Make all necessary field measurements to verify that equipment shall fit in allocated space in full compliance with minimum required clearances specified in National Electrical Code.

1.13 EXTRA MATERIALS

- A. Submit extra materials under provisions of the General Requirements and Section 260500.
- B. Furnish five of each panelboard key.

PART 2 – PRODUCTS

2.1 PANELBOARDS

- A. Phase sequence and balance.
 - 1. Phase sequence: A-B-C, left to right.
 - 2. Load balance: Distribute loads for maximum 10 percent difference.
- B. Each panelboard, and associated fused switches and circuit breakers, shall be of the same manufacturer.
- C. Each panelboard lock shall be operable by the same key.

D. Panelboard Manufacturers:

General Electric Company products have been used as the basis for design. The following other manufacturers' products of equivalent quality, dimensions and operating features may be acceptable, at the Engineer's discretion, if they comply with all requirements specified or indicated in these Contract documents.

1. Chicago Switchboard
2. Eaton/Cutler Hammer
3. GE.
4. ITE/Siemens
5. Illinois Switchboard
6. Square D
7. Owner Approved Equal.

E. Fused Switch and Circuit Breaker Manufacturers:

1. Eaton/Cutler Hammer
2. GE.
3. ITE/Siemens
4. Square D
5. Owner Approved Equal.

2.2 DISTRIBUTION PANELBOARDS

- A. Description: NEMA PB 1, circuit breaker or fusible switch type as shown on drawings. Provide contactors as indicated.
- B. Panelboard Bus: 1000 amp per sq.in. Copper, ampere and voltage ratings as indicated. Provide copper ground bus in each panelboard.
- C. Minimum Short Circuit Rating: Fully rated, 42,000 amperes rms symmetrical for 240 volt panelboards; 65,000 amperes rms symmetrical for 480 volt panelboards, or as indicated, or as required to be greater than the available short circuit current.
- D. Interlocks: Disconnects shall have ON and OFF indication. Disconnect door or cover shall be interlocked mechanically with the disconnect device to prevent opening door with the disconnect device in ON position and application of power while the door is open. Means shall be provided for releasing the interlock for intentional access to the interior, and intentional application of power, if desired, while the door is open. Padlocking arrangements shall permit locking the disconnect device OFF with a maximum of 3 padlocks with door closed or open.
- E. Fusible Switch Assemblies: NEMA KS 1, quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Quantity and ratings as indicated. Switches shall bolt directly onto bus, modular devices utilizing spring reinforcement jaws with pressure locked connections are not acceptable.

- F. Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits. Quantity and ratings as indicated. Circuit breakers shall bolt directly onto bus, modular devices utilizing spring reinforcement jaws with pressure locked connections are not acceptable.
- G. Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower, with bimetal overload relay. Size and ratings as indicated. Provide unit mounted control power transformer and HAND-OFF-AUTO selector switch and GREEN indicating light in front cover.
- H. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.
- I. Enclosure: NEMA PB 1, Galvanized steel finished inside and outside with manufactures standard gray enamel, fully flanged, fastened with quarter-turn trim clamps. Type 1 or 12 or 3R as suitable for the location, 12 inches deep, 35 inches wide, minimum, or as required to accommodate the number of outgoing conduits.
- J. Cabinet Front: Surface type, finished in manufacturer's standard gray enamel. Fasten doors 48 inches in height or less with concealed hinged door with flush catch lock. Fasten doors over 48 inches in height with three point catch lock and vault type handle.

2.3 BRANCH CIRCUIT PANELBOARDS

- A. Equipment:
 - 1. Furnish General Electric A-Series® Lighting Panelboards or equal as indicated in drawings.
 - 2. Minimum Short Circuit Rating: Fully rated, 22,000 amperes rms symmetrical for 240 volt panelboards; 22,000 amperes rms symmetrical for 480 volt panelboards, or as indicated, or as required to be greater than the available short circuit current.
- B. Enclosure
 - 1. Boxes shall be a nominal 20 inches wide and 6 inches deep with wire bending space per local electrical code.
 - 2. Fronts shall be reinforced steel with concealed hinges and concealed trim adjusting screws. Trim clamps are unacceptable.
 - 3. All door locks shall be corrosion proof Valox (or equal) with retractable latches. All door locks shall be keyed for a single key.
 - 4. Clean Lexan (or equal) directory card holders shall be permanently mounted on front door.
 - 5. All panelboard series ratings shall be prominently displayed on dead front shield.
 - 6. Interiors shall permit top or bottom incoming cables.
 - 7. Boxes shall be corrosion resistant, zinc finish galvanized.
 - 8. Fronts shall be powder finish painted ANSI G1 gray.

C. Bus bars

1. Bus bars shall be copper and phase sequenced, fully insulated and supported by high impact Noryl (or equal) interior base assemblies.
2. Panelboard Bus: 1000 amp per sq. in. Copper, ampere and voltage ratings as indicated. Provide copper ground bus in each panelboard. Provide insulated ground bus where identified. Provide 200% rated neutral where identified.
3. Bus bars shall be mechanically supported by zinc finished galvanized steel frames to prevent vibration and damage from short circuits.
4. Terminations shall be UL tested and listed and suitable for UL copper wire.
5. Provide [1] continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors for bolt-on branch circuit breakers. Bus bars shall be rated as indicated in drawings.
6. Split solid neutral bus shall be plated and located in main compartment for all incoming neutral cables to be same length.
7. Lugs shall be rated for 75 degree C terminations.
8. Main lugs for copper conductors shall be bolted lugs.
9. Lug bodies shall bolt in place.

D. Circuit Breakers

1. Molded case circuit breakers shall be bolt-on type.
2. All circuit breakers shall have thermal and magnetic type elements in each pole.
3. Two and three pole breakers shall have internal common trip crossbars for simultaneous tripping of each pole.
4. Circuit breakers shall not be restricted to any mounting location due to physical size.
5. All branch breakers 15 to 100 amperes shall be able to be mounted in any panel position for twin or double mounting without space penalty. Sum of ratings for 2 such twin mounted devices shall not exceed 180 amperes.
6. Main and sub-feed circuit breakers may be vertically or horizontally mounted.
7. Branch breaker panelboard connections shall be copper to copper.
8. All panelboard terminations shall be rated as indicated in drawings.
9. All breakers shall have an over center mechanism and be quick make and quick break.
10. All breakers shall have handle trip indication and a trip indicator in window of circuit breaker housing.
11. Breaker handle and faceplate shall indicate rated ampacity.
12. Circuit breaker escutcheon shall have standard ON/OFF markings.
13. Main breakers shall be UL listed for use with: Shunt, Under Voltage, and Ground Fault Shunt Trips; Auxiliary and Alarm Switches; and Mechanical Lug Kits. Provide these accessories as indicated on drawings.
14. Where indicated on drawings, the branch circuit breakers shall be SWD type, type HACR for air-conditioning equipment, ground fault circuit interrupter type, arc fault circuit interrupter type and shall have shunt trip accessories.

E. Contactors

1. Contactors shall be mechanically held GE type CR160MC, or ASCO Type 920 or approved equal.

2.4 ACCESSORIES

- A. Contactor control relays.
- B. Tork (or equal) time clocks.
- C. Locking devices for breakers and/or operating handles.
- D. Furnish nameplates for each device as indicated in drawings.
- E. Provide Transient Voltage Surge Suppression system as specified.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Provide concrete equipment base for floor mounted equipment installation.
- B. Verify field measurements.
- C. Verify that required utilities are available, in proper location and ready for use.
- D. Beginning of installation means installer accepts conditions.

3.2 INSTALLATION

- A. Install panelboards in accordance with NEMA and NECA standards and as instructed by manufacturer.
- B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
- C. Support free-standing panelboards with structural channel framework.
- D. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with lowest operating handle not lower than 18" above finished floor per NEC.
- E. Provide filler plates for unused spaces in panelboards.
- F. Provide typed circuit directory for each branch circuit panelboard under the provisions of Section 260553. Revise directory to reflect circuiting changes required to balance phase loads.
- G. Provide engraved plastic nameplates under the provisions of Section 260553.
- H. Provide 3-3/4" spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.

- I. Ground and bond panelboard enclosure according to Section 260526.
- J. Inspect installed panelboards for anchoring, alignment, grounding and physical damage.
- K. Check tightness of all accessible mechanical and electrical connections with calibrated torque wrench. Minimum acceptable values are specified in manufacturer's instructions.
- L. Test each key interlock system for proper functioning.

3.3 ADJUSTING

- A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 10 percent of each other. Maintain proper phasing for multi-wire branch circuits.
- B. Adjust all circuit breakers, access doors, operating handles for free mechanical and/or electrical operation as described in manufacturer's instructions.

3.4 CLEANING

- A. Clean installed work under the provisions of the General Requirements.
- B. Clean interior of cabinets and enclosures to remove dust, debris, and other material.
- C. Clean surfaces and touch up scratched or marred surfaces to match original finish.

END OF SECTION 262416

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirements Specification Sections, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Wall switches.
- B. Wall Dimmers.
- C. Receptacles.
- D. Device plates and decorative box covers
- E. Floor box service fittings.

1.3 RELATED SECTIONS

- A. Section 260533 - Boxes.

1.4 REFERENCES

- A. NECA - (National Electrical Contractors Association) Standard of Installation.
- B. NEMA WD 1 - General Requirements for Wiring Devices.
- C. NEMA WD 6 - Wiring Device Dimensional Requirements.
- D. NFPA 70 – National Electrical Code.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirements and Section 260500.
- B. Product Data: Provide for wiring devices, device plates, and fittings. Include manufacturer's catalog information showing dimensions, colors, and configurations.

- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
- D. Project Record Documents: Record actual locations of devices and record actual circuiting arrangements in project record documents.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of local electrical code, unless otherwise specified.
- B. Furnish Products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.8 COORDINATION

- A. Coordinate under provisions of the General Requirements and Section 260500.

PART 2 - PRODUCTS

2.1 WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell
 - 2. Leviton.
 - 3. Cooper Wiring Devices
 - 4. Pass and Seymour
 - 5. Owner Approved Equal.

- B. Specification Grade Toggle Style: 20A., 120-277V., back and side wired.

	<u>Hubbell</u>	<u>Leviton</u>	<u>Cooper</u>	<u>Pass and Seymour</u>
1P	CS120	CSB1-20	CSB120	CS20AC1
2P	CS1222	CSB2-20	CSB220	CSB20AC2
3W	CS1223	CSB3-20	CSB320	CSB20AC3
4W	CS 1224	CSB4-20	CSB420	CSB20AC4
1P-K	HBL1221-L	-----	2221L	PS20AC1-L
1P-PL	HBL1221 PL	1221-PL	2221PL	PS20AC1-RPL
3W-PL	HBL1223 PL	1223-PL	-----	PS20AC3-RPL

- C. Legend: 1P=single pole, 2P=double pole, 3W=three way, 4W=four way, K=keyed, PL=pilot light, MC=momentary contact.
- D. Color: Ivory or red, unless otherwise specified. Final color selection shall be by the Architect.

2.2 WALL RECEPTACLES

- A. Manufacturers:

1. Hubbell
2. Leviton.
3. Cooper Wiring Devices.
4. Pass and Seymour.
5. Owner Approved Equal.

- B. Description: Receptacles shall be constructed to include a grounding pole from which a wired connection to ground shall be provided.

- C. Specification Grade Traditional Style: 20A., 120V., NEMA 5-20R, back and side wired.

	<u>Hubbell</u>	<u>Leviton</u>	<u>Cooper</u>	<u>Pass and Seymour</u>
S	HBL5361	5361	5361	5361
D	CR5362	5362	CR5362	5362
C	HBL5235	5261-CH	93632	S3733-SS
GFI	GF20L	7899	VGF20	2095
IG	CR5352IG	5362-IG	IG5362	IG5362-OSP
HG-S	HBL8310	8310	8310	8301
HG-D	HBL8300H	8300	8300	8300
HG-GFI	GFR8300HL	7899HG	VHGF20	2095-HG
HG-IGI	IG8300	8300-IG	IG8300	IG8300
TR	HBL8300SGA	8300-SG	TR8300	TR63

- D. Range Outlet: 50A., 125/250V., NEMA 10-50R.

	<u>Hubbell</u>	<u>Leviton</u>	<u>Cooper</u>	<u>Pass and Seymour</u>
Single	HBL7962	5206	32B	3890

- E. Combination Outlet: 15A., 125/250V., NEMA 5-15R & 6-15R.

	<u>Hubbell</u>	<u>Leviton</u>	<u>Cooper</u>	<u>Pass and Seymour</u>
Duplex	5292	5031	829	5290

- F. Special NEMA configurations shall be specification grade, unless otherwise specified.
- G. Color: Ivory or red, unless otherwise specified. Isolated ground devices: Orange, unless otherwise specified. Final color selection shall be by the Architect.
- H. Legend: S=single, D=duplex, C=clock hanger, GFI=ground fault, IG=isolated ground, TR=tamper resistant, HG = Hospital Grade.

2.3 WALL PLATES

- A. Manufacture: Match switch and receptacle manufacture. Provide matching cover plates for switches and receptacles within same area, unless otherwise specified.
- B. Decorative Cover Plate: Ivory or red. Final selection shall be by the Architect.
- C. Jumbo Cover Plate: Ivory, brushed satin finish.
- D. Weatherproof Cover Plate: Gasketed corrosion resistant cast metal with hinged and gasketed device cover.

2.4 FLOOR MOUNTED SERVICE FITTINGS

- A. Manufacturers
1. Hubbell.
 2. Square D.
 3. Walker.
 4. Owner Approved Equal.
- B. Description: Assembly comprising service fitting and concrete tight pressed steel fully adjustable floor box with housing, covers, trim, devices and device plate.
- C. Assembly:
1. Type: Flush.
 2. Device Plate and Ring: Brass.
 3. Configuration: Flap opening.
 4. Owner Approved Equal.

2.5 FIRE RATED POKE THROUGH DEVICES

- A. Manufacturers
 - 1. Hubbell or owner approved equal.
- B. Description: Must be flush with floor and utilize a 4" core. Must meet a 4-hour fire rating and must meet or exceed UL514A Scrub Water Requirements. Provide IG receptacle and IG wiring where poke-through is used for an IG outlet.
- C. Poke Through Devices shall be required to have at least two 1" EMT trade size conduit stems to feed power, communication and audio visual applications.
- D. Hubbell part numbers or approved equal:
 - 1. SIPTFIT
 - 2. S1CFCXXX (CARPET FLANGE)
 - 3. S1TFCXXX (TILE FLANGE)
 - 4. Appropriate device subplate part number SISPXXX

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that device types, traditional or designer, finishes, and colors are in conformance with the Architects direction.
- B. Verify that outlet boxes are installed at proper height.
- C. Verify that outlet boxes for light switches are on strike side of door.
- D. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that outlet boxes for wall dimmers are adequately sized to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- G. Verify that exterior, wet locations, and other locations required by authority having jurisdiction, are provided with GFI type devices.
- H. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.

3.2 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean debris from outlet boxes.

3.3 INSTALLATION

- A. Install in accordance with NECA "Standard of Installation."
- B. Install fittings in accordance with manufacturers instructions.
- C. Install devices plumb and level.
- D. Install switches with OFF position down.
- E. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- F. Do not share neutral conductor on load side of dimmers.
- G. Install receptacles with grounding pole on right side.
- H. Connect wiring device grounding terminal to separate green branch circuit equipment grounding conductor.
- I. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- J. Connect wiring devices by wrapping conductor around screw terminal.
- L. Use jumbo size plates for outlets installed in masonry walls.
- M. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- N. Install protective rings on active flush cover service fittings.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 260533 to obtain mounting heights as specified.
- B. Coordinate the installation of wiring devices with furniture systems.

3.5 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of the General Requirements.
- B. Inspect each wiring device for defects.
- C. Operate each wall switch with circuit energized and verify proper operation.
- D. Verify that each receptacle device is energized.
- E. Test each receptacle device for proper polarity.
- F. Test each GFI receptacle device for proper operation.

3.6 ADJUSTING

- A. Adjust installed work under the provisions of the General Requirements.
- B. Adjust devices and wall plates to be flush and level.

3.7 CLEANING

- A. Clean installed work under the provisions of the General Requirements.
- B. Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION 262726

SECTION 262819 - ENCLOSED SWITCHES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Fusible switches.
- B. Nonfusible switches.

1.3 RELATED SECTIONS

- A. Section 26 24 13 - Fuses.
- B. Section 26 05 53 - Electrical Identification.

1.4 REFERENCES

- A. NECA - (National Electrical Contractors Association) Standard of Installation.
- B. NEMA FU1 - Low Voltage Cartridge Fuses.
- C. NEMA KS1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum).
- D. NETA ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems (published by the International Electrical Testing Association).
- E. Local electrical code.

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirements and Section 26 05 00.
- B. Product Data: Provide for enclosed switches.

- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
- D. Project Record Documents: Record actual locations of enclosed switches in project record documents.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of local electrical code.
- B. Furnish products listed and classified by Underwriters Laboratories, Inc. or suitable for the purpose specified and indicated.

1.8 COORDINATION

- A. Coordinate under provisions of the General Requirements and Section 26 05 00.
- B. Field Measurements: Verify that field measurements are as shown on Drawings.
- C. Field Locations: Verify locations of transformers prior to rough-in.

PART 2 – PRODUCTS

2.1 ENCLOSED SWITCHES

- A. Manufactures:
 - 1. Eaton/Cutler-Hammer.
 - 2. GE.
 - 3. Siemens ITE.
 - 4. Square D.
 - 5. Owner Approved Equal.

2.2 FUSIBLE SWITCH ASSEMBLIES

- A. Description: NEMA KS 1, Type HD (Heavy Duty) type, horsepower rated, with operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
- B. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses only.

2.3 NONFUSIBLE SWITCH ASSEMBLIES

- A. Description: NEMA KS 1, Type HD (Heavy Duty) type, horsepower rated, with externally operable handle interlocked to prevent opening front cover with switch in ON position.

2.4 ENCLOSURES

- A. Description: Code gauge steel
- B. Finish: Phosphate coated, primed and finished with high grade lacquer, manufacturers standard color.
- C. Fabrication: NEMA KS 1.
 - 1. Indoor clean, dry locations: Type 1.
 - 2. Indoor dusty, dry locations: Type 12.
 - 3. Indoor wet locations: Type 4X.
 - 4. Outdoor locations: Type 3R.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Install in accordance with NECA "Standard of Installation."
- B. Install fuses in fusible disconnect switches.
- C. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.
- D. Apply Identification Tag.

3.2 CLEANING

- A. Clean installed work under the provisions of the General Requirements.
- B. Clean interior of enclosures to remove dust, debris, and other material.
- C. Clean surfaces and restore finish.

END OF SECTION 262819

SECTION 263100 - FIRE ALARM AND DETECTION SYSTEM

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SCOPE OF WORK

- A. The existing Simplex 4002 fire alarm system shall be modified, as required, and extended into the new addition. The new devices shall be compatible with the manufacturer of the control panel. The new horn/strobe shall be approved for ADA and shall be 24 VDC.

1.3 QUALITY ASSURANCE

- A. Requirements of regulatory agencies:
 - 1. National Fire Protection Association (NFPA):
 - a. NFPA-70 National Electrical Code (NEC)
 - b. NFPA-101 Code for Safety to Life
 - 2. Local codes and ordinances
- B. Reference Standards:
 - 1. National Fire Protection Association (NFPA)
 - a. NFPA-72 Local Protective Signaling Systems
 - b. NFPA-72 Auxiliary Signaling Systems
 - c. NFPA-72 Remote Station Systems
 - d. NFPA-72 Proprietary Signaling Systems
 - e. NFPA-72E Automatic Fire Detectors
 - f. NFPA 72G – Notification Appliances for Protective Signaling Systems.
 - g. NFPA 72H – Guide for Test Procedures for Protective Signaling Systems.

2. National Electrical Manufacturer's Association (NEMA)

- a. ASME A17.1 – Safety Code for Elevators and Escalators.
- b. NFPA 101 – Life Safety Code.
- c. ANSI – American National Standards Institute.
- d. NFPA 71 – Central Station Signaling Systems.

C. All equipment specified shall be UL listed and cross listed for use with the main fire alarm control panel and shall bear the same manufacturer's name on the main control panel as well as all the remote devices. Systems having equipment with various manufacturers' names will not be acceptable.

D. Equipment must be manufactured by Simplex and has a fully staffed and equipped service organization within fifty (50) miles of the project.

E. Manufacturer's Services:

- 1. The following supervision of installation shall be provided by a trained service technician from the manufacturer of the fire alarm equipment. The Technician shall be U.L. certified and have had a minimum of two (2) years of service experience in the fire alarm industry. The technician's name shall appear on equipment submittals and a letter of certification from the fire alarm manufacturer shall be sent to the project engineer. The manufacturer's service technician shall be responsible for the following items:
 - a. Pre-installation visit to the job site to review equipment submittals and verify method by which the system should be wired.
 - b. During job progress, make periodic job site visits to verify installation and wiring of system.
 - c. Upon completion of wiring, final connections shall be made under the supervision of this technician, and final checkout and certification of the system.
 - d. At the time of final checkout, technician shall give operational instructions to the owner and/or his representative on the system.
- 2. All job site visits shall be dated and documented in writing and signed by the Division 26 contractor. Any discrepancy shall be noted on this document and a copy kept in the system job folder, which shall be available to the project engineer any time during the project.

1.4 SUBMITTALS

A. Submit in accordance with the General Requirements.

- 1. Product data sheets and equipment description.
- 2. Bill of materials listing all components and devices.
- 3. A list of every system address provided for purposes of alarm initiation, status monitoring, supervised signaling, and auxiliary controls.
- 4. Component wiring diagrams.
- 5. System wiring and interconnection diagrams.

1.5 PROJECT RECORD DOCUMENTS

- A. Submit documents under the provisions of Section 26 05 00.
- B. Include location of end-of-line devices.

1.6 OPERATION AND MAINTENANCE DATA

- A. Submit data under provisions of Section 26 05 00.
- B. Include results of testing of all devices and functions.
- C. Include manufacturer's representative's letter stating that system is operational.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. Receive equipment at job site; verify applicable components and quantity delivered.
- B. Handle equipment to prevent internal components' damage and breakage, as well as denting and scoring of enclosure finish.
- C. Do not install damaged equipment.
- D. Store equipment in a clean, dry space and protect from dirt, fumes, water, construction debris and physical damage.
- E. After installation, protect equipment from damage by work of other trades.

1.8 GUARANTEE

- A. The Division 26 contractor shall guarantee all wiring and terminal equipment to be free from inherent and mechanical defects due to workmanship and materials used for a period of one (1) year from date of accepted installation.
- B. The fire alarm manufacturer shall furnish in writing a one (1) year warranty. Warranty shall list all equipment in the system and state that equipment to be free from inherent and mechanical defects due to workmanship and materials for a period of one (1) year from date of start up and beneficial use of the system.
- C. Warranty service for the equipment shall be provided by the system supplier's factory trained representative. Emergency service provided at all times and available from the same source at additional cost to the owner.

PART 2 PRODUCTS

2.1 SIGNAL INITIATING DEVICES

Furnish and install, where shown on the drawings, the following signal initiating devices:

- A. Manual Pull Stations shall be addressable dual action with raised white lettering and a smooth high gloss finish. The break-glass station shall have a hinged front with key lock. Stations shall be keyed alike with the fire alarm control panel. Stations, which utilize screwdrivers, allen wrenches, or other commonly available tools shall not be accepted. When the station is operated, the handle shall lock in a protruding manner to facilitate quick visual identification of the activated station.
Provide pull station cover for all new pull stations and on pull stations located in renovation areas.
- B. Smoke Detectors shall be ceiling mounted, photoelectric smoke detectors. Detector shall have a completely closed back to restrict entry of dust and air turbulence and 30 mesh insect screen. Electronics of unit shall be shielded to protect against false alarms from E.M.I. and R.F.I. Unit shall contain a red LED which shall pulse to indicate power on and which shall glow continuously to indicate alarm. Detector shall have a magnetically operated functional test switch and be capable of being supplied with a remote alarm LED indicator. Unit shall have a separate mounting base with terminal strip for ease of wiring, changing and cleaning.
- C. Duct Smoke Detectors shall be addressable, photoelectric, duct smoke detector. Duct housing base assembly shall be provided with an optional auxiliary relay with Form C contacts, rated at 1 AMP. Necessary sampling tubes shall be provided across the entire width of ductwork. Duct Smoke Detectors shall be furnished with a remote alarm indicator with a red light emitting diode (LED), and a key operated test switch mounted on a single gang stainless steel plate.
- D. Duct Smoke Detectors shall be furnished and wired under this section, but installed under Division 23.

2.2 ALARM INDICATING DEVICES

Furnish and install, where shown on the drawings, the following audio/visual devices:

- A. Audio/Visual Device shall be semi-flush mounted on a standard electrical outlet box. If surface mounting is desired utilize a Red 4" square surface box. Flash rate shall be 1 to 3 flashes per second with a 75 candela flash intensity, meeting UL1971 requirements. Both audio and visual units shall be on the same supervised circuit and accomplish two wire "On until Silenced and On until Reset." In addition, temporal coding must be accomplished. The horn shall be rated at 85 db sound pressure level at ten (10) feet. All strobes in a given area shall be synchronized.
- B. Visual devices shall be high intensity Xenon flasher in compliance with the ADA. All strobes located in an area, which can be simultaneously seen, shall be synchronized.

2.3 AUXILIARY DEVICES

- A. Pull Station Cover: The cover shall consist of clear, polycarbonate shield with red frame that easily fits over manual fire alarm pull station. The cover shall have a local 9 volt battery and a local horn. When the cover is lifted to gain access to the station, a loud and piercing warning horn shall be sounded. The horn shall be silenced as soon as the cover is lowered and closed. The cover shall be for flush mounted stations and shall have spacer for surface mounted stations.
- B. Door Release/Closure Devices: The releasing devices are furnished and installed by others, but wired into the fire alarm system by this contractor. Cooperate and coordinate respective responsibilities in order that a complete, aligned, and functioning door release system is integrated into the fire alarm system.
- C. Smoke Dampers/Shutters: Furnished and installed by others, but wired into the fire alarm system by this contractor. Cooperate and coordinate respective responsibilities in order that a complete functioning smoke damper system is integrated into the fire alarm system. The device operating power shall be supplied from a 24 volt DC power supply located within the fire alarm system.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation
 - 1. The contractor shall provide and install the system in accordance with the plans and specifications, all national and local applicable codes, NEC wiring criteria, and the manufacturer's recommendations. All MAPNET communications wiring shall be twisted and shielded cables. All wiring shall be in a conduit system separate from other building wiring. All junction boxes shall be sprayed red and labeled "Fire Alarm". Wiring color code shall be maintained throughout the scope of the work.
 - 2. Installation of equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate subcontractors.
 - 3. The manufacturer's authorized representative shall provide all on-site software modifications and supervision of installation of the complete Fire Alarm System installation, perform a complete functional test of the system, and submit a written report to the contractor attesting to the proper operation of the completed system.
- B. Testing
 - 1. The completed fire alarm system shall be fully tested by the contractor in the presence of the Owner's representative, the architect, the consulting engineer, the local authority having jurisdiction, and the manufacturer's technical representative. Upon completion of a successful test, the contractor shall so certify in writing to the owner, architect, and general contractor.

C. Training

1. The equipment manufacturer's representative shall provide, as part of this contract, a minimum of four (4) hours system operation training for the building owner, the consulting engineer, and fire department personnel. The training session shall be at a time to be stipulated by the owner.

D. Instruction Manuals

1. The contractor shall provide, in addition to one approved copy of the fire alarm system submittal, complete operating instructions; pertinent system orientation documents; and system service, testing, and alarm documentation in the fire control area for the owner's and fire department's permanent use.

E. Install products in accordance with manufacturers instructions.

F. Include services of a certified technician to supervise installation, adjustments, final connections and system testing.

G. Use conductors as specified by the manufacturer for fire alarm detection and signal circuits.

H. Install all wiring in conduit.

I. Mount outlet box for electric door holder to withstand 80 pounds pulling force.

J. Make conduit and wiring connections to door release devices, fire suppression system control panels, and duct smoke detectors.

K. Paint each outlet and junction box red.

L. Provide interface for kitchen suppression system.

M. Provide monitoring of knox box.

N. Provide interface for security system.

O. Provide interface for Building Automation System.

P. Install covers on all new pull stations and on pull stations located in renovated areas.

Q. Provide interface modules (zam) as required to interface with magnetic door holders, tamper switches, etc. as required.

R. Provide off-site remote monitoring as required by Owner and local fire department.

S. Whether specifically indicated or not, provide a minimum of one duct smoke detector for air supply system having a capacity greater than 2000 CFM and two duct smoke detectors for air supply system having a capacity greater than 15,000 CFM.

3.2 SEQUENCE

A. General:

1. System Alarm LED shall flash at the control panel and transponder locations.
2. A local signal in the control panel shall sound.
3. The LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
4. History storage equipment shall log the information associated with the fire alarm control panel (FAP) condition, along with the time and date of occurrence.
5. All system output programs assigned via control-by-event equations to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
6. Transmit signal to central station receiver via the digital communicator.

B. HVAC Unit Shutdown Sequence:

1. Refer to related sequences in this section for activating this HVAC shutdown sequence.
2. The fire alarm system shall directly shutdown the HVAC unit through the local HVAC control device (i.e., variable frequency drive or motor starter, or other automatic means as indicated on the plans). The fire alarm system shall provide an output for each HVAC unit. This output contact shall be connected to the HVAC unit's local control circuit to provide an orderly shutdown.

C. Smoke Detectors (general requirements, except as otherwise noted):

1. Activation of a smoke detector shall initiate audible and visual alarms [throughout the building]
2. Activation of a smoke detector shall release door holders [throughout the building]

D. Duct Mounted Smoke Detectors:

1. Activation of a smoke detector in an air duct designated for HVAC shutdown shall initiate the same operations specified for general smoke detectors as described above.
2. Activation of a smoke detector located in the main supply ducts and/or return ducts shall initiate the following operations:
 - a. The supply and return fans of the associated HVAC unit shall be shut down. Refer to "HVAC Unit Shutdown Sequence" in this section for additional requirements.
 - b. Close all smoke dampers located in the air ducts associated with the HVAC unit being shut down. Only close dampers located in ductwork served by the HVAC unit containing the activated detector. Refer to "Smoke Damper Closure Sequence" in this section for additional requirements.

E. Heat Detectors (general requirements, except as otherwise noted):

1. Activation of a general heat detector shall initiate the same operations specified for general smoke detectors.

F. Manual Pull Stations:

1. Activation of the manual pull stations shall initiate audible and visual alarms throughout the building.
2. Activation of the manual pull stations shall release door holders throughout the building on the floor of the activation.

G. Kitchen Hood Suppression System Activation:

1. Activation of a kitchen hood suppression system shall initiate the same operations specified for general smoke detectors.
2. Activation of a kitchen hood suppression system shall initiate the disconnection of power to all kitchen equipment located underneath the hood. The fire alarm system shall provide a minimum of one addressable control output for each kitchen hood. Electrically powered kitchen equipment shall have power disconnected automatically by utilizing addressable relays to control shunt-trip breakers, power relays, and/or contactors serving kitchen equipment as indicated on the drawings.
3. Gas-supplied kitchen equipment under the hood shall have its fuel source turned off automatically by controlling the gas solenoid valve serving the equipment, as indicated on the drawings.
4. Exhaust hood fans shall be shutdown, as indicated on the drawings and MUA units.

H. Alarm to Remote Site

1. In case of fire in the building an alarm shall be sent either to local fire department or to a central monitoring agency.

END OF SECTION 263100

SECTION 265100 - INTERIOR LUMINAIRES

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. LED Interior luminaires, drivers and integral controls.
- B. Exit signs.
- C. Ballasts.
- D. Lamps.
- E. Luminaire accessories.

1.3 RELATED SECTIONS

- A. Section 26 05 29 - Supporting Devices.

1.4 REFERENCES

- A. NEMA WD 6 - Wiring Devices-Dimensional Requirements.
- B. NFPA 70 - National Electrical Code.
- C. NFPA 101 - Life Safety Code.
- D. IESNA LM-80-08 IESNA - Approved Method for Measuring Lumen Maintenance of LED Light Source.
- E. IESNA TM-21-2011 - Projecting Long Term Lumen Maintenance of LED Light Sources.
- F. UL 1310 and 8750 - Light Emitting Diode (LED) Equipment for use in Lighting Products.
- G. IEC 61347-2-13 - Particular requirements for electronic control gear for LED modules.

- H. IEC-62384 - DC or AC supplied electronic control gear for LED modules - performance requirements.
- I. IEC 62386-101/102/207 - Digital addressable lighting interface (DALI).

1.5 SUBMITTALS

- A. Submit under provisions of the General Requirement Specification Sections and Section 26 05 00.
- B. Product Data: Provide for each luminaire, ballast, and lamp. Include dimensions, ratings, and performance data. Data shall be submitted in order of Luminaire Number as identified on drawings.
- C. Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- D. Manufacturers Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
- E. Project Record Documents: Record actual locations of luminaires and record actual circuiting arrangements in project record documents.
- F. Maintenance Data: Submit manufacturer's operation and maintenance instructions for each product. Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.

1.7 REGULATORY REQUIREMENTS

- A. Conform to requirements of local electrical code, unless otherwise specified.
- B. Conform to requirements of local electrical code.
- C. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.8 COORDINATION

- A. Coordinate under provisions of the General Requirements and Section 26 05 00.
- B. Field Measurements: Verify that field measurements are as shown on Drawings.
- C. Field Locations: Verify locations of luminaires prior to rough-in.

1.9 DELIVERY, STORAGE, PROTECTION, AND HANDLING

- A. Protect from moisture by using appropriate coverings. Store in dry interior locations.
- B. Do not install until building is closed in and suitable temperature conditions are controlled.
- C. Maintain suitable temperature and humidity conditions during and after installation of luminaires.

PART 2 PRODUCTS

2.1 LUMINAIRES

- A. Furnish Products as scheduled.
- B. Luminaires for general illumination, emergency lighting, and exit lighting, shall be complete with all required accessories and attachments. Luminaires of the same type shall be of the same manufacturer.
- C. Luminaires shall bear Underwriters Laboratories, Inc. label and shall be wired and installed in full compliance with applicable codes.
- D. Luminaires shall be recessed, surface, or pendant type, as specified in fixture schedule, and shall include housings, lamp holders, lenses, reflectors, ballasts, lamps, mounting hardware, and other required accessories.
- E. Recessed mounted luminaires shall be in compliance with local codes for plenum installation.
- F. Enameled finishes shall be electrostatically applied and baked. Finish of fixtures shall be uniform in quality and appearance, durable, and free from defects.
- G. Labels and inscriptions in luminaires shall be located in unobtrusive places so that they are not visible to occupants in the completed installation.

- H. Plaster frames, angles, and channels for recessed luminaires shall be furnished under this section where required. Plaster frames shall be specifically constructed for the application by the manufacturer of the related luminaire.
- I. Recessed incandescent luminaires shall have a thermal protective device within the luminaire housing.
- J. Luminaire shall carry the lighting facts label, verified based on LM-85 test reports.

2.2 EXIT SIGNS

- A. Furnish Products as scheduled and in compliance with applicable codes.
- B. Description: Exit sign fixture.
- C. Housing: Sheet steel.
- D. Face: Translucent glass face with red letters on white background.
- E. Letters: 6" high, with 3/4" stroke, minimum.
- F. Directional Arrows: As indicated, with letters 4 1/2" high, 3/4" stroke, minimum.
- G. Lamps: Light emitting diodes.
- H. Electrical Connections: Conduit connection.
- I. Indicators: Lamps to indicate AC-ON and RECHARGING.

2.3 LED LUMINAIRES

- A. Each luminaire shall consist of an assembly that utilizes LED's as the light source. In addition, a complete luminaire shall consist of a housing, LED array, and electronic driver (power supply) and integral controls as per this specification.
- B. Each luminaire shall be designed to operate at an average operating temperature of 25° C.
- C. The operating temperature range shall be 0°to + 25°
- D. Each luminaire shall meet all parameters of this specification throughout the minimum operation life of 50,000 hours when operated at the average operating temperature.
- E. Nominal luminaire dimensions: as scheduled.

F. Luminaire Construction:

1. Luminaire housing to have no visible welding, screws, springs, hooks, rivets, bare LED's or plastic supports.
2. The luminaire shall be a single, self-contained device, not requiring on-site assembly for installation. The power supply and circuit board for the luminaire shall be integral to the unit.
3. Luminaires shall be fabricated from post painted cold rolled steel and shall be a rigid structure with integral T-bar clips. Fixture may be mounted and wired in continuous rows.
4. Finish: Polyester powder coat painted with 92% high-reflective paint after fabrication.
5. Reflector: rugged one-piece cold rolled steel with linear facets to distribute soft light at multiple angles, without flashing thus reducing high luminance contrast.
6. End caps shall be sloped at 70 degrees to create depth.
7. Luminaire to have smooth transition between T-bar and reflector arch. No doorframe or exposed hardware.
8. Lens shall be impact modified, single clear diffuser with advanced optical film and shall provide LED concealment and even illumination across the diffuser.
9. Polymeric materials (if used) of enclosures containing either the power supply or electronic components of the luminaire shall be made of UL94VO flame retardant materials. Luminaire lenses are excluded from this requirement.
10. Integral Grid Clips required on recessed mounted luminaires along with integral tie wire mounting points.
11. Luminaire to have air removal capability as specified.
12. The assembly and manufacturing process for the SSL luminaire shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration.

G. Led Sources

1. LED's shall be manufactured by, Nichia, Samsung, LG or Osram.
2. Lumen Output - minimum initial output of the luminaire shall be as follows for the lumens exiting the luminaire in the 0-90 degree zone - as measured by IESNA Standard LM85 in an accredited lab. Exact tested lumen output shall be clearly noted on the shop drawings.
 - a. Type 2x2-2425 (24 watts max.) or 3617 (36 watts max.) initial lumens @ 3500k per specification.
 - b. Type 2x4 - 4026 (40 watts max.) or 4740 initial lumens (47 watts max.).
3. Lumen output shall not decrease by more than 20% over the minimum operational life of 50,000 hours.
4. Individual LED's shall be connected such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
5. LED boards shall be suitable for field maintenance or service from below the ceiling with plug-in connectors. LED boards shall be upgradable.

6. Light color/quantity:

- a. Correlated color temperature (CCT) range as per specification, between 3500K and 4100 K shall be correlated to chromaticity as defined by the absolute (X,Y) coordinates on the 2-D CIE chromaticity chart.
- b. Color shift over 6,000 hours shall be <0.007 change in u' v' as demonstrated in IES LM8- report.
- c. The color rendition index (CRI) shall be 80 or higher.

H. Power Supply and Driver

1. Driver: Acceptable manufacturer: eldoLED or equal.
2. Ten-year expected life while operating at maximum case temperature and 90% non-condensing relative humidity.
3. Driver shall be UL recognized under the component program and shall be modular for simple field replacement. Drivers that do not meet these requirements will not be accepted.
4. Electrical characteristics: 120 - 277 volt, UL listed, CSA Certified, Sound Rated A+. Driver shall be > 80% efficient at full load across all input voltages. Input wires shall be 18AWG solid copper minimum.
5. Dimming: Driver shall be suitable for full-range dimming. LED dimming shall be equal in range and quality to a commercial grade incandescent dimmer. The luminaire shall be capable of continuous dimming without perceivable flicker over a range of 100 % to 1 % of rated lumen output with a smooth shut off function.
6. Dimming quality to be defined by dimming range, freedom from perceived flicker or visible stroboscopic flicker, smooth and continuous change in level (no visible steps in transitions), natural square law response to control input, inaudible in 26db environment, and stable when input voltage conditions fluctuate over what is typically experienced in a commercial environment. Demonstration of this compliance to dimming performance will be necessary for substitutions or prior approval.
 - a. Dimming shall be controlled by a 0-10V signal.
 - b. Driver shall include ability to provide no light output when the analog control signal drops below 0.5 V, or the DALI/DMX digital signal calls for light to be extinguished and shall consume 0.5 watts or less in this standby. Control dead band between 0.5V and 0.65V shall be included to allow for voltage variation of incoming signal without causing noticeable variation in fixture to fixture output.
 - c. Driver shall be capable of configuring a linear or logarithmic dimming curve, allowing fine grained resolution at low light levels.
 - d. Driver must be capable of 20 bit dimming resolution for white light LED driver.
 - e. Drivers shall track evenly across multiple fixtures at all levels, and shall have an input signal to output light level that allows smooth adjustment over the entire dimming range.

7. Flicker: Driver and luminaire electronics shall deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10). At all points within the dimming range from 100-0.1% luminaire shall have:
 - a. Less than 1% flicker index at frequencies below 120 HZ.
 - b. Less than 12% flicker index at 120 Hz, and shall not increase at greater than 0.1% per Hz to a maximum of 80% flicker index at 800Hz.
8. Driver disconnect shall be provided where required to comply with codes.
9. The electronics/power supply enclosure shall be internal to the SSL luminaire and be accessible per UL requirements.
10. The surge protection which resides within the driver shall protect the luminaire from damage and failure for transient voltages and currents as defined in ANSI/IEEE C64.41 2002 for location category A, where failure does not mean a momentary loss of light during the transient event.

I. Electrical

1. Power Consumption: Maximum power consumption, +/- 5% when operating between 120 - 277V shall be as follows:
 - a. Type 2x2 - 24 or 36 W (100 Lumens per watt).
 - b. Type 2x4 - 47W (100 Lumens per watt).
2. Operation Voltage - The luminaire shall operate from a 50 or 60 HZ ± 3 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output. The standard operating voltages are 120 VAC and 277 VAC.
3. Power factor: The luminaire shall have a per factor of 90% or greater at all standard operating voltages and full luminaire output.
4. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20% at any standard input voltage and meet ANSI C82.11 maximum allowable THD requirements at full output. THD shall at no point in the dimming curve allow imbalance current to exceed full output THD.
5. Surge Suppression: The luminaire shall include surge protection to withstand high repetition noise and other interference. Withstand up to a 1,000 volt surge without impairment of performance as defined by ANSI C62.41 Category A.
6. Inrush Current: Meet or exceed NEMA 410 driver inrush standard of 430 Amps per 10 Amps load with a maximum of 370 A2s.
7. RF Interference: The luminaire and associated on-board circuitry must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 Non-Consumer requirements for EMI/RFI emissions.

8. Driver must support automatic adaptation, allowing for future luminaire upgrade and enhancements and deliver improved performance.
 - a. Adjustment of forward LED voltage, supporting 3V through 60V.
 - b. Adjustment of LED current from 200mA to 1.05A at the 100% control input point in increments of 1mA.
 - c. Adjustments for operating hours to maintain constant lumens (within 5%) over the 50,000 hour design life of the system, and deliver up to 20% energy savings early in the life cycle.
9. Electrical connections between normal power and driver must be modular utilizing a snap fit connector. All electrical components must be easily accessible after installation and be replaceable without removing the fixture from the ceiling.
10. All electrical components shall be RoHS compliant.

J. Photometric Requirements:

1. Luminaire performance shall be tested as described herein.
 - a. Luminaire performance shall be judged against the specified minimum illuminance in the specified pattern for a particular application.
 - b. Luminaire lighting performance shall be adjusted (depreciated) for the minimum life expectancy (Section 2.2.4).
 - c. The performance shall be adjusted (depreciated) by using the LED manufacturer's data from the IESNA Standard TM-21 test report, which ever one results in a higher level of lumen depreciation.
 - d. The luminaire may be determined to be compliant photometrical, if:
 - i. The initial minimum illuminance level is achieved in 100% of the area of the specified lighting pattern.
 - ii. The measurements shall be calibrated to standard photopic calibrations.

K. Thermal Management

1. The thermal management (of the heat generated by the LED's) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life (Section 2.2.7 (c)).
2. The LED manufacturer's maximum junction temperature for the expected life (Section 2.2.7 (c)) shall not be exceeded at the average operating ambient (Section 2.2.2).
3. The LED manufacturer's maximum junction temperature for the catastrophic failure shall not be exceeded at the maximum operating ambient (Section 2.2.3).
4. The luminaire shall have an UL IC rating.
5. The driver manufacturer's maximum case temperature shall not be exceeded at the maximum operating ambient. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.

L. Optics

1. The optical assembly shall provide volumetric distribution to eliminate cave effect and provide uniform illumination in the space and increased luminance on vertical surfaces.
2. Optics shall consist of a ribbed metal reflector system and extruded refracting optical lens with high-transmission internal optical film applied to the inside of the refracting lens. No individual LED images shall be visible to the occupant of the space.
3. Refractor or lens shall be 2 piece assembly composed of impact-resistant (20%) DR acrylic with a polymer optical film.
4. 2x2 and 2x4 luminaire shall have center optic and faceted reflector.

M. Integrated Controls

1. Each luminaire may be equipped with two (2) digital RJ45 ports and interface with other digital control equipment.
2. May connect to devices compatible with 0 to 10V Analog Control Protocol, Class 2, capable of sinking 0.6ma per driver at a low end of 0.3V. Limit the number of drivers on each 0-10V control output based on voltage drop and control capacity.
3. May connect to digital (DALI Low Voltage Controlled) Dimming drivers.
4. Must meet IEC 62386.
5. May connect to digital multiplex (DMX Low Voltage Controlled) Dimming drivers.
6. Must meet DMX/RDM: USITT DMX512A and ANSI E1.20 (Explore & Address).
7. Lumen Management: The luminaire may be capable of continuously monitoring system performance to allow for constant lumen management/compensation function. Lumen output to be maintained at 80% for life of the luminaire, initial input to be 80% of rated input watts and climb to rated watts by end of rated life of luminaire.
8. Each luminaire may be supplied with a unique network address. This address shall be printed on two identification labels. One label shall be permanently affixed to the luminaire and one label shall be easily removed for network control commissioning purposes. Both labels shall be in a location which is easily accessible by the installing contractor.
9. Control Input:
 - a. 4-Wire (0-10V DC Voltage Controlled) Dimming Driver:
 - i. Must meet IEC 60929 Annex E for General White Lighting LED drivers.
 - ii. Must meet ESTA E1.3 for RGBW LED drivers.

N. Luminaire Identification

1. Each luminaire shall have the manufacturer's name, trademark, model number, serial number, date of manufacturer (month-year), and lot number as identification permanently marked inside each unit and the outside of each packaging box.
2. The following operating characteristics shall be permanently marked inside each unit: rated voltage and rated power in Watts and Volt-Ampere.

O. Quality Assurance

1. The luminaires shall be manufactured in accordance with a manufacturer quality assurance (QU) program. The QA program shall include two types of quality assurance: (1) design quality assurance and (2) production quality assurance. The production quality assurance shall include statistically controlled routine tests to ensure minimum performance levels of the modules built to meet this specification. These tests shall include: CCT, CRI, Lumen output and wattage. Tests shall be recorded, analyzed and maintained for future reference.
2. QA process and test results documentation shall be kept on file for a minimum period of seven years.
3. LED luminaire designs not satisfying design qualification testing and the production quality assurance testing performance requirements described below shall not be labeled, advertised, or sold as conforming to this specification.

P. Design Qualification Testing

1. Design Qualification Testing shall be performed by a National Voluntary Laboratory Accreditation Program (NVLAP) testing facility. Such testing may be performed by the manufacturer or an independent testing lab hired by the manufacturer on new luminaire designs, and when a major design change has been implemented on an existing design. A major design change is defined as a design change (electrical or physical) which changes any of the performance characteristics of the luminaire, results in a different circuit configuration for the power supply, or changes the layout of the individual LED's in the module.
2. A quantity of two units for each design shall be submitted for Design Qualification Testing.
3. Product submittals shall be accompanied by product specification sheets or other documentation that includes the designed parameters as detailed in this specification. These parameters include (but not limited to):
 - a. Maximum power in Watts.
 - b. L80 in hours, when extrapolated for the worse case operating temperature (section 2.2.3). TM21 report shall be submitted to demonstrate this.
 - c. Product submittals shall be accompanied by performance data that is derived in accordance with appropriate IESNA testing standards and tested in a laboratory that is NVLAP accredited for Energy Efficient Lighting Products.
4. Luminaire shall be tested per IESNA LM85.

Q. WARRANTY

1. The manufacturer shall provide a warranty against loss of performance and defects in materials and workmanship for the Luminaires for a period of 5 years after acceptance of the Luminaires. Warranty shall cover all components comprising the luminaire. All warranty documentation shall be provided to customer prior to the first shipment.
2. Provide manufacturer's warranty covering 5 years on drivers from date of purchase. Refer to manufacturer's terms and conditions on the website for detailed information.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install suspended luminaires and exit signs directly from building structure using rigid stem pendants supported from swivel hangers. Provide pendant length required to suspend luminaire at indicated height.
- B. Support luminaires larger than 2'x 4' size independent of ceiling framing.
- C. Locate recessed ceiling luminaires as indicated on reflected ceiling plan.
- D. Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- E. Grid Ceilings: Provide auxiliary members spanning ceiling grid members to support surface mounted luminaires. Fasten surface mounted luminaires to ceiling grid members using bolts, screws, rivets, or suitable clips.
- F. Install recessed luminaires to permit removal from below.
- G. Install recessed luminaires using accessories and fire stopping materials to meet regulatory requirements for fire rating.
- H. Install clips to secure recessed grid-supported luminaires in compliance with applicable codes.
- I. Install wall mounted luminaires and exit signs at height as shown.
- J. Install accessories furnished with each luminaire.
- K. Connect luminaires and exit signs to emergency power as indicated branch circuit under Section 260533 using flexible conduit, 3/8" minimum.
- L. Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
 - 1. Recessed LED: AWG No. 14 RHH or THWN.
- M. Bond products and metal accessories to branch circuit separate green equipment grounding conductor.
- N. Install specified lamps in each luminaire and exit sign in accordance with manufactures instructions for handling and burning position.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate installation of recessed luminaire frames and trims with ceiling construction.
- B. Coordinate the installation of suspended luminaires with building components, verify exact locations and mounting heights.

3.3 FIELD QUALITY CONTROL

- A. The use of permanent luminaires for temporary lighting shall only be as permitted by the Architect/Engineer.
- B. Operate each luminaire after installation and connection. Inspect for proper connection and operation.

3.4 ADJUSTING

- A. Adjust installed work under provisions of the General Requirement Specification Sections.
- B. Aim and adjust luminaires as indicated and as directed.
- C. Position exit sign directional arrows as indicated.

3.5 CLEANING

- A. Clean installed work under provisions of the General Requirement Specification Sections.
- B. Clean electrical parts to remove conductive and deleterious materials.
- C. Remove dirt and debris from enclosures.
- D. Clean photometric control surfaces to remove all dust and smudges with cleaning solution as recommended by manufacturer.
- E. Clean finishes and touch up damage.

3.6 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate installed work under provisions of the General Requirement Specification Sections.
- B. Demonstrate luminaire operation for minimum of two hours.

3.7 PROTECTION OF FINISHED WORK

- A. Protect installed work under provisions of the General Requirement Specification Sections.
- B. Relamp luminaires used for temporary lighting and luminaires that have failed lamps at the time of project turn-over.

END OF SECTION 265100

SECTION 270533 - CONDUIT ROUGH-IN FOR SPECIAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and the General Requirement Specification Sections, apply to this Section.
- B. This section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 DESCRIPTION

- A. Furnish and install Conduit Rough-In systems including all work incidental thereto as shown on Drawings and specified.
- B. This section is applicable to data/voice, and security systems.

1.3 SUBMITTALS

- A. Shop drawings are not required for material and equipment specified under this section of the specifications.

PART 2 - PRODUCTS

2.1 OUTLET BOXES

- A. Two gang for data, voice, cable TV, CCTV, card reader and sound system devices.

2.2 PLASTER COVER RINGS

- A. Single gang for single device, double gang for two devices, etc.

2.3 COVER PLATES

- A. Cover plates for data, voice, cable TV, CCTV, card reader and sound systems shall be provided by its respective trade.

2.4 RACEWAYS

- A. Per appropriate section with insulated throat bushings on all conduit runs and rubber grommets holes between boxes or box sections. Provide pull strings.

PART 3 - EXECUTION

3.1 COORDINATION

- A. Comply with all requirements of the Owner's representative for all raceways, boxes, cover plates, etc., and their specific installation considerations.
- B. Consult with Owner's representative prior to installation to determine special raceway requirements for all data, telephone, cable TV, CCTV, card reader and sound systems.

3.2 INSTALLATION

- A. Furnish and install the trunk raceways, outlet box, and outlet box raceways as shown on drawings and specified.
- B. Install trunk raceways to within six inches of backboards.
- C. Stub outlet box raceways to cable support system provided by others within accessible ceiling cavity.
- D. Minimum outlet box conduit sizes shall be 3/4 inch.
- E. In each instance where two or more device boxes are generally located in the same vicinity and at the same mounting height, mount those devices in a common multi-gang barrier box appropriate for the device types.
- F. Mark each conduit end for identification and destination of raceway.
- G. Provide required sleeves in all walls and floors as required by low voltage system contractors.
- H. Provide pull rope in each raceway.
- I. Provide insulating bus wings and locknuts for all raceways.
- J. There shall not be more than the equivalent of three 90 degree bends in any single run of conduit between boxes or fittings.
- K. Bends shall be made so that the conduit will not be flattened or kinked and the internal diameter of the conduit will not be reduced.

- L. The radius of the curve of the inner edge of any bend shall not be less than as indicated by the National Electrical Code and ANSI/TIA/EIA 569A Commercial Building Standard for Telecommunications Pathways and Spaces.
- M. In no case shall any conduit be bent or any fabricated elbow be applied no less than the allowable bending radius as specified by the cable manufacturer of the installed conductor.
- N. Provide blank cover plates for each unused outlet box.

END OF SECTION 270533

SECTION 271443 - DATA AND VOICE CABLING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.
- B. This Section is hereby made a part of all other sections of Division 26 as fully as if repeated in each therein.

1.2 SECTION INCLUDES

- A. Data Cabling.
- B. Voice Cabling.

1.3 RELATED SECTIONS

- A. Section 260532 – Conduit.
- B. Section 260503 – Boxes.

1.4 SYSTEM DESCRIPTION

- A. Furnish, install and test all cabling and equipment necessary for a complete data and voice cabling system as specified and indicated on drawings. Conduit, raceway and outlet boxes for the associated outlets shall be provided by this contractor.
- B. The cabling system shall meet specifications for 10/100 Base TX and gigabit network. Provide connections to 10/100 Base-T Hubs by changing patch cords in wiring closets.
- C. Insure that the cable run from the distribution frame to the information outlet does not exceed 90 meters (295 Feet).
- D. Furnish and install all faceplates, patch panels, equipment racks, equipment trays and all other items necessary to provide connections at all specified information outlets and patch panel(s).
- E. The cabling system shall be in compliance to EIA/TIA 568A, TSB-67, and ISO/TEC IS 11801.

- F. Support analog and digital voice applications, data system on a common cabling platform. The systems that shall be supported include, but are not limited to

1. Data Communications – TIA/EIA-568A/569, Ethernet, Category 5E and or Category 6, UTP plenum cable.
 - a. Data communications from the MDF to IDF's will be via 12 strand 6 pair Grade 4 50 micron, 10 gig rated Beltec multimode fiber plenum cable. From IDF's to local data ports will be over Category 5E and or Category 6 UTP plenum cable.
2. Voice Application – Voice communications will be provided in a star wired, homerun configuration from MDF/IDF to each telephone port specified. Category 5E (Mohawk Megalan 400) or owner approved equal will be used for Voice Applications.

1.5 PROJECT/SITE CONDITIONS

- A. Examine areas and conditions under which all items are to be installed, and notify architect in writing of conditions detrimental to proper completion of the work. Do not proceed with that portion of the work affected until unsatisfactory conditions have been corrected in a manner acceptable to installer.

1.6 SUBMITTALS

- A. Submit shop drawings and product data under provisions of the General Requirements.
- B. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that Contractor has not stamped with his review certification.

1.7 QUALIFICATIONS

- A. Low voltage contractor shall have at least four-(4) year's experience in the installation of similar systems. The low voltage contractor shall provide documentation upon request to certify that all assigned staff have attended training courses corresponding to the type of cabling and equipment specified herein.
- B. Low voltage contractor shall currently be licensed to install low voltage electronic cabling systems in the State if applicable.
- C. Low voltage contractor shall currently meet all manufacturer's requirements for the provision and installation of all equipment specified herein.

- D. Low voltage contractor shall utilize and have operators trained in the utilization of the following test equipment:
 - 1. Copper Cable test equipment
 - a. Fluke 4100
 - b. Ideal Lantek 6A or Owner approved equal.
 - 2. Printout generated by the test equipment showing jack number and cable footage shall be part of submittals.

1.8 MAINTENANCE SERVICE

- A. Provide service and maintenance of cabling system for one (1) year from date of Final Acceptance.
 - 1. Warranty: Warrant the cabling system against malfunction due to component failure or improper installation for a period of (10) years from the date of Final Acceptance. When notified of a malfunction, proceed to immediately correct the situation by replacement or repair without cost to the Owner. Extend manufacturer's warranties when necessary to achieve the full duration. Clearly indicate provisions of the warranty in the Warranty Manual.
 - 2. Response Time: Within the Warranty period, low voltage contractor will replace defective parts within one business day after receiving notification of a problem.
 - 3. Warranty inspection: Prior to expiration of the one year warranty period, arrange to make an inspection of the cabling system. Make adjustments and correct defects that exist to bring the system up to as-new specifications.

PART 2 – PRODUCTS

2.1 GENERAL

- A. Low voltage contractor shall provide written notification to Engineer, prior to bidding, of any discrepancies in model or part numbers specified.
- B. Low voltage contractor shall provide written notification to Engineer, prior to bidding, of the announced discontinuation or replacement of any items specified herein.
- C. Low voltage contractor shall provide all necessary components, mounting hardware and accessories required to install the materials specified herein.

2.2 PRODUCT SUBSTITUTIONS

- A. No substitutions will be allowed.

2.3 MATERIALS

A. Cabling:

1. Data Cable: Furnish and install plenum 4-pair 24awg, solid copper unshielded twisted-pair (UTP) cable or quality that exceeds pending EIA/TIA-568 and EIA/TIA TSB-36 Category 6 requirements.
 - a. Approved Manufacturers: Mohawk, Comscope, Belden, Owner Approved Equal..
2. Voice Cable: Furnish and install plenum 4-pair 24awg, solid copper unshielded twisted-pair (UTP) cable or quality that exceeds pending EIA/TIA-568 and EIA/TIA TSB-36 Category 5E requirements.
 - a. Approved Manufacturers: Mohawk, Comscope, Belden, Owner Approved Equal.
3. Fiber Optic Intra-Building Backbone (Multimode) Cable: 12-Strand 50-micron multimode, "FDDI" or higher grade, tight buffered (900 micron). Riser rated (OFNR) distribution cable.
 - a. Acceptable Manufacturers: Mohawk, Comscope, Seicor, Beltec, Owner Approved Equal.

B. Innerduct: Nonmetallic, corrugated, flexible conduit for use in riser applications. Supplied with factory installed pull tape. Color "Orange"

1. Acceptable Manufacturers: Carlon Telecom Systems or Owner Approved Equal

C. Faceplates:

1. Voice and Data Drop Locations:
 - a. Two gang junction box, single gang faceplate.
 - b. Acceptable Manufacturers: Hubbell, Lucent, Panduit, Siemon
 - c. Cat-5e Voice Jack: Cat-5e, high density, T568A wired, Blue color "RJ45" jack.
 - d. Cat-6 Data Jack: Cat-6, high density, T568A wired, Yellow for administration server, Red for student server, "RJ45" Power Sum jack.
 - e. Refer to Drawings for quantity of jacks.
2. Voice Only Wall Phone Drop Location: Stainless steel single gang faceplate, Wall plate jack.
 - a. Acceptable Manufacturer: Hubbell
 - b. Wall Mount Telephone Mounting Plate: Stainless steel, single gang.
 - c. Cat-5e Voice Jack: Cat-5e, T568B wired, office Blue, "RJ45" wall plate jack.

D. Equipment Racks:

1. Self Supporting Main Distribution Frame (MDF) Network Server Racks.
 - a. Network Rack: Self supporting aluminum, 19" wide by 84" high, universal EIA 12-24 mounting hold pattern front and rear, computer black in color.
 - 1) Acceptable Manufacturers: Hubbell, Chatsworth Products, Inc. CPI, Owner Approved Equal.
 - b. Vertical Cable Management Section: 4" wide by 35" high finger duct front and rear vertical management section, mountable to side of network rack, provides for organization of vertical cables on the network rack, black in color.
 - 1) Acceptable Manufacturers: Hubbell, Panduit or owner approved equal.
 - c. Horizontal Cable Management Panel: Two rack space panel – manages cables on front and back of rack. 3" by 3" front slotted duct, 2" by 4" rear slotted duct, 19" wide, rack mountable horizontal wire management panel utilized for cable management within the data, voice and video racks.
 - 1) Acceptable Manufacturers: Hubbell, Panduit or owner approved equal.
 - d. Rack Mountable Power Strip: Surge Protected Power Strip, 19" Wide, Rack Mountable, 120V. 20A., 10 outlet.
 - 1) Acceptable Manufacturers: Hubbell Premise Wiring, Inc., Owner Approved Equal.

E. Patch Panels:

1. Unshielded Twisted Pair (UTP) Patch Panel and Associated Items:
 - a. 48-Port Patch Panel: 19" rack mount, 48-port cat-6 patch panel, with cable support bar and color-coded label strip, T568A wired.
 - 1) Acceptable Manufacture: Panduit or Owner Approved Equal.
 - b. 24-Port Patch Panel: 19" rack mount, 24-port Cat 6 patch panel, with cable support bar and color-coded label strip, T568A wired.
 - 1) Acceptable Manufactures: Panduit or Owner Approved Equal.
2. Fiber Optic MDF Cabinets and Associated Items:
 - a. Fiber Optic Rack Mountable Cabinet: 19" rack mount, 1 universal cabinet, providing front access to adapter faceplates, Plexiglas door. Mounted a fiber MDF.
 - 1) Acceptable Manufacturers: Hubbell, Panduit, Siemon or Owner Approved Equal.

- b. Fiber Optic Adapter Panels: “SC” adapter panel with 3 duplex SC multi/single-mode adapters.
 - 1) Acceptable Manufacturers: Hubbell, Panduit, Siemon or Owner Approved Equal.
 - c. Blank Adapter Panels: Filler panel with no adapters.
 - 1) Acceptable Manufacturers: Hubbell, Panduit, Siemon or Owner Approved Equal.
 - 3. Fiber Optic IDF Cabinets and Associated Items:
 - a. Fiber Optic Rack Mountable Cabinet: 19” rack mount, 1 universal cabinet, providing front access to adapter faceplates, Plexiglas door.
 - 1) Acceptable Manufacturers: Hubbell, Panduit, Siemon or Owner Approved Equal.
 - b. Fiber Optic Adapter Panels: “SC” adapter panel with 3 duplex SC multi/single-mode adapters. Three panels utilized with each cabinet.
 - 1) Acceptable Manufacturers: Hubbell, Panduit, Siemon or Owner Approved Equal.
 - c. Blank Adapter Panels: Filler panel with no adapters. Nine panels utilized with each cabinet.
 - 1) Acceptable Manufacturers: Hubbell, Panduit, Siemon or Owner Approved Equal.
- F. Cable Runway and Associated Hardware:
- 1. 1.5” Tubular Stringer, 18” wide, 6” rung spacing, light duty. Black finish. Acceptable Manufacturers: Hubbell, B-Line or Owner Approved Equal.
 - a. Cable Runway.
 - 1) Part Number: Hubbell HLS1018B
 - b. Runway Wall Support Kit.
 - 1) Part Number: Hubbell HLX1518
 - c. Runway Dropout.
 - 1) Part Number: Hubbell HLCD18

- d. Splice Extension Clamp Kit.
 - 1) Part Number: Hubbell HLTK
- e. Runway StandOff Kit.
 - 1) Part Number: B-line SB-2109
- f. Relay Rack Runway Support.
 - 1) Part Number: Hubbell HLMPK19
- G. Patch Cords:
 - 1. UTP Patch Cable: Unshielded Twisted Pair (UTP), 24 AWG, stranded copper cable, enhanced category-6 quality (Power Sum Cord), T-568 wired, RJ45 plug connector at each end. 3', 5' and 8' lengths. All with jacket color by owner.
 - a. Acceptable Manufacturers: Mohawk Gigalan, Panduit, Siemon or Owner Approved Equal.
 - b. Quantity: As required for a complete installation
 - 2. Fiber Optic Patch Cable:
 - a. Multimode: 2-Strand, 62.5/125 micron, multimode "Optispeed", "SC" fiber optic patch cord with strain relief caps (Different color caps for identification of each strand).
 - 1) Acceptable Manufacturers: Mohawk, Panduit, Siemon or Owner Approved Equal.
 - 2) Quantity: As required for a complete installation
- H. Interior Telephone Trunk Cable: Unshielded Twisted Pair (UTP), Category 3, 300-pair, 24 AWG., solid copper conductors, plenum rated cable. (Existing)
 - 1. Acceptable Manufacturers: Mohawk, Lucent Technologies or Owner Approved Equal.
- I. Wall Mountable Telephone 110 Wiring Block & Associated Items.
 - 1. 100-Pair Wiring Block: 300-pair block with stand off legs. (Utilized for 300-pair telephone truck cable between DEMARC and MDF/Voice rack).
 - a. Acceptable Manufacturers: Hubbell, Lucent, Siemon or Owner Approved Equal.
- J. 110-Wiring Block Side Mount Wire Bracket: Wire manager snaps onto the legs of the 10-Wiring Block to manage vertical cable routing. Color "White".
 - 1. Acceptable Manufacturers: Hubbell, Lucent, Siemon or Owner Approved Equal.

- K. Telephone 110C Connecting Block: 5-Pair connecting block associated with wire terminations of the backbone cables on Telephone 110 Wiring Block.
 - 1. Acceptable Manufacturers: Hubbell, Lucent, Siemon or Owner Approved Equal.

PART 3 – EXECUTION

3.1 GENERAL

- A. Install all equipment and components in accordance with manufacturer's written instructions, in compliance with NEC, and with recognized industry practices, to ensure that all items comply with specifications and serve intended purposes.
- B. All Cabling and equipment shall be installed in accordance with good engineering practices as established by the EIA and the NEC. Cabling shall meet all applicable local, State, and Federal building codes.
- C. Record serial numbers of all items provided that are serialized. To be completed prior to Final Acceptance.
- D. All items must be complete as specified prior to Final Acceptance. Ensure cabling meets all specifications and standards defined herein.

3.2 INSTALLATION

- A. Cabling - General:
 - 1. All cables shall be provided in conduits except cables above accessible ceiling space. Cables above accessible ceiling space shall be exposed.
 - 2. All cables shall be plenum rated.
 - 3. Furnish and install cabling runs between Wiring Closets and all outlets specified on drawings. A dedicated cabling run shall be utilized for each Faceplate Jack except voice cables for apartment shall be daisy chained within an apartment.
 - 4. Conduit, Raceways and Outlet Boxes, to be provided as required.
 - 5. Furnish and install Faceplates and Faceplate Jacks in Outlet Boxes for all outlets specified on drawings.
 - 6. All Jacks shall be terminated in accordance with Cable Pinout Detail (AT&T or owner approved equal).
 - 7. Furnish and install grommets in conduit to prevent damage to insulation or conductors.
 - 8. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturers published torque-tightening values for equipment connectors.
 - 9. Do not damage cabling and shielding. Avoid excessive and sharp bends. Ensure manufacturer's recommended pulling tensions are not exceeded.
 - 10. Allow sufficient slack in cable to prevent premature deterioration of cable system components and to assist in the maintenance and servicing of cable and/or other building systems and components.
 - 11. Cable that is run above a suspended ceiling shall be supported by J-hooks every 5'-0".

12. Fittings or connections are allowed only at the input and output of devices. Splicing shall not be accepted in any cable runs. The entire cable run shall be replaced in all such instances.
13. All cable must be free of tension at both ends as well as over the length of the run. In cases where a cable must bear some stress, Kellum grips may be used to spread the strain over a longer length of the cable. Cables that require service loops or additional length should be coiled from 100-200% of their recommended minimum bend radius. The coil shall then be cabled tied and attached to a nearby support.
14. Excess cable behind faceplate connections shall be pulled back into ceiling spaces and secured in such a manner as to prevent damage to cabling or connections.
15. A minimum 10 foot loop of extra cable shall be secured in accessible ceiling space for outlets installed in movable partition walls or power poles.
16. Use a cable tie tool to install cable ties with appropriate pressure to the cable bundles so not to damage cable and provide a smooth cut of excess cable tie. Cable ties MUST be able to be turned freely around the bundle of cable. Cable bundles shall be limited to 2" diameter. Cable ties to be used for cable bundle "above the ceiling".
17. Use Velcro® Bands to secure cable bundles from where the cable exits the ceiling and terminates at the Patch Panel on the IDF.

B. Grounding: Ground all equipment per manufacturers' instructions and NEC guidelines.

C. Labeling:

1. Confirm all room numbers with the Owner prior to labeling.
2. Use the following format for all Outlet and Patch Panel labeling: Room Number-Outlet Number-Jack ID. The Jack ID shall be "A" for the top jack or "B" for the bottom jack. For example, the top jack of Outlet #1 in Room 114 shall be labeled as 114-1-A.
3. Brother P-Touch, Casio EZ Label, Brady or prior approved equal self-adhesive labels shall be utilized for all Outlet and Patch Panel labeling. A sample of EACH information outlet with 1' Minimum of each cable terminated shall be required for approval.
4. Place labels on Faceplates and inside Outlet Boxes for all Outlet locations.
5. Label all patch panel terminations with the identical numbers used at outlet locations.
6. Label the ends of all cabling runs with Panduit Pan-Ty, Brady or owner approved equal labels in permanent marker.
7. Label all Patch Cords with Panduit Pan-Ty, Brady or owner approved equal labels in permanent marker.

3.3 CERTIFICATION AND DOCUMENTATION

- A. All circuits must be certified to comply with EIA/TIA 568, TSB36 and TSB40 specifications for 250 MHZ [100 megabits per second (MBPS)] data systems including NExT (near end cross talk), TD (time domain reflectometer) distance and attenuation for all pairs and must meet or exceed all NEC, NFPA, BOCA and local building codes pertaining to low voltage signal cabling.

- B. In order to verify certification and provide reference for future use, the contractor shall provide a complete documented cable performance testing certification on each UTP cable segment per ANSI/EIA/TIA 568, TSB36, TSB40 on all pairs swept at all frequencies. Documentation must be provided in a magnetic media format agreed to in writing by the Owner with results including the following for all pairs at 100 MHZ, 150 MHZ and 250MHz:
 - 1. Cross talk levels (NExT).
 - 2. Attenuation.
 - 3. TDR (cable length).
 - 4. Signal to noise ratio (SNR).
 - 5. Testing for Shorts/Breaks, Correct Pairing
- C. Testing must be done in both directions: Perminant Link
 - 1. From the station outlet/connector.
 - 2. From the telecommunications closet.
- D. Results must meet or exceed all parameters for proposed Category 6 structured premise cabling systems. Provide hard copy test results for each cabling run in Technical Manual.
- E. Low voltage contractor shall utilize and have operators trained in the utilization of the following test equipment:
 - 1. Copper Cable test equipment
 - a. Ideal Lantek 6A or prior approved equal.
 - 2. Printout generated by the test equipment showing jack number and cable footage shall be part of submittals.

END OF SECTION 271443

SECTION 280010 – BASIC DIVISION 28 REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

- A. This Section includes general administrative, material, and procedural requirements for Division 28 installations to expand the requirements specified in Division 01.

1.2 REFERENCES

- A. Abbreviations and Acronyms:

1. A/E - Architect / Engineer (designer).
2. AHJ - Authority Having Jurisdiction.
3. ANSI - American National Standards Institute.
4. AWG - American Wire Gauge.
5. BICSI - Building Industry Consulting Service International.
6. BDF - Building Distribution Facility; space within a building that is the nexus of LAN distribution for that particular building.
7. Broadband - Wide bandwidth equipment or systems that can carry signals occupying in the frequency range of 54 to 1002 MHz.
8. Cat - Category; based on numerical value of structured cabling performance.
9. CAT 6 - Category 6 performance as defined by ANSI/TIA/EIA-568-B.2-1.
10. CTS - Certified Technology Specialist.
11. DC - Data Center.
12. EIA - Electronics Industry Alliance.
13. ELFEXT - Equal Level far End Cross Talk.
14. ER - Equipment Room.
15. EOR - Engineer of Record.
16. FOTP - Fiber Optic Test Procedure.
17. ILEC/LEC - Incumbent / Local Exchange Carrier.
18. IT - Information Technology.
19. IDF - Intermediate Distribution Frame.
20. ICC - Intermediate Cross Connect.
21. LOMMF - Laser Optimized Multimode Fiber.
22. LV - Low Voltage Room, Intermediate Distribution Facility; station and backbone cable concentration point on a particular floor for specific use on that same floor.
23. MCC - Main Cross Connect.
24. Main Low Voltage Room - Main Distribution Facility; space within a building that is the main point of LAN distribution for that building or to other buildings.
25. MPOE - Main Point of Entry.
26. MHz - Megahertz.
27. NEXT - Near End Cross Talk.
28. NECA - National Electrical Contractors Association.
29. NEMA - National Electrical Manufacturers Association.
30. OTDR - Optical Time Domain Reflectometer.
31. PSELFEXT - Power Sum Equal Level far End Cross Talk.
32. PSNEXT - Power Sum Near End Cross Talk.

33. PTZ - Pan/Tilt/Zoom.
34. RCDD - Registered Communications Distribution Designer.
35. ScTP - Screened Twisted Pair.
36. SCS - Structured Cabling System.
37. SMF - Single-Mode Fiber.
38. STP - Shielded Twisted Pair.
39. TCIM - Telecommunication Cabling Installation Manual.
40. TDMM - Telecommunications Distribution Methods Manual.
41. Technology Outlet - Voice/data/video/other interface outlet located at workstation.
42. Telecom Spaces - Include all areas where cable or equipment will be placed, including IT resources, Engineering resources, and user stations.
43. TIA - Telecommunications Industry Association.
44. TBB - Telecommunications Bonding Backbone.
45. TDR - Time Domain Reflectometer.
46. TGB - Telecommunications Ground Bus Bar.
47. TR - Telecommunications Room.
48. UTP - Unshielded Twisted Pair cabling.
49. UL - Underwriters Laboratory.
50. UNO - Unless Noted Otherwise.
51. UPS - Uninterruptible Power Supply.

B. Definitions:

1. In addition to those Definitions listed in Division 01, the following list of terms shall be defined as follows:
 - a. Connect - To install required patch cords, equipment cords, cross-connect wire, etc. to complete an electrical or optical circuit.
 - b. Cabling - A combination of cables, wire, cords, and connecting hardware e.g., cables, conductor terminations, connectors, outlets, patch panels, blocks, and labeling.
 - c. Identifier - A unique code assigned to an element of the telecommunications infrastructure that links it to its corresponding record.
 - d. Open Cabling - Cabling run horizontally within a pathway supported by J-hooks, D-hooks, etc. that is installed above an accessible ceiling. This installed cabling is considered concealed.
 - e. Exposed Cabling - Cabling that is not concealed by an accessible pathway, conduit, etc. Cabling installed open below an exposed structure.
 - f. Concealed Cabling - Cabling rendered inaccessible by the structure or finish of the building.
 - g. Pathway - Routing of cabling from work area outlet box to telecommunications room. Pathways may consist of conduit, conduit stub, conduit sleeve(s), J-Hooks, etc.
 - h. Telecom Cabling/Datacom Cabling - Low voltage extended frequency signal and communications cabling. Category 6 and fiber optic cabling.
 - i. System cabling - Low voltage signal and control cabling. System cabling is designated by the manufacturer for a particular system in each specification section.

1.3 ADMINISTRATIVE REQUIREMENTS

A. Substitutions

1. The materials, products and equipment described in the Bidding Documents establish a standard of required functions, dimensions, appearance and quality to be met by any proposed substitution.
2. No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect/Engineer at least ten (10) days prior to the date for receipt of Bids. Each such request shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitute including drawings, cuts, performance, test data and warranties, and any other information necessary for an evaluation. A statement setting forth any changes in other materials, equipment, or other work for incorporation of the substitute shall be included. The burden of proof of the merit of the proposed substituted is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.
3. If the Architect approved any proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. This Addendum shall then be issued to all Bidders.
4. Requests for substitution shall be made only by a Bidder. Requests for substitution received by the Architect from sales representative, vendors, suppliers, etc., are not acceptable.
5. Refer to Division 01 for instructions on substitutions.

B. Permit and Inspections

1. Permits: Obtain and pay for all permits, bonds, licenses, tap-in fees, etc., required by the City, State, or other Authority Having Jurisdiction over the work, as a part of the work of the affected sections.
2. Inspections: Arrange and pay for all inspections required by the above when they become due as part of the work of the sections affected. Conceal no work until approved by these governing authorities. Coordinate inspection period with the AHJ and Engineer through Construction Manager. Present the Engineer with properly signed certificate of final inspection.

C. Coordination:

1. Coordinate all programming components, device designations, and labels to match the final room numbers of the completed project. The room numbers on the Drawings may not be the final room numbers and may be finalized after system components are installed.
2. Coordinate arrangement, mounting, and support of Division 28 equipment.
 - a. To allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
 - b. To provide for ease of disconnecting the equipment with minimum interference to other installations.
 - c. To allow right of way for piping and conduit installed at required slope.
 - d. So connecting raceways, cables, wireways, and pathways will be clear of obstructions and of the working and access space of other equipment.

3. Coordinate installation of required supporting devices and set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.
4. Coordinate location of access panels and doors for electrical items that are behind finished surfaces or otherwise concealed. Access doors and panels are specified in Division 08 Section "Access Doors and Frames."
 - a. Submit coordination drawings indicating proposed access door locations for review per Division 28 Section "Basic Division 28 Requirements."
 - b. Ensure access doors are sized to permit complete access for any concealed and/or inaccessible junction boxes, control and monitoring devices, elevator shaft and other items of equipment requiring access, maintenance, and/or operation.
- 1) Assure access to devices per codes and local Authorities Having Jurisdiction.
5. Wiring and controls associated with equipment shall be furnished, installed and wired in accordance with the manufacturer's recommendations and applicable standards and codes. Provide installation instructions, locating dimensions and wiring diagrams for the other trades. Supervise the installation and start-up and test the equipment unless otherwise specified.
6. Equipment Furnished by Other Divisions: Equipment specified in other divisions and requiring communication and control connectivity shall be erected, aligned, leveled and prepared for operation. Provide required controls and accessories along with installation instructions, diagrams, dimensions and supervision of installation and start-up. Provide the required terminations, accessories and programming furnished under the specifications for the other divisions. Install those controls and accessories not located in the provided equipment. Provide additional electrical controls, accessories, fittings and devices not specified under the equipment but required for a finished, operating job. Make final electrical connections. Participate in the start-up and test services.
7. Coordinate installation of all devices operating in radio frequency ranges with existing and new devices such that interference between systems/devices does not occur and cause system/devices to malfunction or fail. Revise operation of system or replace system as required. Coordinate RF ranges with all equipment provided in other divisions or by Owner.
8. Coordination with local electronic safety and security services:
 - a. Coordinate connection of telecommunication systems with exterior underground and overhead utilities and services and meet all of their schedules so that the services proceed in a timely and orderly fashion. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 - b. Locations and details required by Division 28 for the utility rough-in shall be the responsibility of Division 28.

1.4 SUBMITTAL PROCEDURES

- A. General: Provide required submittals in accordance with Division 01 "Submittal Procedures".

B. Definitions:

1. Submittals: A written or graphical expression of the Contractor's interpretation of requirements in the Contract Documents to show how the Contractor intends to fulfill those requirements and identifying deviations from contract.
2. Action Submittals: Required submittal which Engineer reviews and approves or takes other appropriate action to communicate to the Contractor the status if the submittal and subsequent action are required.
3. Other (Information, Closeout, and Maintenance and Material) Submittals: Required submittals which Engineer reviews and may elect to respond. If rejected by Engineer for not complying with requirements, resubmittal or other action may be required on the part of the Contractor.
4. Layout Drawings: Drawings assembled by the Contractor consisting of to-scale architectural floor plans with room numbers and elevations of the actual facility being constructed or renovated with equipment symbols utilized to represent the size, shape and location of equipment.
5. Riser Drawings: By means of single lines and graphic symbols, drawings assembled by the Contractor depicting devices provided and their functions with connectivity to associated equipment. Locations shall be identified using room numbers.

C. Failure to Submit:

1. Contractor's failure to provide submittals does not alleviate the responsibility to provide the requirements in the Contract Documents as interpreted by the Engineer. Correct Non-compliant items.

D. Applicable Information:

1. All information not applicable to the project shall be crossed out in the submittal. All applicable accessories, option, etc. shall be clearly indicated. Failure to comply shall be grounds for the submittal to be rejected.

1.5 ACTION SUBMITTALS

- A. Submit action submittals in groups by specification number. For example, all structured cabling equipment identified within that section number, including cabling, components, faceplates and accessories shall be submitted simultaneously in one package.

1. Equipment submitted from multiple sections under a single cover will not be reviewed.

- B. Provide a complete submittal list with dates for submission of documentation to Engineer. Identify any submittals requiring priority processing and review based on equipment lead times or fast track construction. Ensure submittals that contain information that transcends section numbers are submitted simultaneously so that review is not delayed waiting for concurring information. Submit in hard copy and Microsoft Excel format.

- C. Each System Submittal shall contain the following minimum information in addition to the information requested in the individual section:

1. Section number and equipment/device type in a bound submission.
2. Table of Contents identifying equipment lists with numbered pages identifying equipment/device locations within submittal.
3. System Scope of Work narrative.
4. Equipment/device quantities.

5. Equipment/device product information sheets with submission designated, installation information, color/finish options, etc.
 6. Program information sheets.
 7. Coordination requirements with all trades.
 8. Program layout diagrams, riser diagrams, wiring diagrams, rack elevations, seismic requirements, etc. Utilize Architectural, Electrical, and Communication symbology and room numbers to be consistent with Owner's standards.
 9. Training outline.
 10. Sample testing reports.
 11. Deviations from specifications, if any, highlighted with specific explanation and identification requiring Architect/Engineer specific approval.
 12. Identify any products that will no longer be available or will be discontinued by the manufacturer prior to the completion of the warranty period.
 13. Estimated equipment heat loads and power requirements. List and tabulate equipment specifically required in Data Rooms. Coordinate with Division 27 equipment as applicable.
 14. Submit qualifications based on quality assurance requirements.
 15. Provide secondary submittal for systems requiring programming and Owner input, review, and approval after Programming meeting, sequence of operations review, etc. Provide all information in spreadsheet format in electronic and hardcopy.
 16. Manufacturer required information for base and extended warranties including submission requirements and timeframes.
 17. Provide copies of manufacturer's warranty information to Owner that is submitted directly to manufacturer.
 18. Identify any additional power requirements, communications connections or alterations needed to support the proposed equipment.
- D. Submit the following action submittals as qualified in associated Division 28 Sections:
1. Batteries and Battery Chargers (Submit with associated system).
 2. Fire Alarm Systems
 3. Security Systems.
 4. Wire Guards.
- E. Action submittals submitted for other than those listed above or not specifically required in the appropriate Specification Section will not be reviewed or returned.
- F. Contractor Certificates:
1. Contractor certification forms may be submitted in accordance with Division 01 Section "Submittal Procedures" in lieu of complete system submittal requirements for the systems.

1.6 INFORMATIONAL SUBMITTALS

A. Coordination Drawings:

1. Prepare coordination drawings in accordance with Division 01 Section "Project Management Coordination," to a scale of 1/4"=1'-0" or larger; detailing major elements, components, and systems of electrical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - a. Indicate the proposed locations of major raceway systems, equipment, and materials. Include the following:
 - 1) Clearances for servicing equipment, including space for equipment disassembly required for periodic maintenance.
 - 2) Exterior wall and foundation penetrations.
 - 3) Wall and floor sleeve penetrations.
 - 4) Floor box and poke-through assembly installations.
 - 5) Equipment connections and support details.
 - 6) Sizes and location of required concrete pads and bases.
 - 7) LAN connections.
2. Submit the following specific coordination drawings and others as defined in other Division 28 Sections:
 - a. Access door locations and sizes (for installation by Division 08).
 - b. Head-end equipment.
3. Indicate scheduling, sequencing, movement, and positioning of large equipment into the building during construction.
4. Prepare floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
5. Prepare reflected ceiling plans to coordinate and integrate installations, air outlets and inlets, speakers, wireless access points, communications systems components, sprinklers, and other ceiling-mounted devices.
6. Coordination drawings do not omit the required submission of layout and plan drawings identified in other specification sections for review and approval.
7. Contract Document Drawing copies may be used as base for coordination drawings, then marked to depict actual equipment sizes and other requirements of coordination drawings. Those not marked will be rejected.

1.7 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data:

1. Prepare and submit operation and maintenance manuals in accordance with Division 01 Section "Project Closeout." In addition to the requirements specified in Division 01, include specific Division 28 Section requirements, and the following information for equipment items:
 - a. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - b. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 - c. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - d. Servicing instructions and lubrication charts and schedules, software release update and patch criteria.
 - e. Individual characteristics for trouble shooting sequences for each item of each communications systems.
2. The minimum information that shall be furnished in the maintenance manual shall include the following:
 - a. Title, table of contents, tabbed sections for each installed system in an organized 3-ring binder labeled with the project name and date.
 - b. Emergency and warranty contact names and numbers for the contractor and vendor of each installed system.
 - c. Final submittal copy with catalog cut sheets for every item for which a submittal was provided.
 - d. Contract modifications and actual equipment and materials installed.
 - e. Model numbers and serial numbers for all provided equipment.
 - f. Provide a digital color photo (8-1/2 x 11 minimum) and .TIFF file on DVD-Rom of the following areas:
 - 1) All head-end equipment (racks) showing model numbers and final connectivity.
 - 2) All telecom equipment.
 - 3) All sound and video equipment racks and portable equipment.
 - 4) Interiors of manholes.
 - g. On-hand spare parts list and complete parts list for each communication system.
 - h. Manufacturers' recommended cleaning intervals and special procedures for each communications system device.
 - i. Calibration and exercise procedures for each communications system device.
 - j. Approved special construction details that differ from the details shown on Drawings.
 - k. Testing and troubleshooting procedures unique to special systems. For example:
 - 1) Water tightness tests for manholes and handholes.

- l. Test reports; sign off and acceptance of manufacturer, vendor, etc.
 - m. Inspection reports.
 - n. Warranty information for all systems including individual manufacturer product warranties and system extended manufacturer warranty certificate where applicable.
 - o. Provide an additional engraved spare key for each system with documentation.
 - p. Required software/programming/information.
 - 1) Provide system programming design manual with Owner sign-off and associated Meeting minutes.
 - 2) Provide software documentation and licensing information.
 - q. Training documentation and DVD's.
- 3. Drawings:
 - a. Major cabling systems (trunk risers), size and location, for both interior and exterior; locations of control devices and distribution boxes.
 - b. Major equipment locations (exposed and concealed), dimensioned from prominent building lines.
 - c. In slab conduit routings.
 - d. Outlet devices with final outlet nomenclature identified at each device.
- 4. Engage the services of a Land Surveyor or Professional Engineer registered in the state in which the project is located as specified in Division 01 Section "Execution" to record the locations and invert elevations of underground installations.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Extra Material:

- 1. Provide four (4) keys for every different piece of equipment which is equipped with a lock.
 - a. Coordinate similar locks/keys for like equipment. Verify with Owner.
 - b. Stamp keys with system name.
- 2. Provide all other loose equipment specified/supplied for use with all systems.

1.9 QUALITY ASSURANCE

- A. General: Follow the procedures specified in Division 01 Section "Quality Requirements," Source Limitations.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to Authorities Having Jurisdiction and marked for intended use.
- C. Obtain similar products through one source from a single manufacturer.

- D. Manufacturers of equipment shall be firms regularly engaged in manufacturing factory fabricated systems and equipment whose products have been in satisfactory use in similar service for not less than three (3) years.
- E. All equipment shall be provided by an authorized dealer or distributor of the manufacturer to ensure authentic product and warranty will be provided. Provide all necessary documentation at time of delivery.
- F. Provide equipment as required by and/or listed in the specifications for a complete and operational system.
- G. Testing Agency Qualifications: An agency with the experience and capability to conduct the testing indicated, is acceptable to the equipment manufacturer, the Engineer, and that is acceptable to Authorities Having Jurisdiction.
 - 1. For electrical power equipment and systems, the agency shall be a member company of the International Electrical Testing Association (NETA) or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
 - 2. For other than electrical power equipment or where NETA is not a recognized testing agent, the testing agency shall be as defined in the appropriate Division 28 Section.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Comply with Architecture specifications Division 01 Section "Product Requirements."
- B. Deliver products to the project site properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- C. Provide all documentation identifying authorized distribution of the products.

1.11 WARRANTY

- A. All equipment, software, services, and programming shall be covered by a one (1) year parts and labor warranty from date of acceptance. Acceptance will be provided in writing by Engineer after system is installed, programmed, and tested to the satisfaction of the Owner.
- B. All manufacturer product warranties shall be transferable to the Owner upon substantial completion of the project for the full term of the warranty.
- C. All warranties shall be standard manufacturer agreements. "Special" project warranties are not acceptable.
- D. For all existing systems being expanded or extended, provide an extension of the current maintenance agreement or warranty on all existing components of that system to ensure proper operation and maintenance of that equipment through the completion of the new warranty period.

PART 2 - PRODUCTS

2.1 REGULATORY REQUIREMENTS

- A. Work and materials shall conform to and be executed, inspected and tested in accordance with the latest edition of the National Electric Code and with the governing rules and regulations of federal, state and local governmental agencies. References to "NEC" within the Division 28 Sections shall be considered synonymous to this electrical code.
- B. Other codes and standards which will apply to this installation include the current editions of:
 - 1. ANSI C2 - National Electrical Safety Code.
 - 2. NFPA 70E - Standard for Electrical Safety Requirements for Employee Workspaces.
 - 3. NFPA 99 - Health Care Facilities.
 - 4. NFPA 101 - Life Safety Code.
- C. Where governing codes indicate the Drawings and Specifications do not comply with the minimum requirements of applicable codes, be responsible for either notifying the Architect in writing during the bidding period of the revisions required to meet code requirements, or providing an installation which will comply with the code requirements.
- D. U.L. Listing
 - 1. All equipment shall bear the Underwriter's Laboratories (UL), or other approved agency, listing label. Acceptable alternates include:
 - a. Intertek Testing Service NA, Inc. (ITSNA) (formerly ETL).
 - b. Wherein an item of equipment is specified to be U.L. Listed, the entire assembly shall be listed by Underwriters Laboratories, Inc. Any modifications to suit the intent of the Specifications shall be performed in accordance with the National Electrical Code and listed by U.L.
 - 2. Definitions:
 - a. Listed: Equipment or materials included in a list published by an organization acceptable to the authority having jurisdiction and concerned with product evaluation, that maintain periodic inspection of production of listed equipment or materials, and whose listing states either that the equipment or material meets appropriate designated standards or has been tested and found suitable for use in a specified manner.
 - b. Labeled: Equipment or materials to which has been attached a label, symbol or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation that maintains periodic inspection of production of labeled equipment or materials and by whose labeling the manufacturer indicated compliance with appropriate standards or performance in a specified manner.

2.2 SUSTAINABILITY CHARACTERISTICS

- A. Priority shall be given to selecting products from the approved manufacturers that are General Regionally Manufactured Materials for compliance with Credit MR 5.1. General Regionally Manufactured Materials are materials that are manufactured within a radius of 500 miles from the Project location. Manufacturing refers to the final assembly of components into the building product that is installed at the Project site.

2.3 MATERIALS

- A. Products and the terms materials, equipment, devices, components, assemblies and systems are considered synonymous.
- B. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Seconds, rejects, or damaged materials will be rejected.
- C. The equipment to be provided under these Specifications shall be essentially the standard commercial grade product of the manufacturer. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer.
- D. The listing of a manufacturer for certain equipment and systems does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems shall conform to the Specifications and the requirements listed.
- E. All equipment and materials specified shall be products currently in production.
 - 1. If the specified item is not available or is discontinued, a similar product with the same features and functionality shall be provided from the same manufacturer in the newer/upgraded series of product.
 - a. Provide information as to the anticipated availability of the provided products at the time of submission and installation. No products shall be provided that will be discontinued within the warranty period of the system.
 - 2. Equipment and/or devices discovered to be discontinued after submission approval will not be accepted and will require resubmittal for an approved replacement.
- F. Product Selection for Restricted Space: Drawings indicated maximum dimensions for products including clearances between products and adjacent surfaces and other items. Comply with indicated maximum product dimensions.
 - 1. Assembly Selection: The Drawings indicate sizes, profiles and dimensional requirements of assembly equipment. Equipment having equal performance characteristics and complying with indicated maximum dimensions and profiles may be considered, provided deviations do not change the design concept intended performance, or code/future extension provision clearances. The burden of proof of equality is on the proposer a minimum of 10 days prior to bid.

2.4 SOFTWARE PROTECTION

- A. All software supplied with new equipment shall be warranted against leap year program disruption or failure. Refer to Division 01 Section "Warranties and Supplementary Conditions for Requirements."
- B. All software supplied with new equipment shall be warranted against Daylight Savings Time program disruption or failure. Refer to Division 01 Section "Warranties and Supplementary Conditions for Requirements."
- C. All software shall be the most current release of the latest available software of the equipment provided.
 - 1. BETA software versions will not be accepted.

2.5 LABELS

- A. Per Division 26 Section "Electrical Identification".
- B. Nameplates: Utilize laminated phenolic resin with white core to enable engraved white lettering 1/4" high. Color shall be identifiable to system type.
- C. Tags: Utilize laminated phenolic resin with white core to enable engraved white lettering 1/4" high. Color shall be identifiable to system type. Provide nylon cable tie to secure to device as required.
- D. Labels:
 - 1. Utilize adhesive vinyl labels with laser printed, smudge resistant lettering. Size incorporated to affix to device plate or cable as appropriate.
 - 2. Laser engrave faceplates utilizing 1/8" high lettering.

PART 3 - EXECUTION

3.1 EXAMINATION OF FIELD CONDITIONS

- A. Verification of Conditions:
 - 1. Examine areas and conditions under which work is to be performed. Verify that site conditions are satisfactory for installation of cable and components.
 - 2. Ensure components and conditions are in compliance with manufacturer's requirements, installation tolerances and other conditions affecting performance.
- B. Pre-Installation Testing:
 - 1. Identify conditions detrimental to proper or timely completion.

C. Evaluation and Assessment:

1. Correct unsatisfactory conditions.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General:

1. Review device locations, telecommunication room locations, routings, trunk risers, pathways, details, and special features.
2. Meet with the Owner's telecommunications representatives prior to each of the following installation tasks:
 - a. Mounting cabinets and equipment grounds.
 - b. Telecommunications room raceway installations.
 - c. Pulling cable.
 - d. Terminating cable.
 - e. Labeling of cable and equipment.
 - f. Testing cable.
 - g. As-built documentation completion.

B. Installation Guidelines:

1. Install systems and components in accordance with equipment manufacturer's written instructions, in compliance with National Electrical Code, and with recognized industry practices, to ensure that each system complies with requirements and serves intended purposes.
2. Comply with ANSI/NECA 1, Standard for Good Workmanship in Electrical Contracting.
3. Comply with ANSI/NECA/BICSI 568, Standard for Installing Commercial Building Telecommunications Cabling.

C. Protection of In-Place Conditions:

1. Handle components to be re-used carefully to avoid breakage, dents, scoring finishes, and impacts.
2. Take precautions to protect any surfaces already in-place before continuing with work.
3. Protect everything in existing space from dust and debris in an acceptable manner.
4. Notify Engineer, in writing, of any damage to surrounding areas or surfaces already in place.
5. Keep hands clean when handling ceiling tiles to avoid fingerprints and smudges on the finished installation. Use clean cotton gloves for maximum protection. Ceiling tiles should be handled carefully to protect the face and edges of the tile from damage.
6. Old ceiling tiles can remain in the grid system by being moved to one side and then replaced. Avoid scratching or jamming the tiles.
7. Support all existing cabling that is not supported above the ceiling.

D. Rough-In Preparations -

1. General:

- a. Verify final locations for rough-ins with field measurements and with the requirements and dimensions of the actual equipment to be installed and connected.
- b. The Architect shall control the placement of wall and ceiling mounted communications systems devices and outlets. The intent is to aesthetically locate equipment/outlets by providing rough-in hardware, boxes and/or mounting plates, as required, when stud or furring may not be readily available for direct mounting. When drawing details or elevations are not available, consult with Architect's representative for actual placement.
- c. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.
- d. Refer to equipment specifications in Divisions 02 through 28 for rough-in requirements.

2. Equipment:

- a. Install to facilitate service, maintenance, and repair or replacement of components of equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.
- b. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

3. Raceways and Cabling:

- a. Coordinate with system maximum cable lengths and address Engineer with conflicts.
- b. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for communications systems installations.
- c. Coordinate cabling installation requirements with installation of all pathways, raceways, outlet boxes, etc. as listed in Division 26 Section "Conduit Rough-In Systems."
- d. Right of Way: Give to piping systems installed at a required slope.

E. Protection of Equipment:

1. Protect all equipment and materials from the elements, dirt and other damage from the time it is removed from the point of storage until final acceptance.

F. Installation Auxiliary Equipment:

1. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from the premises when no longer required.

3.3 INSTALLATION

A. Interface with Other Work:

1. Sequence, coordinate, and integrate installations of communications materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
2. Coordinate communications systems, equipment, and materials installation with other building components. Be responsible for any changes in openings and locations necessitated by the equipment installed.
3. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.

B. Systems Integration:

1. Sequence, coordinate, and integrate the various elements of electrical, and telecommunications, systems, materials, and equipment.

C. General:

1. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components.
2. When several devices are wall mounted in the same area, care shall be taken to align them horizontally and vertically.
3. When field cutting hangers or supports with corrosion protection, apply approved sealant to restore corrosion protection.
4. Install systems, materials, and equipment giving right of way priority to systems required to be installed at a specified slope
5. All screws, bolts, nuts, clamps, fittings, or other fastening devices shall be tightened in accordance with manufacturer instructions.
6. Plaster debris and residue shall be thoroughly cleaned and vacuumed from boxes before cables are terminated.

D. Equipment:

1. Install communications systems equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
2. Match room numbers for labels, programming, etc. with existing/final room numbers approved by the Owner's representative upon completion of this project. The room numbers on the Drawings are not necessarily the actual room numbers.
3. Provide cabinets and associated raceway/pathway installations including special wire management auxiliaries.
4. Provide all support devices to mount supplied and installed equipment at the appropriate device height. Conceal furring as required.
5. Install equipment properly to avoid causing mechanical stresses, twisting or misalignment of equipment being exerted by clamps, supports, and cabling.
6. Coordinate branch circuit power connection to equipment as required to support the system being installed. Indicate additional power requirements on wiring diagrams at submittal stage for approval by Engineer.
7. Remove all dirt, dust and construction debris from all system equipment. Touch-up scratched and marred surfaces to match original finishes to the satisfaction of the Owner and Engineer.

E. Raceways and Cabling:

1. Routing:

- a. Pull all cabling to rack or equipment backboard in telecommunication room from outlet boxes shown on Drawings.
- b. Conceal all cabling in the facility except where specifically indicated otherwise. Surface raceway allowed only where specifically shown on Drawings or approved by Engineer.
- c. Install horizontal cabling open in accessible ceiling spaces. Install each cabling system in separate pathway from other cabling systems.
- d. Install all cabling parallel and perpendicular to building lines.
- e. Install cabling tight to building steel. Avoid locating cabling within 12 inches of lay-in ceilings or access panels.
- f. Traverse common system cables along the same pathway. Multiple runs of cabling terminated at roughly the same geographic area shall traverse the same path whenever possible.
- g. Verify all conduits are reamed and bushed prior to pulling cable. Do not pull cable if field manufactured bends reduce the recommended bending radius.
- h. Route cabling to avoid elevator shafts, elevator equipment rooms or any areas that contain or store hazardous materials.
- i. Avoid sources of electromagnetic interface (EMI) for all voice/data/system equipment and cables.
 - 1) Maintain 5 inch minimum from lighting ballast.
 - 2) Maintain 4 foot minimum from all transformers.
 - 3) Maintain 1 foot minimum from electric power conductors.
 - 4) Distances may be reduced if sufficient EMI isolation is provided and prior approval is given by the Engineer.
- j. Avoid routing cabling in areas subject to excessive environmental conditions.
 - 1) Refer to Division 26 Section "Conduit Rough-In Systems" for environmental requirements.

2. Supports:

- a. Coordinate cabling installation such that it is not supported from new or existing conduits, piping, ductwork, etc. Cabling shall not lie directly on ceiling or be supported by ceiling tie-wires.
- b. Support vertically routed cabling at each floor. Attach supports such as wire mesh grips as recommended by manufacturer and required by local codes.
- c. Do not support cables by their terminals.

3. Damage Prevention:

- a. Provide caution during installation so as to not stress or provide excessive tension on the cable.
 - 1) Pulling tension shall not exceed 25 lbs. on a single cable or bundle.
 - 2) Avoid unnecessary bends and do not exceed a 90 degree bend for any cable.
 - 3) Do not exceed manufactures bend radius requirements.
- b. Replace entirely any cable jacket that is cut or scored.
- c. Do not employ pulling lubricants as they can degrade cable performance.

4. Terminations:

- a. Terminate all horizontal and backbone cabling at each cable end as indicated.
- b. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Standards 486A and B, and the National Electrical Code.

3.4 PAINTING

- A. Provide the prime painting of all equipment and materials furnished under Division 27 Specifications, unless specifically stated otherwise. In general, all equipment except raceways and galvanized boxes that are not provided with a factory-applied final finish shall be delivered to the job site with a shop-applied prime coat of paint. Refer to Division 09 Sections "Interior Painting" and "Exterior Painting."
1. Provide touch-up painting services for any equipment as required and approved by the Engineer.
2. Replace any damaged equipment that cannot be returned to a "Like New" condition/finish.

3.5 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 01 Section "Cutting and Patching." In addition to the requirements specified in Division 01, the following requirements apply:
 1. Perform cutting, fitting, and patching of equipment and materials required to:
 - a. Uncover Work to provide for installation of ill-timed Work.
 - b. Remove and replace defective Work.
 - c. Remove and replace Work not conforming to requirements of the Contract Documents.
 - d. Remove samples of installed Work as specified for testing.
 - e. Install equipment and materials in existing structures.
 - f. Upon written instructions from the Architect, uncover and restore Work to provide for Architect observation of concealed Work.
 2. Cut, remove, and legally dispose of selected equipment, components, and materials as indicated, including but not limited to, removal of electrical items indicated to be removed and items made obsolete by the new Work.
 3. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
 4. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
 5. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.

6. Painting:

- a. Refer to Division 01 Section "Definitions and Standards" for definition of experienced "Installer."
- b. Provide paint note to renovation projects where painting is covered by Division 01.
- c. Paint to match existing surfaces if painting is not provided by Division 01 or as indicated.
- d. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
- e. Refer to Division 01 Section "Definitions and Standards" for definition of experienced "Installer."

3.6 LABELING

- A. Labels shall be applied by the installer at a visible location on all end-user device faceplates per Owner requirements and verbiage shall clearly identify device, use, destination, and location per Division 26 Section "Electrical Identification."
 1. Provide engraved faceplates for devices without a designated label location or means of protecting/securing the label.
 - a. Colors shall be black on stainless steel faceplates or white on black faceplates.
 2. Standard manufacturer device plates shall provide engraved supplementary information as noted above.
- B. Engrave label all keys provided to the Owner for system cabinets and devices.
 1. Label with system name as required by the Owner.

3.7 PROGRAMMING DESIGN MEETINGS AND MANUAL

- A. Meet with Owner's representative to develop a system programming design to function for the operations needed. Document all meetings for review by the Engineer.
- B. Provide sample programming requirements, system features, etc. for review by Owner and coordinate correspondence with other facility representatives that have installed similar systems.
- C. Provide a customized Programming Manual identifying the project name/job number and date of installation.
 1. Provide all documentation in spreadsheet format on CD-Rom and hardcopy.
 2. Provide features utilized and identification.

3. Identify features available per the Specifications and the product not required based on Owner requirements.
 - a. Features not identified to the Owner as available and not listed may be required by Owner after initial use and operation of the system is found to be inadequate without such features. It will be required to have the necessary features installed and programmed for use at no additional cost to the Owner.
4. Provide alterations/configurations based on time of day, day of week, holiday, etc.

3.8 LICENSES

- A. Provide the necessary licenses for all devices and equipment to operate for the life of the product.
 1. Equipment/devices shall not require licenses to operate with the current or any updated/upgraded software release or version.

3.9 FIELD QUALITY CONTROL

- A. Do not cover up or hide from view any communications systems equipment before it has been examined and approved. Any unsatisfactory work or materials shall be removed and corrected immediately.
- B. Tests and Inspections:
 1. Submit a detailed test plan for all equipment and cabling prior to start of testing. Test plan shall provide for Owner to witness test.
 - a. The following will be witnessed by the Engineer:
 - 1) As-Built Drawings will be verified with actual installation.
 - 2) Workmanship of installation of equipment.
 - 3) All systems are fully programmed and functional, including interconnections with other systems.
 - b. Any electrical equipment in vicinity of cabling or devices shall be on and operational during testing, including luminaires, elevators, HVAC units, and wireless devices.
- C. Manufacturer's Services:
 1. Where supervision by a manufacturer is specified, follow all instructions, recommended manufacturer and specified field tests, and other recommendations of the manufacturer. The manufacturer shall supervise the installation, connection, start-up, testing, adjustment, instruction of the Owner, and final tests of such equipment or system. Where two or more manufacturer's equipment are interrelated, take responsibility to coordinate their work and provide supervision.

3.10 ADJUSTING

- A. Complete all system programming to the satisfaction of the Owner. If after preliminary use of the system or training, the increased understanding of the systems features and capabilities necessitate programming or set-up adjustments, perform these programming updates at no additional cost.
- B. Provide software programming changes to match Owner's final room number designations. The room numbers shown on the Drawings are not necessarily the final room numbers and may be subject to change by the Owner.
- C. Provide on-site assistance in reprogramming software based system to suit actual occupied conditions during the warranty period. Provide up to three 8 hour visits to the site for this purpose.

3.11 CLOSEOUT ACTIVITIES

- A. Upon completion of the work, notify the Architect in writing that each entire system installation has been examined, inspected, tested, calibrated, or adjusted as specified and that it is ready for final inspection. Work to be connected prior to final inspection and also to include all of the work specified for "Manufacturers Services." Include documentation of specified testing and inspection.
- B. Training:
 - 1. Have the manufacturer instruct the Owner in the proper operation and maintenance techniques of all equipment, systems, etc., at the time of completion of all work.
 - 2. Provide a training outline for distribution to the Owner for all required training and the necessary personnel required for operation, maintenance, and service (warranty) notification. Include instructors' qualifications.
 - a. Training shall be provided in session increments of at maximum eight (8) hours. Minimum of two (2) hours.
 - b. Coordinate all training to best service participants based on job description.
 - c. Provide several sessions as required to meet participants' schedules, etc. Coordinate dates and times with Owner's representative three (3) months prior to start of training.
 - d. Training shall be completed at the Owners facility and all necessary devices, equipment, and training aids shall be provided. Training aids shall include approved maintenance manual.
 - e. Provide a refresher training session of at minimum two (2) hours 30 days after original training has been completed.
 - 3. Provide PowerPoint presentation and handouts for all training. Class sizes shall be appropriate for the system to allow hands-on instruction.
 - 4. Record each training session and provide a professionally edited DVD of each training session to be turned over to the Owner.
 - 5. Off-Site Training:
 - a. If required by the Specification section, provide factory training for designated Owner personnel at the manufacturer's training facility.
 - b. Include all associated costs including transportation, lodging, meals, etc.

C. Software Turnover:

1. All software for system operation including source code for proper operation, reconfiguring and/or reworking of systems in future implementations shall be provided to the Owner by the manufacturer and/or vendor for the Owner's future use.
 - a. This shall include any license agreements, associated costs, and fees for turnover of this information.
 - b. The provided programming and source code shall become the intellectual property of the Owner.
 - c. Supply on CD-ROM and format required by equipment for re-installation and re-programming.

END OF SECTION 280010

SECTION 281300 - ACCESS CONTROL SYSTEM EXTENSION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. Base Bid - Provide new Access Control System (ACS) devices, including associated equipment and appurtenances that are compatible with the district's S2 system. The design of the ACS shall include all devices, wiring and equipment required to control access, and deny unauthorized entries within specific areas. Report generation, Photo Identification badges, and annunciation of alarms are existing at the district level. The ACS shall be designed to provide operational flexibility and reliable performance. The ACS shall be modular, allowing for future incremental expansion or modification of inputs, outputs, and remote control stations. Each system shall be complete and ready for operation and provide for a fully integrated access control solution.

1.2 WORK INCLUDES

- A. The work includes furnishing all labor, materials, tools, and equipment, and documentation required for a complete and working Security Management System (SMS) as specified in this Section. This scope of work shall cover the requirements for the access control, alarm monitoring (door contacts and motion detectors) and badging system.
- B. The SMS specified herein shall be fully compatible and coordinated in seamless operation with the district's S2 system.
- C. Base Bid - All equipment (security panel, cards readers, door contacts, REX, etc.) shall operate and function as a single system with existing campus buildings via Owner WAN connectivity for updating user profiles, access rights and recording events. Multiple system data entry steps will not be acceptable to perform events/functions at other buildings.

1.3 REFERENCES

- A. Design and operation of the system shall conform to the following referenced codes, regulations, and standards as applicable:
 - 1. National Electrical Code (NEC).
 - 2. American National Standards Institute (ANSI)
 - a. Section ANSI C39.1 Requirements for Electrical Analog Indicating Instruments.

3. Underwriters Laboratories (UL):
 - a. UL 294 Access Control Systems Units
 - b. UL 497B Protectors for Data Communication Circuits.
 - c. UL 796 Standard for Printed-Wiring Boards.
4. National Electrical Manufacturers Association (NEMA):
 - a. Section 250 Enclosures for Electrical Equipment.
5. Applicable Federal, State, and Local laws, regulations, and codes.
6. CE mark as and where applicable.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Division 28 Section "Basic Division 28 Requirements".

1.5 ACTION SUBMITTALS

- A. Submittals and shall include but not be limited to the following:
 1. Model numbers of all provided components.
 2. Manufacturers catalog data sheets for all components.
 3. Input power requirements for all SMS components.
 4. Complete engineered drawings indicating:
 - a. Manufacturer model numbers and specifications.
 - b. Dimensions, layouts, installation details.
 - c. Point-to-point wiring diagrams for all SMS devices.
 - d. Termination details for all SMS devices.
 - e. Single-line system architecture drawings representing the entire SMS.
 - f. Interfaces with all sub-systems.
 - g. ACS operational test plan
 - h. Installer's qualifications.
 - i. Instructor's qualifications.
 - j. ACS components Operation and Maintenance Data.
 - k. As-Built drawings for ACS.
 - l. Posted operating instructions for ACS.

1.6 CLOSEOUT SUBMITTALS

- A. Manufacturer's User's Manuals and Installation Manuals.
- B. Course outlines for each of the end user training programs. The course outlines shall include the course duration, and a brief description of the subject matter.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications:

1. Firms regularly engaged in manufacturer of professional quality access control systems, components and accessories, of types, capacities and characteristics required, whose products have been in satisfactory use in similar service for not less than 2 years.

B. Supplier's Qualifications:

1. Engage an experienced product supplier who is a factory-authorized sales and service representative regularly engaged in the design and installation of such systems to oversee the installation, trouble-shoot and make final connections at headend equipment.
2. Supplier shall have represented the product and components being installed for a minimum of 5 years.

C. Installer Qualifications:

1. Prior to installation, submit data of the installer's experience and certified qualifications. Show that the installer who will perform the work has a minimum of 2 years' experience successfully installing ACS of the same type and design as specified herein. Include the names, locations, and points of contact of at least two installations of the same type and design as specified herein where the installer has installed such systems. Indicate the type of each system and certify that each system has performed satisfactorily in the manner intended for a period of not less than 12 months.

D. Instructor's Qualifications:

1. Prior to installation, submit data of the instructor's experience and certified qualifications. Show that the instructor, who will train operating and maintenance personnel, has received a minimum of 24 hours of ACS training from the manufacturer, and 2 years' experience in the installation of ACS of the type specified.

E. Electrical Component Standard: Provide work complying with applicable requirements of NFPA 70 "National Electrical Code."

F. All system and components shall be Underwriters Laboratories listed and labeled.

G. EIA Compliance: Comply with the following Electronics Industries Association Standards:

1. UL Compliance: Comply with requirements of UL.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver products in factory containers. Store in clean, dry space in original containers. Protect products from fumes and construction traffic. Handle carefully to avoid damage.

PART 2 - PRODUCTS

2.1 PRODUCT -- GENERAL

- A. Provide components that are compatible with the districts existing S2 enterprise access control system; ensure a complete integrated ACS consisting of the following major subsystems:

1. Automated Access Control System Hardware and Software - Door Controllers

- a. Mercury EP-1501
- b. S2 Netdoor Micro Node

2. Communications/Cabling/Wiring - See Access Control Block Diagram on drawings.

3. All access control hardware and software shall be of a single manufacturer including Host system, controller panels, and input and output terminal modules.

B. Network Controllers:

1. The Network Controllers shall be a fully stand-alone processor capable of making all access control decisions without the involvement of the Host Server based on a set of parameters passed to the sub-controller from the host.

- a. The Network Controllers shall support eight (4) or sixteen (8) card readers in addition to either 256 input points or 128 input points and 128 output points. It shall further support up to 12 facility codes per reader, 40 unique holidays, 8 access group and time zone pairs.
- b. Memory Requirements:

- 1) Minimum number of cards: By district.

- c. The controller shall require no firmware changes and shall use flash memory modules to provide non-volatile storage of both data and operational code.
- d. Each controller shall be provided with built-in hardware to support hard-wired communications between the controller(s) and readers of up to 4000 feet.
- e. Communications between the controller(s) and the host server shall be via Ethernet TCP/IP at 10Mbps minimum. There shall be an alternate communications path to the host via a secondary IP address such that in the unlikely even the primary IP address/network is down an alternate communications path may be established.
- f. An alarm summary relay shall be built-in to the controller motherboard. The alarm relay shall be activated whenever a connected alarm point transfers to the alarm state and whenever soft alarms become active.
- g. A tamper switch shall be attached to the inner surface of the controller enclosure. The tamper switch shall change state whenever the enclosure door is opened to signal the SMS of the condition. The tamper switch input shall be user programmable to be suppressed, to be recognized as an input point to be process by the alarm queue at the host computer, to printout at an optional printer connected directly to the controller, and to activate the alarm summary relay described above.

- h. The standard AC linear power supply version of the controller shall include a battery module to back-up the controller's applications programs and database for 30 days after the failure of the primary AC power service. The controller database, the time clock, the transaction history, and all operator entered parameters shall be backed-up by the battery.
 - i. The controller shall provide built-in LED to indicate whether the controller is properly communicating with the host computer.
 - j. Alarm monitoring and Output Control terminal boards. Intelligent alarm monitoring and output control terminal boards shall be plug-in modules to the Network Controllers with the following functionality:
 - 1) Sixteen two-state alarm input points.
 - 2) Eight four-state supervised alarm input points.
 - 3) Eight two-state alarm input points and eight SPDT output relays.
 - 4) Eight four-state supervised alarm-input points and six SPDT output relays.
2. Signature capture device shall be connectable via a serial port interface communicating at 9600 BPS. Signature capture device shall be able to display the signature at the capture pad as well as on-screen.

2.2 READERS - VERIFICATION DEVICES

A. General:

- 1. All readers shall be configured with the reader electronics mounted separately, on the "secure" side of the door such that only the reader head/keypad and pilot lights are mounted in the reader housing on the "entry" side of the door.
- 2. All readers shall support the following technologies:
 - a. HID Proximity.
- 3. All readers shall be in compliance with the following standards:
 - a. ISO 14443A.
 - b. ISO 14443B.
 - c. ISO 15693.
 - d. All readers shall be multi-frequency capable.
 - 1) 125 KHz.

- B. HID Proximity - Furnish and install the reader style as shown on the drawings or as called for in this Specification:

1. Proximity Reader:

- a. The reader shall be integrated and contain all reader electronics inside a single polycarbonate enclosure; exterior, vandal proof, weatherproof housing.
- b. The reader shall operate when mounted on a variety of surfaces including metal. Maximum read range degradation when mounted on a metal surface shall be 50-percent.
- c. The reader shall contain an integral color LED and audio tone to indicate if the card has been successfully read.
- d. Mullion Mounted
- e. The reader shall be 6.0" x 1.7" x 1" maximum.
- f. Read range shall be up to 5".
- g. The reader shall be rated for normal operation from -22 to 150 deg. F.
- h. HID Mini Prox. 5365
- i. Access Control Cards are by the district.

2.3 INTEGRATED SYSTEM FUNCTIONAL REQUIREMENTS:

- A. Ensure that ACS is fully integrated with physical security and other elements of the existing S2 District security system. Provide specific subsystem consisting of the following:
1. Automated Access Control subsystem: Door Access Control Nodes, and Electronic devices to include Door Contacts, Card Readers, and Request to Exit sensors/modules to control personnel movement through normal access routes in and out of the school.
 2. Communications subsystem: Cabling/wiring between elements required to ensure that pertinent data is transferred from point of origin to point where appropriate actions can be taken.
 3. Power subsystem: Components required to ensure continuous operation of the entire ACS.

2.4 INTEGRATED SYSTEM PERFORMANCE REQUIREMENTS:

- A. The installed and operating ESS shall be integrated into the overall facility to detect intrusion, Control Access, provide Closed Circuit Television (CCTV) surveillance, provide visual verification and shall perform as an entity, as specified below.
1. Fail-Safe Capability
 - a. Provide fail-safe capability in critical elements of the ACS. This shall include, but not be limited to, capability to monitor communication link integrity and to provide self-test. When diminished functional capabilities are detected, system shall provide annunciation of the fault. Fail-safe alarms shall be annunciated to be clearly distinguishable from other type of alarms.

2. Line Fault Detection

- a. Communication links of the ACS shall have an active mode for line fault detection. System shall be either a static, or dynamic system. In a static system, the “no-alarm” condition shall always be represented by the same signal, which will be different than the signal originally transmitted. The dynamic system shall represent “no-alarm” with a signal which continually changes with time.

3. Power Loss Detection

- a. Provide capability to detect when a critical component of the system experiences temporary or permanent loss of power and to declare an alarm. Alarm shall be annunciated to clearly identify the component experiencing power loss.

4. Electrical Power

- a. Obtain by PoE connection from district provided Ethernet switches powered by emergency electrical distribution system.

2.5 SYSTEM PERFORMANCE REQUIREMENTS:

- A. Design system components to operate as described herein within the context of the overall system performance previously described. Perceived inconsistencies between the following component performance specifications and overall system level performance descriptions shall be decided in favor of the former.

1. Modularity

- a. Provide components designed for modular increase and decrease of system capability by installation or removal of plug-in modules. Design system components to facilitate modular subassembly and part replacement.

2. Reliability

- a. Provide only new components in current manufacturing production, manufactured to meet requirements specified herein, and free from characteristics and defects which affect appearance, or serviceability or render equipment unsuitable for the intended purpose.

3. Environmental Conditions

- a. Interior conditions - Equipment installed in environmentally protected interior areas shall meet performance requirements specified for the following ambient conditions:
 - 1) Temperature: 32 to 120 degrees F. Components installed in unheated security protected areas shall meet performance requirements for temperatures as low as zero degrees F.
 - 2) Pressure: Sea level to 15,000 feet above sea level.
- b. Exterior conditions - Components mounted in locations exposed to weather shall be housed in corrosion-resistant enclosures with appropriate environmental protection or be rated for their environment. Component performance shall not degrade because of improper housing.

2.6 ELECTRIC STRIKE

- A. Electric strike/lock release provided by hardware manufacturer. Connections by Division 26. Interface door electrical strike release system to local card access control panel at the local doors terminal cabinet serving that area.

2.7 DOOR LATCH NOTIFICATION

- A. Provided by door hardware manufacturer and connected by Division 26.

2.8 SECURITY OVERRIDE DEVICE

- A. Provided by Door Hardware Manufacturer. Connected by Division 26.

2.9 DOOR CONTACTS

- A. Provide, where shown on drawings, UL listed magnetic flush mounted contacts and magnets. Each contact shall be provided with matching magnet. All contacts shall be hermetically sealed for long term 10,000,000 cycle contact. Switch contacts shall be of the reed blade type with rhodium plating eliminating cold-welding; sticking and resistance build-up. All switches shall be 100% factory tested prior to installation. Coordinate with door frame manufacturer.
- B. Manufacturer: Bosch ISN-CSM 20-WG Commercial Contacts, or Honeywell 7940.

2.10 REQUEST TO EXIT DEVICES

- A. Motion Sensors: Passive infrared type designed for hands-free operation.
 - 1. Coverage Pattern: Provide adjustable coverage pattern using masking kit. Sensor shall have adjustable aiming of 14 degrees vertically.
 - 2. Provide a walk test/activation LED indicator.
 - 3. Relay latch time adjustable to 60 seconds. Provide two (2) Form C contacts rated 1 amp at 30 VDC for resistive loads.
 - 4. Sensors shall be RFI immune in the 26-900 MHz range.
- B. REX devices that are part of the electrified hardware will be provided by others. This Contractor shall completely wire (power and control) hardware to the access control system.
- C. Manufacturer: Bosch DS150i with trim plate TP160. Provide in color white.

2.11 WIRE AND CABLE

- A. Comply with requirements of Section "Wires and Cables" with stranded copper conductors. Size conductors as indicated, but not less than recommended by system manufacturer.
- B. Utilize unshielded, twisted pair cable (UTP) installed in conduit system.
- C. Furnish and install standard manufacturer's cable assemblies for components, as recommended by the system manufacturer. Include connections for electric door strikes, card reader connections and all required peripheral devices.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with the installer present, for compliance with requirements and other factors affecting the performance of the security access system work.
- B. Do not proceed until satisfactory conditions have been corrected.

3.2 INSTALLATION REQUIREMENTS

- A. All consoles, terminals, and controllers shall be factory wired before shipment to the job site.
- B. Cabinet doors shall open a minimum of 170 degrees to avoid blocking personnel movement. Each door shall be equipped with a cylinder lock, a tamper switch and a piano-type hinge with welded tamperproof pins.

- C. Provisions shall be made for field wiring to enter the cabinet via standard knock-outs at the top, bottom and sides of controller cabinets.
- D. Each wire shall be identified at both ends with the wire designation corresponding to the wire numbers shown on the wiring diagrams.
- E. All exposed wiring within the cabinets, consoles, and terminals shall be formed neatly with wires grouped in bundles using non-metallic, flame-resistant wiring cleats or wire ties.
- F. All ferrous metal work shall be painted, in accordance with the manufacturer's standards.
- G. Coordinate installation of door contacts with door/door hardware manufacturer. All wiring shall be concealed within door-frame and fished/routed within building walls, where not accessible with conduits.

3.3 SYSTEM WIRING

- A. Provide system and device wiring as recommended by the manufacturer. All wiring shall be concealed. Route system cabling in J-hooks above ceiling or in crawlspace as required. Install in surface raceway in other areas.

3.4 TESTING AND COMMISSIONING

- A. The Contractor shall be responsible for testing and commissioning of the installation in accordance with all applicable documents in the Contract set.
 - 1. Testing shall be comprehensive and sufficient to demonstrate compliance with each requirement.
 - 2. Proposed test plan shall be submitted to the Engineer and Owner's representative for approval before commencement of final test.
 - 3. Final tests shall be conducted in the presence of the Engineer and Owner's representative.

3.5 TRAINING AND INSTRUCTION

- A. Upon completion of the work, and prior to acceptance of the same by the Owner, the Contractor and major equipment manufacturer's qualified representative shall provide 4 hours of Owner instruction in one-hour sessions. Sessions shall include instruction on the operation and service of all closed circuit television system equipment and controls. This instruction shall be done at the facilities' location and convenience, and in the presence of the Architect/Engineer's representative.

- B. Training materials shall consist of the following:
1. Formal course outline and agenda.
 2. Operator training student guide for each student.
 3. Hands-on practice with on-line equipment.
 4. Written examinations.

3.6 WARRANTY

- A. All equipment furnished under this contract shall be warranted for a period of twelve (12) months from the date of final Engineer/Owner acceptance of the system.
1. Respond to service requests on-site, if required.
 2. Replace or repair defective components as required.

END OF SECTION 281300