Project Manual
Project Number: 21-019

Duneland School Corporation
Alternative Classroom Renovation at:
Chesterton Middle School
651 West Morgan Avenue, Chesterton, Indiana 46304

For

Board of School Trustees
Duneland School Corporation
601 West Morgan Avenue
Chesterton, Indiana 46304

Issued for Proposal: June 15, 2021

TRIA ARCHITECTURE
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TABLE OF CONTENTS

DIVISION 0 – PROPOSAL REQUIREMENTS, CONTRACTOR FORMS AND CONDITIONS OF THE CONTRACT

Section	00100	Instructions to Proposers	4	Page(s)
	00300	Proposal Form	3	Page(s)
	00440	Substitution Sheet	1	Page(s)
	00495	Addendum to Contract for Construction	2	Page(s)
	00496	Certification Regarding Investment Activities in Iran	1	Page(s)
	00700	General Conditions	66	Page(s)

DIVISION 1 – GENERAL REQUIREMENTS

Section	01100	Summary	4	Page(s)
	01200	Price and Payment Procedures	5	Page(s)
	01210	Allowances	2	Page(s)
	01300	Administrative Requirements	8	Page(s)
	01325	Construction Progress Schedule	3	Page(s)
	01400	Quality Requirements	3	Page(s)
	01425	Reference Standards	2	Page(s)
	01600	Product Requirements	5	Page(s)
	01700	Execution Requirements	7	Page(s)
	01780	Closeout Submittals	6	Page(s)

DIVISION 2 – SITEWORK – NOT USED

DIVISION 3 – CONCRETE

Section	03505	Self-Leveling Underlayment	2	Page(s)

DIVISION 4 – MASONRY

Section	04065	Mortar and Masonry Grout	4	Page(s)
	04810	Unit Masonry Assemblies	6	Page(s)

DIVISION 5 – METALS

Section	05120	Structural Steel	4	Page(s)

DIVISION 6 – WOOD AND PLASTIC – NOT USED

TABLE OF CONTENTS

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

Section	07840	Firestopping	6	Page(s)
	07900	Joint Sealers	3	Page(s)

DIVISION 8 – DOORS AND WINDOWS

Section	08110	Steel Doors and Frames	4	Page(s)
	08211	Flush Wood Doors	3	Page(s)
	08710	Door Hardware	17	Page(s)
	08800	Glazing	3	Page(s)

DIVISION 9 – FINISHES

Section	09260	Gypsum Board Assemblies	4	Page(s)
	09511	Suspended Acoustical Ceilings	5	Page(s)
	09650	Resilient Flooring	4	Page(s)
	09900	Paints and Coatings	6	Page(s)

DIVISION 10 – SPECIALTIES – NOT USED

DIVISION 11 – EQUIPMENT – NOT USED

DIVISION 12 – FURNISHINGS – NOT USED

DIVISION 13 – SPECIAL CONSTRUCTION – NOT USED

DIVISION 14 – CONVEYING SYSTEMS – NOT USED

DIVISION 15 – MECHANICAL

Section	15010	Basic Mechanical Requirements	5	Page(s)
	15020	Mechanical Demolition	3	Page(s)
	15121	Piping Expansion Compensation	2	Page(s)
	15135	Gages and Meters	3	Page(s)
	15140	Supports and Anchors	6	Page(s)
	15170	Motors	4	Page(s)
	15190	Mechanical Identification	2	Page(s)
	15195	Testing of Gas Piping	2	Page(s)
	15242	Vibration Isolation	8	Page(s)
	15260	Pipe Insulation	4	Page(s)
	15290	Ductwork Insulation	4	Page(s)

TABLE OF CONTENTS

	15505	Fuel Piping	4 Page(s)
	15510	Hydronic Piping	4 Page(s)
	15515	Hydronic Specialties	4 Page(s)
	15535	Refrigerant Piping and Specialties	4 Page(s)
	15545	Chemical Water Treatment	3 Page(s)
	15671	Air Cooled Condensing Units	4 Page(s)
	15835	Terminal Heat Transfer Units	4 Page(s)
	15860	Dedicated Outdoor Make-Up Air Units (Package)	6 Page(s)
	15880	Heat Pump Heat Recovery System – Owner Purchased	7 Page(s)
	15890	Ductwork	4 Page(s)
	15910	Ductwork Accessories	3 Page(s)
	15940	Air Outlets and Inlets	2 Page(s)

DIVISION 16 – ELECTRICAL

Section	16010	Basic Electrical Requirements	10 Page(s)
	16060	Electrical Demolition for Remodeling	6 Page(s)
	16111	Conduit	6 Page(s)
	16123	Building Wire and Cable	6 Page(s)
	16130	Boxes	3 Page(s)
	16140	Wiring Devices	4 Page(s)
	16150	Occupancy Sensors	4 Page(s)
	16170	Grounding and Bonding	3 Page(s)
	16180	Equipment Wiring	3 Page(s)
	16190	Supporting Devices	3 Page(s)
	16195	Electrical Identification	2 Page(s)
	16441	Enclosed Switches	2 Page(s)
	16470	Panelboards	5 Page(s)
	16510	Interior Luminaires	8 Page(s)
	16705	Conduit Rough-In for Special Systems	2 Page(s)
	16721	Fire Alarm and Detection System	7 Page(s)
	16745	Data Cabling	4 Page(s)

DIVISION 17 –BUILDING AUTOMATION SYSTEMS

Section	17100	Direct Digital Controls	4 Page(s)
	17600	Sequence of Operation	3 Page(s)
	17800	Testing, Adjusting and Balancing	3 Page(s)

SECTION 00100

INSTRUCTIONS TO PROPOSERS

PART 1 – GENERAL

1.1 **PROPOSAL**

A. The Board of School Trustees of the Duneland School Corporation will receive sealed proposals for the Alternative Classroom Renovation at: Chesterton Middle School.

B. To receive full consideration bids must contain the following documents properly completed and signed:
   1. Proposal Form.
   2. Addendum to Contract for Construction.
   3. Certification Regarding Investment Activities in Iran.
   4. Fully completed AIA document A305 providing the Contractor's qualifications and references.

1.2 PREPARATION FOR PROPOSALS

A. Proposals to be entitled for consideration must be made in accordance with the following instructions.
   1. Submit one copy of proposal on forms provided by the Architect with all blank spaces for proposal prices filled in, in ink, or typewritten.
   2. Submit one reproduction of proposal forms and associated documents.
   3. Submit proposal in an opaque, sealed envelope, addressed to: Mr. Greg Lindy, Director of Support Services, 601 West Morgan Avenue, Chesterton, Indiana 46304.
      a. Mark the envelope ATTENTION: Alternative Classroom Renovation at: Chesterton Middle School – PROPOSAL.
   4. Sealed Proposals will be received until 10:00 a.m. CST (local time), on June 30, 2021 for all specified work at Duneland School Corporation Administration Office, 601 West Morgan Avenue, Chesterton Indiana 46304.
   5. Proposals received after this time shall be returned unopened.
   6. Erasures or written memorandum on the Proposal Form are prohibited. Include additional explanations, statements, or qualifications in a separate sheet attached to the Proposal Form.
   7. The Base Proposal shall appear only where called for in the Proposal Form and shall not appear elsewhere in the proposal. Any Alternate prices (other than those set forth in the Proposal Form) shall be listed on the Substitution Sheet.
   8. Fill in all blank spaces for the proposal items with prices, or if not applicable, the words "No Proposal."

B. The Owner reserves the right to reject any or all proposals or parts thereof at its sole discretion.

C. The Owner reserves the right to waive any or all irregularities or informalities.

D. The Owner reserves the right to terminate this request for proposal at any time in the bidding process.

E. All costs associated with developing or submitting a proposal in response to this request, or to obtain oral or written clarification of its content shall be borne by the respondent. The Owner and Architect, and their agents, assume no responsibility for these costs. This request for proposal does not commit the Owner or Architect, or any of their agents, to pay any costs incurred in the preparation or submission of a proposal.

F. Do not detach Proposal Forms from the Project Manual for use in submission of proposals; use separate forms furnished by the Architect.

G. Telegraphic proposals will not be accepted, but modifications by telegram of proposals already submitted will be considered if received prior to the scheduled closing time for receiving proposals.

1.3 DEFINITIONS

A. All definitions set forth in the General Conditions of the Contract for Construction as printed in AIA Document A201 as modified and included herewith are applicable to these Instructions to Proposers.

B. Proposal Documents include the Advertisement to Proposal, Instructions to Proposers, the Proposal Form and required attachments, AIA Document A101 Standard Form of Agreement Between Owner and Contractor where the Basis of Payment is a Stipulated Sum, 2007 edition, including General Conditions as modified for this project, AIA Document A305, and the proposed Contract Documents including any addendum issued prior to receipt of proposals.
C. Addenda are written or graphic instruments issued prior to the execution of the Contract which modify or interpret the proposal documents, including Drawings and Specifications, by additions, clarifications, or corrections. Addenda will become part of the Contract Documents when the Construction Contract is executed.
   1. Addenda will be issued by Email, direct mail or United Parcel delivery. Proposers are to consider all addenda, regardless of method of transmittal, as a binding modification to the contract documents.
   2. It is the proposer's responsibility to ascertain from the Architect that they have received all addenda issued to the proposal documents prior to submitting their proposals.

1.4 DOCUMENTS

A. The Proposal Documents are on file and may be examined at Gill Reprographics, Inc. (GRI), 17W715 Butterfield Road, Suite B, Oak Brook Terrace, IL 60181, (630) 652-0800, www.gillrepro.com.
B. General Contractors may obtain (1) set of the Proposal Documents, consisting of (2) sets of drawings, (2) project manuals, (1) Compact Disc containing PDF files of the drawings and the project manual, and (1) set of proposal forms at Gill Reprographics, Inc. (GRI), 17W715 Butterfield Road, Suite B, Oak Brook Terrace, IL 60181, (630) 652-0800, www.gillrepro.com, upon deposit of a check in the amount of $100.00 made payable to the Duneland School Corporation. Deposit is refundable if a proposal is submitted and if drawings are returned in good condition by July 9, 2021, as well as to the winning proposer.
C. Contractors may obtain additional sets of plans and specifications directly from the Printer. Contractor shall be responsible for the reproduction costs. Amounts paid for additional sets are not refundable.
D. All documents furnished for proposal purposes (including Compact Disc), obtained by deposit or purchase MUST BE RETURNED to the Printer, transportation prepaid, within ten days after opening of the Bids or deposit checks will not be returned.

1.5 EXAMINATION OF DOCUMENTS AND SITE

A. Proposers are responsible for examining all documents on file at the office of the Printer or Owner and must make a mandatory site visit to examine the site to become familiar with and make allowance for any conditions which may affect the work. Contractors will not be given extra payments for conditions which can be determined by examining the site and documents.
B. A non-mandatory Pre-Proposal Conference will be held on June 23, 2021, 10:00 a.m. at Chesterton Middle School, 651 West Morgan Avenue, Chesterton, Indiana 46304. There will be a walk-through immediately following the pre-proposal meeting at the school. The Architect will transmit to prospective bidders of record any Addenda the Architect considers necessary in response to questions arising at the conference.

1.6 POST-PROPOSAL QUALIFICATION

A. Any bidder may be required to submit supporting data to substantiate that such bidder is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein.

1.7 PROPOSAL WITHDRAWAL

A. Any proposer may withdraw their proposal prior to the scheduled closing time for receiving proposals. All proposers shall hold their Proposals open for a period of sixty calendar days from the date of Proposal Opening. The Owner and Proposers may agree to extend the period of irrevocability beyond the sixty-day period.

1.8 INTERPRETATION OF PROPOSAL DOCUMENTS

A. Submit all questions regarding the Proposal Documents to the Architect. Replies will be issued to all proposers of record in the form of an Addendum. Questions received less than five days before the proposal opening date cannot be answered.

1.9 NON-SPECIFIED ITEMS

A. Approved Equal Items:
   1. To obtain approval to use non-specified items, submit written request at least five days prior to the opening date; requests received after this time will NOT be considered.
   2. Requests shall clearly describe the items for which approval is asked including all data necessary to demonstrate acceptability.
   3. If an item is acceptable, the Architect will approve same in an Addendum issued to all proposers of record.

B. Substitutions:
   1. Substitutions for the items specified may be made by the Contractor only by submitting proposed substitutions on the Substitution Sheet provided.
   2. Requests received after proposal opening will not be considered except for the following conditions:
      a. Product discontinued.
      b. Insufficient quantity. Except the following will not establish cause for substitution:
         1) Failure to award subcontract in sufficient time, or failure to place orders for products so as to ensure delivery without delaying work.
      c. Delays beyond control, such as strikes, lockouts, storms, fires, or acts of God, which may preclude the procurement and delivery of products for purposes of the Project.

C. No consideration will be given to substitutions after the Contractor submits the Schedule of Values.

1.10 METHOD OF AWARD

A. If the Owner should award a Contract, the Owner will award it to the lowest responsible bona fide Proposer with full consideration given to Contractor's Completion Schedule.

B. In determining the lowest responsible bona fide Proposer and in awarding a contract, the Owner may take into consideration skill, facilities, capacity, experience, ability, responsibility, previous work, financial standing of proposer, amount of work being carried on by proposer, quality and efficiency of construction equipment proposed to be furnished, period of time within which proposed equipment is furnished and delivered, and necessity of prompt and efficient completion of work herein described.

1.11 PROPOSAL REQUIREMENTS

A. Bidder's proposals shall be expressly based on the following items:
   1. Instructions to Proposers.
   2. Proposal Form.
   3. General Conditions.
   4. Plans and Specifications.
   5. Addenda

B. Any Contract resulting from the Proposal Documents will incorporate the terms and provisions of said documents. It is intended that these Proposal Documents shall prevail over conflicting terms and conditions of Contractor's proposal. Proposer’s printed terms and conditions are NOT considered as exceptions to the Contract.

1.12 OTHER CERTIFICATIONS AND SUBMITTALS

A. All proposers must complete and sign the following certifications and submit them with their proposals. FAILURE TO DO SO MAY RESULT IN DISQUALIFICATION OF PROPOSER.
   1. Addendum to Contract for Construction.
   2. Certification Regarding Investment Activities in Iran.
   3. Fully completed AIA document A305 providing the Contractor's qualifications and references.

1.13 POWER OF ATTORNEY

A. Attorneys-in-Fact who sign bonds, Agreements or proposals must file with each such document a certified and effectively-dated copy of their Power of Attorney.

1.14 EMPLOYMENT AND LABOR PROVISIONS

A. Vendors/Contractors must conform to all federal, state, local and OSHA Regulations now in effect.
B. The Contractor shall not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin.

END OF SECTION

SECTION 00300

PROPOSAL FORM

THE PROJECT AND THE PARTIES

1.1 NAME OF PROPOSER: _____

1.1 TO: MR. GREG LINDY, DIRECTOR OF SUPPORT SERVICES
DUNELAND SCHOOL CORPORATION
601 WEST MORGAN AVENUE
CHESTERTON, INDIANA 46304

A. We as contractor having familiarized ourselves with local conditions affecting the work and with the proposed Contact Documents on file at the office of the Owner, hereby propose to perform everything required to be performed and to provide all of the labor, materials, necessary equipment and all utilities and transportation and services necessary to perform and complete in a workmanlike manner all work required to complete the proposed work indicated in the proposal documents for the construction of the Alternative Classroom Renovation at: Chesterton Middle School, all in accordance with the Drawings and Specifications prepared by the office of Tria Architecture, Inc. including Addenda No. _____, _____ and _____ issued thereto for the sum of:

1. Base Proposal for all Work:
   _____
   _____
   ($ ___ ___ ___ , ___ ___ ___ , ___ ___ ___ . ___ ___)
2. The base proposal consists of all Work specified and required by the proposed Contract Documents.

B. In signing and submitting this Proposal, the undersigned certifies that all materials and construction to be provided are as indicated in the proposed Contract Documents.

C. Time of Completion: If awarded the Contract, the proposer agrees to complete all Construction Work and achieve Substantial Completion by August 10, 2021, 5:00 p.m. NOTE: Substantial Completion for this project refers to all work being a minimum of 99% complete. Final Completion for this project refers to all scheduled work, punch-list and closeout items being 100% complete.

D. The space below of the desired Substantial Completion Date has been left blank for insertion of Contractor's own desired Substantial Completion Date, if he feels that the desired date as stated in the specifications cannot be met. Insertion of a date by the proposer does not change the specified Substantial Completion Date unless the Owner chooses to accept the bidder's date when awarding the contract.

1. Specified Substantial Completion Date: August 10, 2021, 5:00 p.m.
2. Contractor's Desired Substantial Completion Date: _____.

E. Base Proposal Breakdown: For the purpose of logical comparison of orders of magnitude in the bids, the Owner requires a global breakdown of the components of the base proposal. Contractors are required to provide this breakdown. Failure to do so will subject the bid to rejection. The sum of the following items must equal the Lump Sum Base Proposal.

BREAKDOWN:

Division 01:	General Requirements – Allowances:	$ _____
Division 01:	General Requirements – O&P:	$ _____
Division 01:	General Requirements – Remaining Items:	$ _____

SECTION 00300

PROPOSAL FORM

Division 03:	Concrete:	$ _____
	Subcontractor (Legal Name, Address:	_____
	_____	
Division 04:	Masonry:	$ _____
	Subcontractor (Legal Name, Address):	_____
	_____	
Division 05:	Metals:	$ _____
	Subcontractor (Legal Name, Address):	_____
	_____	
Division 07:	Thermal and Moisture Protection:	$ _____
	Subcontractor (Legal Name, Address):	_____
	_____	
Division 08:	Doors and Windows:	$ _____
	Subcontractor (Legal Name, Address):	_____
	_____	
Division 09:	Finishes:	$ _____
	Subcontractor (Legal Name, Address):	_____
	_____	
Division 15:	Mechanical - HVAC:	$ _____
	Subcontractor (Legal Name, Address):	_____
	_____	
Division 15:	Mechanical - Plumbing:	$ _____
	Subcontractor (Legal Name, Address):	_____
	_____	
Division 16:	Electrical:	$ _____
	Subcontractor (Legal Name, Address):	_____
	_____	
Division 16:	Electrical – Fire Alarm:	$ _____
	Subcontractor (Legal Name, Address):	_____
	_____	
Division 16:	Electrical – Low Voltage:	$ _____
	Subcontractor (Legal Name, Address):	_____
	_____	

SECTION 00300

PROPOSAL FORM

Division 17: Building Automation Systems: $ _____

Subcontractor (Legal Name, Address): _____

_____

Miscellaneous Any items not identified above: $ _____

Subcontractor (Legal Name, Address): _____

_____

TOTAL (Should equal base bid): $ _____

FIRM NAME: _____

OFFICIAL ADDRESS: _____

Telephone Number: _____ Fax Number: _____

Email Address: _____

By: _____ Date: _____
(Signature)

_____
(Printed/Typed Name and Title)

Where the Bidder is a corporation, add Attest

_____ (SEAL)
Secretary (signature) Date

CERTIFIED OR CASHIERS CHECK, BID BOND, OR BANK DRAFT ENCLOSED IN THE FOLLOWING AMOUNT: $_____.

END OF PROPOSAL FORM

SECTION 00440

SUBSTITUTION SHEET

1.1 SUBSTITUTION INFORMATION

A. All proposals shall be based upon the provisions of the proposed Contract Documents.

B. Proposers desiring to make substitutions for "proprietary brands" specified shall list such proposed substitutions below, together with the amount to be added or deducted from the amounts of their base proposals.

C. The Owner reserves the right to reject all such substitutions, and such substitutions will not be used to determine the low proposal.

D. Complete descriptions and technical data shall accompany all proposed substitutions.

E. NOTE: Manufacturer's names and material approved by the Architect during the proposal time, but not shown in Addenda, must be listed below if said material is to be considered.

F.	BRAND/MAKE SPECIFED	PROPOSED	ADD	DEDUCT
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				

NAME OF PROPOSER: _____

DATE: _____.

END OF SECTION

SECTION 00495

ADDENDUM TO CONTRACT FOR CONSTRUCTION

This following Addendum to THE Contract for Construction is made by _____ ("contractor") and the Duneland School Corporation ("School Corporation") this ___ day of _____, _____..

The contractor is party to a Contract for Construction with the School Corporation ("Agreement").

The contractor states that it is in compliance with the requirements of Indiana Code 22-5-1.7-11 in that it uses the E-Verify program, as such is defined by Ind. Code 22-5-1.7-3, as such may be amended from time to time, or that it is no longer required to verify the work eligibility status of all newly hired employees if the E-Verify program no longer exists.

Attached to this Addendum is an Affidavit signed on behalf of the contractor and executed in accordance with Ind. Code 22-5-1.7-11(b).

This Addendum is intended to supplement the Agreement between the School Corporation and the contractor, whether oral or in writing.

CONTRACTOR

By: _____

Its: _____

SECTION 00495

ADDENDUM TO CONTRACT FOR CONSTRUCTION

STATE OF INDIANA)
)
COUNTY OF _____)

AFFIDAVIT

The undersigned, being duly sworn upon his oath, does state as follows:

1. He/she is _____ (specify position) of _____ ("contractor") and has personal knowledge of the facts set forth in this Affidavit.

2. The contractor provides services to the Duneland School Corporation.

3. The contractor does not knowingly employ any unauthorized aliens, as such term is defined by Indiana Code 22-5-1.7-9.

4. This Affidavit is made for the purpose of complying with the requirements of Indiana Code 22-5-1.7 et seq.

Dated this ___ day of _____, _____.

Further Affiant sayeth not.

_____

I affirm, under the penalties for perjury, that the foregoing representations are true to the best of my knowledge and belief.

_____

SECTION 00496

CERTIFICATION REGARDING INVESTMENT ACTIVITIES IN IRAN

The CONTRACTOR certifies to the Duneland School Corporation ("OWNER"), as a condition of its contract with the School Corporation that CONTRACTOR is not engaged in investment activities in Iran. Pursuant to Ind. Code §5-22-16.5-8, a firm is considered to be engaging in investment activities with Iran if: (1) it has provided goods or services of Twenty Million Dollars ($20,000,000.00) or more in value in the energy section of Iran, including oil or liquefied natural gas; or (2) has extended Twenty Million Dollars ($20,000,000.00) or more in credit to another party, for 45 days or more, if that other party will use the credit to provide goods or services in the energy section in Iran and is, at the time credit is extended, identified on the list developed by the State of Indiana of parties it has determined to be engaged in investment activities in Iran. Be advised that the CONTRACTOR is not listed on the list published and/or endorsed by the State of Indiana pursuant to Ind. Code §5-22-16.5-9 as a company engaged in investment activities with Iran.

Dated this _____ day of _____, 20___.

CONTRACTOR:

By: _____

Its: _____

SECTION 00700

GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.1 AIA Document A201, General Conditions of the Contract for Construction, 2017 Edition, attached, is the General Conditions between the Owner and Contractor.

1.2 AIA Document A101-Exhibit A, Insurance and Bonds, 2017 Edition, attached, is the Insurance and Bonds requirements, for the Owner and Contractor, for the project.

1.3 A Letter of Intent to Award a Construction Contract will be issued to the approved contractor upon approval of the Owner. This Letter of Intent shall serve as the Notice to proceed and the Contract for Construction, with all the terms and conditions referenced in the contract documents, until the contract, referenced above, has been fully executed. The awarded contractor shall begin all construction services as specified upon receipt of this Letter of Intent.

END OF SECTION

DRAFT

AIA® Document A201™ – 2017

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)

Duneland School Corporation - General »
« »

THE OWNER:
(Name, legal status and address)

«Duneland School Corporation »« »
«601 West Morgan Avenue
Chesterton, Indiana 46304 »

THE ARCHITECT:
(Name, legal status and address)

« «Tria Architecture, Inc.»« »
«901 McClintock Drive, Suite 100
Burr Ridge, Illinois 60527»

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

14 TERMINATION OR SUSPENSION OF THE CONTRACT

15 CLAIMS AND DISPUTES

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.

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

For guidance in modifying this document to include supplementary conditions, see AIA Document A503™, Guide for Supplementary Conditions.

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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, 13.3.2, 14.1, 15.1.2, 15.2
Addenda
1.1.1
Additional Costs, Claims for
3.7.4, 3.7.5, 10.3.2, 15.1.5
Additional Inspections and Testing
9.4.2, 9.8.3, 12.2.1, **13.4**
Additional Time, Claims for
3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.6**
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
Applications for Payment
4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.5.4, 9.6.3, 9.7, 9.10
Approvals
2.1.1, 2.3.1, 2.5, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10.1, 4.2.7, 9.3.2, 13.4.1
Arbitration
8.3.1, 15.3.2, **15.4**
ARCHITECT
4
Architect, Definition of
4.1.1
Architect, Extent of Authority
2.5, 3.12.7, 4.1.2, 4.2, 5.2, 6.3, 7.1.2, 7.3.4, 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, 13.4.1, 13.4.2, 14.2.2, 14.2.4, 15.1.4, 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, 9.5.4, 9.6.4, 15.1.4, 15.2
Architect's Additional Services and Expenses
2.5, 12.2.1, 13.4.2, 13.4.3, 14.2.4
Architect's Administration of the Contract
3.1.3, 3.7.4, 15.2, 9.4.1, 9.5
Architect's Approvals
2.5, 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, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.4.2, 15.2
Architect's Inspections
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.4
Architect's Instructions
3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.4.2
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, 2.3.3, 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, 4.2, 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, 12, 13.3.2, 13.4, 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
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, 13.4
Asbestos
10.3.1
Attorneys' Fees
3.18.1, 9.6.8, 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
Binding Dispute Resolution
8.3.1, 9.7, 11.5, 13.1, 15.1.2, 15.1.3, 15.2.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.3.3, 15.4.1
Bonds, Lien
7.3.4.4, 9.6.8, 9.10.2, 9.10.3
Bonds, Performance, and Payment
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**, 11.1.3, **11.5**
Building Information Models Use and Reliance
1.8
Building Permit
3.7.1
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, 15.1.4
Certificates of Inspection, Testing or Approval
13.4.4
Certificates of Insurance
9.10.2
Change Orders
1.1.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.7, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.2, 11.5, 12.1.2
Change Orders, Definition of
7.2.1
CHANGES IN THE WORK
2.2.2, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 8.3.1, 9.3.1.1, 11.5
Claims, Definition of
15.1.1
Claims, Notice of
1.6.2, 15.1.3
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, 3.3.1, 3.7.4, 7.3.9, 9.5.2, 10.2.5, 10.3.2, **15.1.5**
Claims for Additional Time
3.2.4, 3.3.1, 3.7.4, 6.1.1, 8.3.2, 9.5.2, 10.3.2, **15.1.6**
Concealed or Unknown Conditions, Claims for
3.7.4
Claims for Damages
3.2.4, 3.18, 8.3.3, 9.5.1, 9.6.7, 10.2.5, 10.3.3, 11.3, 11.3.2, 14.2.4, 15.1.7
Claims Subject to Arbitration
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, 11.2, **15.1.5**
Commencement of the Work, Definition of
8.1.2
Communications
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, 14.1.2, 15.1.2
COMPLETION, PAYMENTS AND
9
Completion, Substantial
3.10.1, 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, 15.1.2
Compliance with Laws
2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 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, 3.14.2, 4.1.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 13.2, 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, 3.11, 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, 3.11, 3.12.1, 3.12.2, 6.1.3, 15.1.6.2
Contingent Assignment of Subcontracts
5.4, 14.2.2.2
Continuing Contract Performance
15.1.4
Contract, Definition of
1.1.2
CONTRACT, TERMINATION OR
SUSPENSION OF THE
5.4.1.1, 5.4.2, 11.5, **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
Contract Documents, Copies Furnished and Use of
1.5.2, 2.3.6, 5.3
Contract Documents, Definition of
1.1.1
Contract Sum
2.2.2, 2.2.4, 3.7.4, 3.7.5, 3.8, 3.10.2, 5.2.3, 7.3, 7.4, **9.1**, 9.2, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.5, 12.1.2, 12.3, 14.2.4, 14.3.2, 15.1.4.2, **15.1.5, 15.2.5**
Contract Sum, Definition of
9.1
Contract Time
1.1.4, 2.2.1, 2.2.2, 3.7.4, 3.7.5, 3.10.2, 5.2.3, 6.1.5, 7.2.1.3, 7.3.1, 7.3.5, 7.3.6, 7, 7, 7.3.10, 7.4, 8.1.1, 8.2.1, 8.2.3, 8.3.1, 9.5.1, 9.7, 10.3.2, 12.1.1, 12.1.2, 14.3.2, 15.1.4.2, 15.1.6.1, 15.2.5
Contract Time, Definition of
8.1.1
CONTRACTOR
3
Contractor, Definition of
3.1, 6.1.2
Contractor's Construction and Submittal
Schedules
3.10, 3.12.1, 3.12.2, 4.2.3, 6.1.3, 15.1.6.2

Contractor's Employees
2.2.4, 3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.3, 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, 12.2.4
Contractor's Relationship with Subcontractors
1.2.2, 2.2.4, 3.3.2, 3.18.1, 3.18.2, 4.2.4, 5, 9.6.2, 9.6.7, 9.10.2, 11.2, 11.3, 11.4
Contractor's Relationship with the Architect
1.1.2, 1.5, 2.3.3, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 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, 12, 13.4, 15.1.3, 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, 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
2.2.2, 9.7
Contractor's Right to Terminate the Contract
~~14.1~~
Contractor's Submittals
3.10, 3.11, 3.12, 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
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, 7.3.4, 7.3.6, 8.2, 10, 12, 14, 15.1.4
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, 2.3.6, 3.11
Copyrights
1.5, **3.17**
Correction of Work
2.5, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**, 12.3, 15.1.3.1, 15.1.3.2, 15.2.1
Correlation and Intent of the Contract Documents
1.2
Cost, Definition of
7.3.4
Costs
2.5, 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, 7.3.4, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.2, 12.1.2, 12.2.1, 12.2.4, 13.4, 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, 12.2.4
Damage to the Work
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4, 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, 11.3.2, 11.3, 14.2.4, 15.1.7
Damages for Delay
6.2.3, 8.3.3, 9.5.1.6, 9.7, 10.3.2, 14.3.2
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, 6.3, 7.3.4, 7.3.9, 8.1.3, 8.3.1, 9.2, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.4.2, 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
2.5, 3.5, 4.2.6, 6.2.3, 9.5.1, 9.5.3, 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, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1, 15.1.1
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**, 14.3.2, **15.1.6**, 15.2.5
Digital Data Use and Transmission
1.7
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
Emergencies
10.4, 14.1.1.2, **15.1.5**
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, 11.3, 14.1, 14.2.1.1
Equipment, Labor, or Materials
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, 7.3.4, 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, 2.3.4, 2.3.6, 3.1, 3.3.1, 3.4.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.6, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.1, 12.2, 14.2, 14.3.1, 15.1.4

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, 14.3, 15.1.6, **15.2.5**
Failure of Payment
9.5.1.3, **9.7**, 9.10.2, 13.5, 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**, 12.3, 14.2.4, 14.4.3
Financial Arrangements, Owner's
2.2.1, 13.2.2, 14.1.1.4
GENERAL PROVISIONS
1
Governing Law
13.1
Guarantees (See Warranty)
Hazardous Materials and Substances
10.2.4, **10.3**
Identification of Subcontractors and Suppliers
5.2.1
Indemnification
3.17, **3.18**, 9.6.8, 9.10.2, 10.3.3, 11.3
Information and Services Required of the Owner
2.1.2, **2.2**, 2.3, 3.2.2, 3.12.10.1, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.9.2, 9.10.3, 10.3.3, 11.2, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Initial Decision
15.2
Initial Decision Maker, Definition of
1.1.8
Initial Decision Maker, Decisions
14.2.4, 15.1.4.2, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5
Initial Decision Maker, Extent of Authority
14.2.4, 15.1.4.2, 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
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, 13.4
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, 13.4.2
Instruments of Service, Definition of
1.1.7
Insurance
6.1.1, 7.3.4, 8.2.2, 9.3.2, 9.8.4, 9.9.1, 9.10.2, 10.2.5, **11**
Insurance, Notice of Cancellation or Expiration
11.1.4, 11.2.3
Insurance, Contractor's Liability
11.1
Insurance, Effective Date of
8.2.2, 14.4.2
Insurance, Owner's Liability
11.2
Insurance, Property
10.2.5, 11.2, 11.4, 11.5
Insurance, Stored Materials
9.3.2
INSURANCE AND BONDS
11
Insurance Companies, Consent to Partial Occupancy
9.9.1
Insured loss, Adjustment and Settlement of
11.5
Intent of the Contract Documents
1.2.1, 4.2.7, 4.2.12, 4.2.13
Interest
13.5
Interpretation
1.1.8, 1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1
Interpretations, Written
4.2.11, 4.2.12
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, 5.2.1, 6.2.1, 7.3.4, 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, 2.3.2, 3.2.3, 3.2.4, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Liens
2.1.2, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Limitations, Statutes of
12.2.5, 15.1.2, 15.4.1.1
Limitations of Liability
3.2.2, 3.5, 3.12.10, 3.12.10.1, 3.17, 3.18.1, 4.2.6, 4.2.7, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 9.6.8, 10.2.5, 10.3.3, 11.3, 12.2.5, 13.3.1
Limitations of Time
2.1.2, 2.2, 2.5, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3, 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, 12.2, 13.4, 14, 15, 15.1.2, 15.1.3, 15.1.5
Materials, Hazardous
10.2.4, **10.3**
Materials, Labor, Equipment and
1.1.3, 1.1.6, 3.4.1, 3.5, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 5.2.1, 6.2.1, 7.3.4, 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, 9.3.1, 9.3.3, 9.6.8, 9.10.2, 9.10.4, 15.2.8
Mediation
8.3.1, 15.1.3.2, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1, 15.4.1.1
Minor Changes in the Work
1.1.1, 3.4.2, 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, 2.5, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7, 10.3.2
Mutual Responsibility
6.2
Nonconforming Work, Acceptance of
9.6.6, 9.9.3, **12.3**
Nonconforming Work, Rejection and Correction of
2.4, 2.5, 3.5, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2
Notice
1.6, 1.6.1, 1.6.2, 2.1.2, 2.2.2., 2.2.3, 2.2.4, 2.5, 3.2.4, 3.3.1, 3.7.4, 3.7.5, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 7.4, 8.2.2 9.6.8, 9.7, 9.10.1, 10.2.8, 10.3.2, 11.5, 12.2.2.1, 13.4.1, 13.4.2, 14.1, 14.2.2, 14.4.2, 15.1.3, 15.1.5, 15.1.6, 15.4.1
Notice of Cancellation or Expiration of Insurance
11.1.4, 11.2.3
Notice of Claims
1.6.2, 2.1.2, 3.7.4, 9.6.8, 10.2.8, **15.1.3**, 15.1.5, 15.1.6, 15.2.8, 15.3.2, 15.4.1
Notice of Testing and Inspections
13.4.1, 13.4.2
Observations, Contractor's
3.2, 3.7.4
Occupancy
2.3.1, 9.6.6, 9.8
Orders, Written
1.1.1, 2.4, 3.9.2, 7, 8.2.2, 11.5, 12.1, 12.2.2.1, 13.4.2, 14.3.1
OWNER
2
Owner, Definition of
2.1.1
Owner, Evidence of Financial Arrangements
2.2, 13.2.2, 14.1.1.4
Owner, Information and Services Required of the
2.1.2, **2.2**, 2.3, 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, 13.4.1, 13.4.2, 14.1.1.4, 14.1.4, 15.1.4
Owner's Authority
1.5, 2.1.1, 2.3.32.4, 2.5, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 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, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.4, 11.5, 12.2.2, 12.3, 13.2.2, 14.3, 14.4, 15.2.7
Owner's 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
2.5, 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
2.4
Owner's Right to Suspend the Work
14.3
Owner's Right to Terminate the Contract
14.2, 14.4
Ownership and Use of Drawings, Specifications and Other Instruments of Service
1.1.1, 1.1.6, 1.1.7, **1.5**, 2.3.6, 3.2.2, 3.11, 3.17, 4.2.12, 5.3
Partial Occupancy or Use
9.6.6, **9.9**
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, 14.1.1.3, 14.2.4
Payment, Failure of
9.5.1.3, **9.7**, 9.10.2, 13.5, 14.1.1.3, 14.2.1.2
Payment, Final
4.2.1, 4.2.9, **9.10**, 12.3, 14.2.4, 14.4.3
Payment Bond, Performance Bond and
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Payments, Progress
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4
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
7.3.4.4, 9.6.7, 9.10.3, **11.1.2**
Permits, Fees, Notices and Compliance with Laws
2.3.1, **3.7**, 3.13, 7.3.4.4, 10.2.2
PERSONS AND PROPERTY, PROTECTION OF
10
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, 15.1.4
Progress Payments
9.3, **9.6**, 9.8.5, 9.10.3, 14.2.3, 15.1.4

Project, Definition of
1.1.4
Project Representatives
4.2.10
Property Insurance
10.2.5, **11.2**
Proposal Requirements
1.1.1
PROTECTION OF PERSONS AND PROPERTY
10
Regulations and Laws
1.5, 2.3.2, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 9.6.4, 9.9.1, 10.2.2, 13.1, 13.3, 13.4.1, 13.4.2, 13.5, 14, 15.2.8, 15.4
Rejection of Work
4.2.6, 12.2.1
Releases and Waivers of Liens
9.3.1, 9.10.2
Representations
3.2.1, 3.5, 3.12.6, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.10.1
Representatives
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.10, 13.2.1
Responsibility for Those Performing the Work
3.3.2, 3.18, 4.2.2, 4.2.3, 5.3, 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, 2.4, 2.5, 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, 12.2.1, 12.2.2, 12.2.4, **13.3**, 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, **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, 15.1.6.2
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
Separate Contractors, Definition of
6.1.1
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, 9.9.2, 9.4.2, 9.10.1, 13.4
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, 13.4
Special Inspections and Testing
4.2.6, 12.2.1, 13.4
Specifications, Definition of
1.1.6
Specifications
1.1.1, **1.1.6**, 1.2.2, 1.5, 3.12.10, 3.17, 4.2.14
Statute of Limitations
15.1.2, 15.4.1.1
Stopping the Work
2.2.2, 2.4, 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, 3.18, 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, 7.3.4, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3
Submittal Schedule
3.10.2, 3.12.5, 4.2.7
Subrogation, Waivers of
6.1.1, **11.3**
Substances, Hazardous
10.3
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, 15.1.2
Substantial Completion, Definition of
9.8.1
Substitution of Subcontractors
5.2.3, 5.2.4
Substitution of Architect
2.3.3
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, 7.3.4, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.4
Suppliers
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.5.4, 9.6, 9.10.5, 14.2.1
Surety
5.4.1.2, 9.6.8, 9.8.5, 9.10.2, 9.10.3, 11.1.2, 14.2.2, 15.2.7
Surety, Consent of
9.8.5, 9.10.2, 9.10.3
Surveys
1.1.7, 2.3.4
Suspension by the Owner for Convenience
14.3
Suspension of the Work
3.7.5, 5.4.2, 14.3
Suspension or Termination of the Contract
5.4.1.1, 14
Taxes
3.6, 3.8.2.1, 7.3.4.4
Termination by the Contractor
14.1, 15.1.7
Termination by the Owner for Cause
5.4.1.1, **14.2,** 15.1.7
Termination by the Owner for Convenience
14.4
Termination of the Architect
2.3.3
Termination of the Contractor Employment
14.2.2

TERMINATION OR SUSPENSION OF THE CONTRACT
14
Tests and 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, 10.3.2, 12.2.1, **13.4**
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, 14.3.2, 15.1.6, 15.2.5
Time Limits
2.1.2, 2.2, 2.5, 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, 12.2, 13.4, 14, 15.1.2, 15.1.3, 15.4
Time Limits on Claims
3.7.4, 10.2.8, 15.1.2, 15.1.3
Title to Work
9.3.2, 9.3.3
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, 9.1.2
Use of Documents
1.1.1, 1.5, 2.3.6, 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
13.3.2
Waiver of Claims by the Contractor
9.10.5, 13.3.2, **15.1.7**
Waiver of Claims by the Owner
9.9.3, 9.10.3, 9.10.4, 12.2.2.1, 13.3.2, 14.2.4, **15.1.7**
Waiver of Consequential Damages
14.2.4, 15.1.7
Waiver of Liens
9.3, 9.10.2, 9.10.4
Waivers of Subrogation
6.1.1, **11.3**
Warranty
3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.2, 9.10.4, 12.2.2, 15.1.2
Weather Delays
8.3, 15.1.6.2
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, 9.10.3, 13.2, 13.3.2, 15.4.4.2
Written Interpretations
4.2.11, 4.2.12
Written Orders
1.1.1, 2.4, 3.9, 7, 8.2.2, 12.1, 12.2, 13.4.2, 14.3.1

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,~~ consist of the Invitation to Bid, Instruction to Bidders, Bid Form, Agreement between Owner and Contractor (hereinafter the Agreement), Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Schedules, 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~~ of the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive, ~~or (4)~~ (4) an Architect's Supplemental Instruction, or 5) a written order for a minor change in the Work issued by the Architect. ~~Unless specifically enumerated in the Agreement, the Contract Documents do not 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 or proposal 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. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.~~

§ 1.1.2 THE OWNER

The term "Owner" shall refer to the Duneland School Corporation, which shall also be referred to as the "School Corporation."

§ 1.1.3 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.

§ 1.1.4 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.

§ 1.1.5 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.

§ 1.1.6 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. Figured dimensions shall be followed in preference to measurements by scale. All dimensions shall be checked against field measurements of existing conditions to be taken by the Contractor.

§ 1.1.7 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.

§ 1.1.8 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.

§ 1.1.9 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. The Initial Decision Maker shall not show partiality to the Owner or Contractor and shall not be liable for results of interpretations or decisions rendered in good faith.

§ 1.1.10 The term "Contractor" as used herein shall refer to the Contractor or Construction Manager at Risk.

1.1.10. MISCELLANEOUS DEFINITIONS

1.1.10.1 The term "Fabricated" as used throughout the Contract Documents is hereby defined to mean items specifically assembled or made of selected materials or components to meet individual design requirements.

1.1.10.2 The term "Furnish" as used throughout the Contract Documents is hereby defined to mean materials or items to be furnished.

1.1.10.3 The term "Install" as used throughout the Contract Documents is hereby defined to mean materials or items furnished by other trades shall be installed only. Such materials or items shall be received at the site, unloaded, stored, protected, and installed in place, including connections, auxiliary items, and other work required for a complete and functioning installation, unless any such work is specifically excluded.

1.1.10.4 The term "Provide" as used throughout the Contract Documents is hereby defined to mean "furnish and install."

1.1.10.5 The phrase "Shop Fabricated" or "Shop Made" as used throughout the Contract Documents is hereby defined as items made by a contractor or subcontractor in their own Shop.

1.1.10.6 The words "Contractor shall" are implied and shall be so understood wherever a direction or instruction is stated in the imperative sense.

§ 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.~~ Contractor and items reasonably inferable therefrom. The Contract Documents are complementary, and what is required by one shall be as binding as if required by ~~all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.~~all.

§ 1.2.1.1 The invalidity of any provision of the Contract Documents shall not invalidate the Contract or its remaining provisions. If it is determined that any provision of the Contract Documents violates any law, or is otherwise invalid or unenforceable, then that provision shall be revised to the extent necessary to make that provision legal and enforceable. In such case the Contract Documents shall be construed, to the fullest extent permitted by law, to give effect to the parties' intentions and purposes in executing the Contract.

§ 1.2.1.1 Where conflicts exist within or between parts of the Contract Documents, or between the Contract Documents and applicable standards, codes and ordinances, the more stringent, or higher quality or greater quantity requirements shall apply. Large-scale drawings take precedence over small-scale drawings, figured dimensions over scaled dimensions and noted materials over graphic representations.

§ 1.2.1.2 The specifications are of the abbreviated type and may include incomplete sentences. Omissions of phrases such as "The Contractor shall" or "conforming to the requirements of" is intentional; omitted words or phrases shall be supplied by inference in the same manner as they are when a "note" occurs on the drawings. Words in singular shall include a plural whenever applicable, or the context so indicates.

§ 1.2.1.3 Large-scale drawings take precedence over small-scale drawings, figured dimensions over scaled dimensions and noted materials over graphic representations.

§ 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.

§ 1.2.3.1 In the event of conflicts or discrepancies among the Contract Documents, interpretations will be based on the following priorities: 1) The Agreement, 2) Addenda, with those of later date having precedence over those of earlier date, 3) The General Conditions of the Contract for Construction, 4) Drawings and Specifications.

§ 1.2.3.2 In the case of an inconsistency between Drawings and Specifications or within either Document not clarified by addendum, the better quality or greater quantity of work shall be provided in accordance with the Architect's interpretation.

§ 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. The descriptive headings of this Agreement are inserted for convenience only and shall not control or affect the meaning or construction of any provisions following them.

§ 1.5 Ownership and Use of Drawings, Specifications, and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and retain all common law, statutory, and other reserved rights in their Instruments of Service, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and 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 the 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 suppliers are authorized to use and reproduce the Instruments of Service provided to them, subject to any protocols established pursuant to Sections 1.7 and 1.8, 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 suppliers may not use the Instruments of Service on other projects or for additions to the Project outside the scope of the Work without the specific written consent of the Owner, Architect, and the Architect's consultants.

§ 1.6 Notice

§ 1.6.1 Except as otherwise provided in Section 1.6.2, where the Contract Documents require one party to notify or give notice to the other party, such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly served if delivered in person, by mail, by courier, or by electronic transmission if a method for electronic transmission is set forth in the Agreement.

§ 1.6.2 Notice of Claims as provided in Section 15.1.3 shall be provided in writing and shall be deemed to have been duly served only if delivered to the designated representative of the party to whom the notice is addressed by certified or registered mail, or by courier providing proof of delivery.

§ 1.7 Digital Data Use and Transmission

The parties shall agree upon protocols governing the transmission and use of Instruments of Service or any other information or documentation in digital form. The parties will use AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, to establish the protocols for the development, use, transmission, and exchange of digital data.

§ 1.8 Building Information Models Use and Reliance

Any use of, or reliance on, all or a portion of a building information model without agreement to protocols governing the use of, and reliance on, the information contained in the model and without having those protocols set forth in AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, and the requisite AIA Document G202™–2013, Project Building Information Modeling Protocol Form, shall be at the using or relying party's sole risk and without liability to the other party and its contractors or consultants, the authors of, or contributors to, the building information model, and each of their agents and employees.

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 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.~~

§ 2.2 ~~Evidence of the Owner's Financial Arrangements~~Information and Services Required of Owner

§ 2.2.1 ~~Prior to commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations~~

~~under the Contract. The Contractor shall have no obligation to commence the Work until the Owner provides such evidence. If commencement of the Work is delayed under this Section 2.2.1, the Contract Time shall be extended appropriately.~~ All other permits and fees shall be obtained and paid for by the Contractor under the Contract Documents. The Contractor shall be responsible to obtain all temporary permits including, but not limited to, demolition and canopy permits required to execute the Work

§ 2.2.2 ~~Following commencement of the Work and upon written request by the Contractor, the Owner shall furnish to the Contractor reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract only if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due; or (3) a change in the Work materially changes the Contract Sum. If the Owner fails to provide such evidence, as required, within fourteen days of the Contractor's request, the Contractor may immediately stop the Work and, in that event, shall notify the Owner that the Work has stopped. However, if the request is made because a change in the Work materially changes the Contract Sum under (3) above, the Contractor may immediately stop only that portion of the Work affected by the change until reasonable evidence is provided. If the Work is stopped under this Section 2.2.2, the Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided in~~ Permits and fees are the responsibility of the Contractor under the Contract Documents.

~~**§ 2.2.3** After the Owner furnishes evidence of financial arrangements under this Section 2.2, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.~~

~~**§ 2.2.4** Where the Owner has designated information furnished under this Section 2.2 as "confidential," the Contractor shall keep the information confidential and shall not disclose it to any other person. However, the Contractor may disclose "confidential" information, after seven (7) days' notice to the Owner, where disclosure is required by law, including a subpoena or other form of compulsory legal process issued by a court or governmental entity, or by court or arbitrator(s) order. The Contractor may also disclose "confidential" information to its employees, consultants, sureties, Subcontractors and their employees, Sub-subcontractors, and others who need to know the content of such information solely and exclusively for the Project and who agree to maintain the confidentiality of such information.~~

~~**§ 2.3 Information and Services Required of the Owner**~~
§ 2.2.2.2 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.

§ 2.2.2.3 If the employment of the Architect terminates, the Owner shall employ a successor whose status under the Contract Documents shall be that of the Architect.

§ 2.3.1 ~~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.~~ **Surveys.** The Owner shall 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.

§ 2.3.2 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.~~ 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.

§ 2.3.3 ~~If the employment of the Architect terminates, the Owner shall employ a successor to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Architect.~~ 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.

~~§ 2.3.4 The Owner shall 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.~~

~~§ 2.3.5 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.~~

~~§ 2.3.6 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.~~

§ 2.4 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 ~~repeatedly~~ 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. This right shall be in addition to and not in restriction or derogation of Owner's rights under Article 14 hereof.

§ 2.5 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~~ seven-day (7) period after receipt of notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner ~~may,~~ may immediately, without prejudice to other remedies the Owner may have, correct such default or neglect. ~~Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect and the Architect may, pursuant to Section 9.5.1, withhold or nullify a Certificate for Payment in whole or in part, to the extent reasonably necessary to reimburse the Owner for the reasonable~~ In such case, an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor, the cost of correcting such deficiencies, including ~~Owner's expenses and~~ but not limited to, attorney's fees, compensation for the Architect's additional services ~~made necessary by such default, neglect, or failure. If current and future payments~~ and expenses incurred in connection with such default, neglect or failure. Said Change Order shall be deemed signed by the Contract for the purposes stated in Section 7.2.1 even if the Contractor fails to physically sign such Change Order. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, ~~the Contractor shall pay the difference to the Owner. If the Contractor disagrees with the actions of the Owner or the Architect, or the amounts claimed as costs to the Owner, the Contractor may file a Claim pursuant to Article 15.~~ at the Owner's option, the excess shall be deducted from any payment thereafter due or shall be paid by the Contractor immediately upon demand of the Owner. This right shall be in addition to and not in restriction or derogation of the Owner's rights under Article 14 hereof.

§ 2.6 ADDITIONAL RIGHTS

The rights stated in Article 2 shall be in addition and not in limitation of any other rights of the Owner granted in the Contract Documents or at law or in equity.

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 its 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~~ has inspected the local conditions under which the Work is to be performed, and has reviewed the Contract Documents, and correlated personal observations and inspections, and the bid, with all of the requirements of the Contract Documents.

§ 3.2.1.1 It shall be the duty of the Contractor to verify all dimensions given on the Drawings, and to report any error or inconsistency to the Architect before commencing Work.

§ 3.2.1.2 If the Contractor finds any details, construction procedures or materials shown on the Drawings or called for in the Specifications which the Contractor believes may not be satisfactory for the use shown, the Contractor shall so notify the Architect at least five (5) days before bids are due. Signing of the Agreement and starting the Work by the Contractor shall indicate the Contractor agreement with all details, construction procedures, and materials so shown and/or specified and shall indicate the Contractor's willingness to construct the Project in strict accordance with the Contract Documents and to guarantee the Project in full compliance with the warranty provisions of the Contract Documents. By executing this Agreement, the Contractor further acknowledges that it has satisfied itself as to the nature and location of the Work, the general and local conditions under which the Work is to be performed, including those bearing upon transportation, disposal, handling and storage of materials availability of labor, water, electric power, roads and uncertainties of weather, ground water table or similar physical conditions of the ground, the character, quality and quantity of surface and subsurface materials to be encountered, the character of equipment and facilities needed prior to and during the prosecution of the Work, and all other matters which can in any way affect the Work or the cost thereof . Any failure by the Contractor to become acquainted with all the available information concerning these conditions will not relieve the Contractor from any obligations with respect to the Contract Documents.

§ 3.2.1.3 If Work is required in a manner that makes it impossible to produce the quality required by the Contract Documents, or should discrepancies appear among the Contract Documents, the Contractor shall request in writing an interpretation from the Architect before proceeding with the Work. The Contractor shall perform the work at no additional cost to the Owner in accordance with the Architect's determination.

§ 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 2.3.4, 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~~ The Contractor shall promptly report to the Owner and the Architect any 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.~~Documents. The Contractor shall not be liable to the Owner or Architect for damage resulting from errors, inconsistencies, or omissions in the Contract Documents unless the Contractor recognized or should have recognized such error, inconsistency, or omission, and failed to report it to the Architect, in which case the Contractor shall not be entitled to an increase in the Contract Sum or Contract Time and the Contractor shall bear all attributable costs for correction. The Contractor agrees to release and hold harmless the Owner for errors, inconsistencies or omissions in the Contract Document which should have been discovered by the Contractor.

§ 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 any nonconformity discovered by or made known to the Contractor as a request for information in such form as the Architect may require.~~

§ 3.2.2.1 The exactness of grades, elevations, dimensions, existing conditions, or locations given on any drawings issued by the Architect or the work installed by other contractors, is not guaranteed by the Architect or Owner.

§ 3.2.2.2 The Contractor shall, therefore, satisfy himself as to the accuracy of all grades, elevations, existing conditions, dimensions and locations. In all cases of interconnection of the Contractor's work with existing or other work, the Contractor shall verify at the site all dimensions relating to such existing or other work. Any errors due to the Contractor's failure to so verify all such grades, elevations, existing conditions, locations or dimensions shall be promptly rectified by him without extra cost to the Owner.

§ 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,~~ 3.2.2, the Contractor shall submit 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, subject to Section 15.1.7, as would have been avoided if the Contractor had performed such obligations. If the Contractor performs ~~those obligations,~~ the obligations in Sections 3.2.2, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, ~~inconsistencies~~ inconsistencies, or omissions in the Contract ~~Documents,~~ Documents or 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.~~ unless the Contractor recognized or should have recognized the error, inconsistency, omission, or difference and failed to report it.

§ 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. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences, or procedures, the Contractor shall evaluate the jobsite safety thereof and shall be 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 notice to the Owner and Architect, and shall propose alternative means, methods, techniques, sequences, or procedures. The Architect shall evaluate the proposed alternative solely for conformance with the design intent for the completed construction. Unless the Architect objects to the Contractor's proposed alternative, the Contractor shall perform the Work using its alternative means, methods, techniques, sequences, or procedures. The Contractor shall review any construction or installation procedure (including those recommended by any product manufacturer). The Contractor shall provide written notice to the Architect:

(a) If a specified product deviates from good construction practices.
(b) If following the Specifications will affect any warranties.
(c) Any objections which the Contractor may have to the Specifications.

The responsibilities imposed on the Contractor by this Section shall be in addition to, and not be limited by, any and all other provisions of these Contract Documents.

§ 3.3.2 The Contractor shall engage workmen who are skilled in performing the Work and all Work shall be performed with care and skill and in a good workmanlike manner under the full-time supervision of the approved superintendent described in Section 3.9.3. The Contractor shall be liable for all property damage including repairs or replacement of the Work and economic losses which proximately result from the breach of this duty. The Contractor shall be responsible to the Owner for the acts and omissions of the Contractor's employees, Subcontractors and their agents and employees, and any other persons or entities performing portions of the Work for, or on behalf of, the Contractor or any of its ~~Subcontractors.~~
Subcontractors or claiming by, through or under the Contractor, and for any damages, losses, costs, and expenses resulting from such acts or omissions.

§ 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.

§ 3.3.4 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 of or performed by persons other than the Contractor.

§ 3.3.5 The Contractor shall coordinate all portions of the work with separate Owner-employed contractors, if any.

§ 3.3.6 The Contractor shall assign a competent, technically-trained office project manager to the Project who shall perform all office functions including checking, approving and coordinating shop drawings and approving purchasing and disbursement pay-out requests and correspondence, and responding to Owner inquiries.

§ 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 approved by the Architect in accordance with Section 3.12.8 or ordered by the Architect in accordance with Section 7.4, the Contractor may make substitutions only with the written consent of the Owner, after evaluation by the Architect and in accordance with a Change Order or Construction Change Directive. By making requests for substitutions hereunder, the Contractor:

.1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;

.2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;

.3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and

.4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects.

§ 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. The Contractor shall be responsible for any damages to property or injuries to persons, or to any other harm, caused by the Contractor's employees.

§ 3.4.4 After the Agreement has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in Section 7.5.

§ 3.5 Warranty

§ 3.5.1 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, except for those inherent in the quality of the Work the Contract Documents require or permit. 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.~~ new, unless otherwise required or permitted by the Contract Documents and that the Work will be free from faults and defects and in conformance with the Contract Documents. The warranty will not be affected by the specification of any product or procedure, unless the Contractor objects promptly to such product or procedure and advises the Architect of possible substitute products or procedures which will not affect the warranty. This warranty shall not be restricted by the limitations of any manufacturer's warranty. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective in the Owner's sole discretion. Inability or refusal of the Subcontractor or supplier responsible for the defective work to correct such work shall not excuse the Contractor from performing under the warranty. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

§ 3.5.2 Unless an alternative guaranty is specified in a particular division of the Specifications that is longer in duration than one (1) year, the Work shall be guaranteed by the Contractor against defect in material and workmanship for a period of one (1) year from the date of final completion (date of issuance of final payment to the contractor).

§ 3.5.2 All material, equipment, or other special warranties required by the Contract Documents shall be issued in the name of the Owner, or shall be transferable to the Owner, and shall commence in accordance with Section 9.8.4.

~~**§ 3.6 Taxes**~~

~~The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, 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 for the building permit as well as for other permits, fees, licenses, and inspections by government agencies.~~ The Contractor shall secure all permits, licenses and inspections necessary for proper execution and completion of the Work ~~that~~ which are customarily secured after execution of the Contract and ~~legally required at the time bids are received or negotiations concluded.~~ which are legally required when bids are received.

§ 3.7.1.1 All cash deposits, bonds, fees, inspections, licenses, or permit fees shall be paid for by the Contractor.

§ 3.7.1.2 Prior to submission of all applications for permits, licenses or inspections the Contractor shall submit a copy of the application or written notice to the Owner for approval.

§ 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 observes or believes that portions of the Contract Documents are at variance with applicable laws, statutes, ordinances, building codes, and rules and regulations, the Contractor shall promptly notify the Architect and Owner in writing for clarification by the Architect. If the Contractor performs Work knowing it to be contrary to any 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~~ cost, damages, losses and expenses 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 14 days after first observance of the conditions.~~ disturbed.. 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 that an equitable adjustment be made 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, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may submit a Claim as provided in Article 15. The site conditions contemplated by this Section include, but are not limited to, materials containing asbestos, polychlorinated biphenyl (PCB), or hazardous materials as defined in the Contract Documents.

§ 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~~ competent, English speaking superintendent and necessary assistants who shall be in attendance at the 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. Important communications by the superintendent shall be confirmed in writing. Other communications by the superintendent shall be similarly confirmed on written request in each case. Failure of the superintendent to supervise the job properly shall be deemed as a default by the Contractor under the Contract Documents as determined by the Owner with the advice of the Architect.

~~**§ 3.9.2** The Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect of the name and qualifications of a proposed superintendent. Within 14 days of receipt of the information, the Architect may notify the Contractor, stating whether the Owner or the Architect (1) has reasonable objection to the proposed superintendent or (2) requires additional time for review. Failure of the Architect to provide notice 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 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.~~and Architect's written consent..

§ 3.9.4 The Contractor's superintendent must be dedicated solely to the Project and must be at the Project site each day and at all times that Work is being performed at the site, whether the Work is performed by the Contractor's own forces or by any subcontractors. The superintendent must be at the Project site from the first day of on-site activities until a minimum of fourteen (14) days after the date of Substantial Completion. Failure by the Contractor to provide full-time on-site supervision shall constitute grounds for termination of the Contract Documents by the Owner with seven days written notice.

§ 3.10 Contractor's Construction and Submittal Schedules

§ 3.10.1 The Contractor, promptly after being awarded the ~~Contract, shall~~ Project, shall prepare and submit for the Owner's and Architect's ~~information a Contractor's construction schedule for the Work. The schedule shall contain detail appropriate for the Project, including (1) the date of commencement of the Work, interim schedule milestone dates, and the date of Substantial Completion; (2) an apportionment of the Work by construction activity; and (3) the time required for completion of each portion of the Work. The schedule shall provide for the orderly progression of the Work to completion and shall not exceed time limits current under the Contract Documents. The schedule shall be revised~~ review its Construction Schedule for the Work of the Contractor. Such Construction Schedule shall not exceed the completion dates, delivery dates or time limits required in the Contract Documents. The Construction Schedule

shall be revised by the Contractor at appropriate intervals as required by the conditions of the Work ~~and Project.~~and Project, and shall provide for expeditious execution of the Work.

§ 3.10.2 The ~~Contractor, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, shall submit a submittal schedule for the Architect's approval. The Architect's approval shall not be unreasonably 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, or fails to provide submittals in accordance with the approved 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.~~Contractor shall prepare and keep current, for the Architect's record only, a schedule of submittals (the "Submittal Schedule") which is coordinated with the Contractor's Construction Schedule and allows the Architect reasonable time, as indicated in the Contract Documents, to review submittals. Neither the Contractor's preparation of the Submittal Schedule nor the Architect's receipt or review shall modify the Contractor's responsibility to make required submittals or to do so in a timely manner to provide for review in accordance with Section 4.2.7 as modified herein.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect. The Owner's or Architect's failure to object to a submitted schedule that exceeds time limits current under the Contract Documents shall not relieve the Contractor of its obligations to meet those limits, nor shall it make the Owner or Architect liable for any of the Contractor's damages incurred as a result of increased construction time or not meeting those time limits. Similarly, the Architect's or Owner's failure to object to a Contractor's schedule showing performance in advance of such time limits shall not create or infer any rights in favor of the Contractor for performance in advance of such time limits.

§ 3.10.4 At the time of each Application for Payment, the Contractor shall provide to the Owner and the Architect an update on the Project schedule and a written status report, which includes a description of the progress of the Work and if progress is behind schedule, the Contractor's plan to recover the Work to meet the approved Construction Schedule. The report shall also include a summary of the Contractor's meetings with subcontractors.

§ 3.10.5 The Contractor shall hold meetings at least weekly (or at such intervals as are otherwise acceptable to the Owner and Architect) at the site. The Contractor shall provide the subcontractors, Architect and the Owner with a meeting schedule. The Contractor shall require subcontractors currently working at the site(s) to have a representative present for such meetings.

§ 3.10.6 Within twenty-one (21) days of the award of the Project, the Contractor shall provide a written report to the Architect and the Owner that includes a list of the Contractor's suppliers, a list of materials and equipment to be purchased from suppliers and fabricators, the time required for fabrication, and the scheduled delivery dates for materials and equipment. Copies of the Contractor's purchase orders shall be delivered to the Architect and the Owner as soon as possible after receipt by the Contractor.

§ 3.11 Documents and Samples at the Site

The Contractor shall ~~make available, at the Project site, the Contract Documents, including Change Orders, Construction Change Directives,~~ 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 ~~the approved Shop Drawings, Product Data, Samples, and similar required submittals. These shall be in electronic form or paper copy, available to the Architect and Owner, and~~ one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These, along with all operating manuals for all equipment, shall be available to the Architect at all times and delivered to the Architect for submittal to the Owner ~~upon completion of the Work as a record of the Work as constructed.~~after completion of the Work but before the final Application for Payment.

§ 3.11.1 The Contractor shall maintain at the site(s) one set of record drawings for the Owner and Architect of the as built plans and specifications for concealed work, particularly concealed piping and conduit. Any deviations from conditions shown on the Contract Drawings shall be shown and dimensioned on these record drawings. The Contractor shall develop layout drawings for concealed work that is schematically indicated on Contract Drawings in

order to have dimensioned layouts of such concealed work. This requirement does not authorize any deviations without approval of the Architect.

§ 3.11.1.1 The field information in the record drawings to be so marked shall include at a minimum:

(1) Significant deviations of any nature made during construction;

(2) Location of underground mechanical and electrical services, utilities, and appurtenances, referenced to permanent surface improvements.

(3) Location of mechanical and electrical services, utilities, and appurtenances that are concealed in the building, referenced to accessible features of the building.

§ 3.11.2 The Contractor and their Subcontractors shall maintain at the site(s) an accurate record of deviations and changes from the Contract Documents which occur in the work; shall indicate all such deviations and changes on reproducible transparencies of the Contract Documents; and shall turn over to the Architect upon completion of the work all such documents and information, such as final shop drawings and sketches, marked prints and similar data indicating the as-built conditions. Plumbing, HVAC and Electrical Contractors shall record all changes or deviations in their work from what appears on the Contract Documents. The electronic AutoCAD base plan backgrounds shall be furnished by the Architect. The cost of recording and transferring the changes or deviations to the transparencies shall be included in the contract price for the respective work. The as-built transparencies shall be delivered by the Contractor to the Architect prior to the final acceptance of the Project and issuance of final payment.

§ 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 how 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 the requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals, unless the Contractor has specifically notified the Architect 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 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.

~~**§ 3.12.10.1** 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 be entitled to rely upon the adequacy and accuracy of the performance and design criteria provided in the Contract Documents. The Contractor shall cause such services or certifications to be provided by an appropriately 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 and accuracy of the services, certifications, and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor the performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review and 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.~~

§ 3.12.10.1. When professional certification or performance criteria of materials, systems or equipment is required by the Contract Documents, the Contractor shall provide the person or party providing the certification with full information of the relevant performance requirements and on the conditions under which the materials, systems, or equipment will be expected to operate at the Project site. The certification shall be based on performance under the operating conditions at the Project site. The Architect shall be entitled to rely on the accuracy and completeness of such certifications.

§ 3.12.10.2 ~~If~~ When the Contract Documents require the Contractor's design professional to certify that the Work has been performed in accordance with the design criteria, the Contractor shall furnish such certifications to the Architect at the time and in the form specified by the Architect.

§ 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, lawful orders of public authorities, and the Contract Documents and shall not unreasonably encumber the site with materials or equipment.

§ 3.13.1 Only material and equipment which is to be used directly in the construction of this Project shall be brought to and stored on the job site by the Contractor. After equipment is no longer needed on this Project, it shall be promptly removed from the job site. Protection of all construction materials and equipment stored at the Job Site is the sole responsibility of the Contractor.

§ 3.13.2 The Contractor and its Subcontractors, and their respective employees, agents, and consultants, shall not enter any part or portion of the building work sites when students are present without the Owner's written authorization.

§ 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, or patching shall be restored to the condition existing prior to the cutting, fitting, or 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 construction by the Owner or a Separate Contractor except with prior written consent of the Owner and of the Separate ~~Contractor. Consent~~ Contractor such consent shall not be unreasonably withheld. The ~~Contractor shall not unreasonably withhold, from the Owner or a Separate Contractor, its consent to cutting or otherwise altering the Work.~~ Contractor's consent shall not be required.

§ 3.14.3 Only tradespersons skilled and experienced in cutting and patching shall perform such work.

§ 3.15 Cleaning Up

§ 3.15.1 The Contractor shall keep the premises and surrounding area free from accumulation of waste materials and 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. The Contractor shall remove and clean up hazardous materials in accordance with these General Conditions.

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

§ 3.15.3 All exterior and interior Work shall be cleaned using specific materials as recommended for surfaces to be cleaned. Damage to any surfaces due to improper cleaning methods of materials shall be repaired to the satisfaction of the Architect and Owner, by the Contractor, at no cost to the Owner.

§ 3.16 Access to Work

The Contractor shall provide the Owner and Architect with 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 and Architect harmless from loss on account thereof, including, but not limited to, attorney's fees, but shall not be responsible for 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.~~ Architect, except to the extent of Contractor's fault. However, if an infringement of a copyright or patent is discovered by, or made known to, the Contractor, the Contractor shall be responsible for the loss unless the information is promptly furnished to the Architect.

§ 3.18 Indemnification

§ 3.18.1 To the fullest extent permitted by law, the Contractor ~~shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses,~~ waives any right of contribution against and shall defend, indemnify and hold harmless Owner, any Owner's Representative, the Architect and each of their officers, directors, board members, officials, agents, consultants and employees from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from or in connection with the 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 negligent acts or omissions of the Contractor,~~

~~a~~ any such claim, damage, loss or expense (these are collectively referred to as "claims") is caused by or alleged to be caused by an act or omission of Contractor, any 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~~ any of them or anyone for whose acts any of them may be liable in the performance of the Agreement, regardless of whether or not it 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~~ otherwise reduce any other right or obligation of indemnity or contribution which would otherwise exist as to any party or person described in this ~~Section 3.18.~~ Contract. The obligations of the Contractor under this Section 3.18.1 shall be construed to include, but not be limited to, injury or damage consequent upon failure to use or misuse by the Contractor, his agents, Sub-Contractors, and employees of any scaffold, hoist, crane, stay, ladder, support, or other mechanical contrivance erected or constructed by any person, or any or all other kinds of equipment, whether or not owned or furnished by the Owner.

§ 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.~~ The Contractor shall, and hereby covenants and agrees to indemnify, defend, save and hold harmless the following indemnitees: The Owner, its Architects, Board Members, Officers, Agents, and Employees, individually and collectively, from all claims, demands, actions and the like, of every nature and description, made or instituted, by Third Parties, arising or alleged to arise out of the work under this contract, as a result of any act or omission of either the Contractor or any Subcontractor, or any of their employees or agents. Contractor and Subcontractor shall name the Owner, its Architects, Board Members, Officers, Agents and Employees, individually and collectively, as additional insured as primary coverage without limitation on their general liability policies. Contractor and Subcontractor/s shall furnish Owner with copies of such policies prior to beginning any work.

§ 3.18.3 "Claims, damages, loses and expenses" as these words are used in this Contract shall be construed to include, but not be limited to (1) injury or damage consequent upon the failure of or use or misuse by Contractor, its Subcontractors, agents, servants or employees, of any hoist, rigging, blocking, scaffolding, or any and all other kinds of items of equipment, whether or not the same be owned, furnished or loaned by Owner; (2) all attorneys' fees and costs incurred in defense of the claim or in bringing an action to enforce the provision of this Indemnity or any other indemnity contained in the Contract Documents; and (3) all costs, expenses, lost time, opportunity costs, etc. incurred by the party being indemnified or its employees, agents or consultants.

§ 3.18.4 In the event that any party is requested but refuses to honor the indemnity obligations hereunder, then the party indemnifying shall, in addition to all other obligations, pay the cost of bringing any such action, including attorneys' fees, time expended by the party being indemnified and their employees in the defense of any litigation covered by this indemnity provision at their usual rates plus cost of travel, long distance telephone calls and reproduction of documents to the party requesting indemnity.

§ 3.18.5 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. The Contractor hereby knowingly and intentionally waives the right to assert that Contractor's liability may be limited to the amount of its statutory liability under the Workers' Compensation Act, and agrees that Contractor's liability to indemnify and defend the Owner and Architect is not so limited. The Contractor shall include this provision in each of its Subcontract agreements and shall require its Subcontractors to be so bound.

§ 3.18.6 Contractor shall include in each and every contract with any and all subcontractors and/or material suppliers performing Work and require each and every subcontractor and/or material supplier performing Work to agree to be bound by all of the provisions 3.18.1 through 3.18.9 under the Contract Documents.

§ 3.18.7 Contractor's indemnity obligations hereunder shall, but not by way of limitation, specifically include all claims and judgments which may be made against the indemnitees under federal or state law or the law of the other

governmental bodies having jurisdiction, and further, against claims and judgments arising from violation of public ordinances and requirements of governing authorities due to Contractor's or Contractor's employees method of execution of the Work.

§ 3.18.9 The Contractor shall indemnify and hold harmless the Owner in the event of labor or trade union conflicts or disputes between the Contractor and subcontractors and their respective employees. The Contractor shall endeavor to adjust and resolve such conflicts and disputes which affect the timely completion of the Work. Such conflicts or disputes shall not be a basis or excuse for the violation of the Contract Documents by the Contractor or its subcontractors, and shall not provide the Contractor with relief from meeting all time limits for Substantial Completion or Final Completion. Labor or trade union disputes that effect production or delivery of materials or equipment, or their installation, shall be at no cost to the Owner. The Contractor shall notify the Architect and the Owner in writing as soon as possible as to any labor or trade disputes which may affect the Work and its timely completion. In such event, the Contractor shall provide a written proposal to the Architect and the Owner which includes any comparable substitution(s) necessary to complete the Work.

§ 3.18.10 None of the foregoing provisions shall deprive the Owner or the Architect of any action, right or remedy otherwise available to them or either of them at law.

§ 3.19 If the work is to be performed by trade unions, the Contractor shall make all necessary arrangements to reconcile, without delay, damage, or cost to the Owner, the Architect or the Owner, any conflict between the Contract Documents and any agreements or regulations of any kind at any time in force among members or councils which regulate or distinguish what activities shall not be included in the work of any particular trade. In case the progress of the work is affected by any undue delay in furnishing or installing any items or materials or equipment required under the Contract Documents because of the conflict involving any such agreement or regulation, the Architect may require that other material or equipment of equal kind and quality be provided at no additional cost to the Owner.

ARTICLE 4 ARCHITECT

§ 4.1 General

§ 4.1.1 The Architect is the person or entity retained by the Owner pursuant to Section 2.3.2 and identified as such in the Agreement.

§ 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, ~~Contractor,~~ and Architect. Consent shall not be unreasonably withheld.

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

§ 4.1.4 The Architect's and its consultants' services will terminate sixty (60) days after (1) the date of Substantial Completion of the Work or (2) the anticipated date of Substantial Completion identified in the Contract Documents, whichever is earlier. Any services required of the Architect and its consultants after this date will be back-charged to the Contractor by the Owner.

§ 4.2 Administration of the Contract

§ 4.2.1 The Architect 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,~~ as agreed to by Owner and Architect 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~~ Work to endeavor to determine that the Work, when completed, will be in accordance with the Contract ~~Documents.~~ Documents, and to endeavor to guard the Owner against defects and deficiencies in the Work. 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.

§ 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 promptly report to the Owner (1) known deviations from the Contract Documents, (2) known deviations from the most recent construction schedule submitted by the Contractor, and (3) 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

The Owner and Contractor shall include the Architect in all communications that relate to or affect the Architect's services or professional responsibilities. The Owner shall promptly notify the Architect of the substance of any direct communications between the Owner and the Contractor otherwise relating to the Project. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and suppliers shall be through the Contractor. Communications by and with Separate Contractors shall be through the Owner. The Contract Documents may specify other communication protocols. However, this Section shall not be deemed to prohibit direct communication between the Owner and the Architect.

§ 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. The Contractor shall provide to the Architect (1) mechanics lien waivers, (2) certified payroll statements and documentation as may be requested and (3) sworn statements listing subcontractors and materialmen before issuing Payment Certificates, and if such sworn statement or waivers are not provided, the Architect's Certificates shall be conditioned upon and subject to the receipt of such waivers.

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Any Work rejected by the Architect shall be reported promptly to the Owner in writing 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 13.4.2 and 13.4.3, whether or not the 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, 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 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. The Contractor shall give submittals to the Architect in a manner to allow for the Architect's reasonable prompt review and to allow for timely ordering of components of the Work to affect no delay in the Work.

§ 4.2.8 The Architect will prepare Change Orders and Construction Change Directives, and may order 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~~ Section 9.10; however, the issuance of such final Certificate of Payment shall not bind the Owner to any payment unless it accepts such final Certificate for Payment. The Owner's acceptance shall not be unreasonably withheld. Additionally, the Architect shall review all warranties and related documents and provide a recommendation to the Owner as to whether the warranties comply with the Contract Documents.

§ 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 Owner shall notify the Contractor of any change in the duties, responsibilities and limitations of authority of the Project representatives.

§ 4.2.11 The Architect will initially 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. If the Contractor submits such written request to the Architect, the Contractor will simultaneously provide a copy of such request to the Owner. The Architect will consult with the Owner regarding any request by the Contractor before responding to the Contractor.

§ 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. The Architect will provide the Owner with a copy of any response provided pursuant to this Section.

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 the 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, the Contractor, as soon as practicable after award of the Contract, shall notify the Owner and Architect~~ Prior to executing the Contract, the Contractor shall furnish in writing to notify the Owner through the Architect the names of the persons or entities proposed for each principal portion of the Work, including those who are to furnish materials or equipment fabricated to a special design. Within 14 days of receipt of the information, the Architect may notify the Contractor whether the Owner or the Architect (1) has reasonable objection to any such proposed person or entity or (2) requires additional time for review. ~~Failure of the Architect to provide notice within the 14-day period shall constitute notice of no reasonable objection.~~

§ 5.2.1.1 In addition to the information which may be required prior to the award of the Project, not later than twenty-one (21) days after Notice of Award of the Project, the Contractor shall furnish to the Owner through the

Architect the names of persons or entities proposed as manufacturers for each of the products identified in the General Requirements and, where applicable, the name of the installing Subcontractor.

§ 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~~ an objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection. All contracts between the Contractor and subcontractors shall be made in writing, shall be assignable to the Owner, and shall contain the following sentence, 'The Owner is an intended third-party beneficiary of this Subcontract.'

§ 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.~~objection No additional costs shall be allowed for a change required due to an objection by the Owner, Contractor, or Architect

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person, or entity for one previously selected ~~if the Owner or Architect makes reasonable objection to such substitution.~~without written approval of the Owner. The Contractor further acknowledges and agrees that after award of the Project to the Contractor, any savings on changes to contracts with subcontractors or substitute subcontractors will be for the benefit of the Owner and will not be used for the benefit of the Contractor or to increase the Contractor's profit on the Project. The foregoing benefit to the Owner shall include any adjustment in the amount of the price of a contract to less than the quoted price of the subcontractor upon which the Contractor's fixed bid price or Contract Sum was based. Further, if a manufacturer or supplier of any machinery or equipment, including, but not limited to, heating and air conditioning units or systems, changes specifications or offers incentives, discounts or lower prices after award of the Contract to the Contractor, those savings will inure to the benefit of the Owner and not the Contractor, subcontractor, manufacturer or supplier.

§ 5.3 Subcontractual Relations

By appropriate written agreement, 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 that the Contractor, by these Contract 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.

§ 5.3.1 The Contractor shall be responsible for any and all Subcontractors working under him and shall carry insurance for all Subcontractors or ensure that they are carrying it for themselves so as to relieve the Owner, Architect and Architect's Consultants of any and all liability.

§ 5.3.2 The Owner and Architect assume no responsibility for overlapping or omission of parts of the Work by various Subcontractors in their Contracts with the Contractor.

§ 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; 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 shall be equitably adjusted for increases in cost resulting from the suspension.~~Intentionally Deleted.

§ 5.4.3 Upon 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 term "Separate Contractor(s)" shall mean other contractors retained by the Owner under separate agreements. The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and with Separate Contractors retained under Conditions of the Contract substantially similar to those of this Contract, including those provisions of the Conditions of the Contract related to insurance and waiver of ~~subrogation.~~
subrogation, without altering the Owner's Agreement with the Contractor.

§ 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 any Separate Contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to its 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 or with Separate Contractors, the Owner or its Separate Contractors shall have the same obligations and rights that the Contractor has 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 notify the Architect of apparent discrepancies or defects in the construction or operations by the Owner or Separate Contractor that would render it unsuitable for proper execution and results of the Contractor's Work. Failure of the Contractor to notify the Architect of apparent discrepancies or defects prior to proceeding with the Work 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. The Contractor shall not be responsible for discrepancies or defects in the construction or operations by the Owner or Separate Contractor that are not apparent.

§ 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 that the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or Separate Contractor 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 under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible.

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.

§ 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. The Contractor shall proceed promptly with changes in the Work, unless otherwise provided in the Change Order, Construction Change Directive, or order for a minor change in the Work.

§ 7.1.4 For any changes in the Work requested by the Contractor involving more than a three (3) calendar day extension of time, the Contractor shall submit critical path schedule showing the original schedule and impact of the proposed change justifying the requested extension of time. The Owner may at its option refuse the extension of time and have the Contractor perform the Work within the original schedule provided all reasonable costs for completing the Work including overtime and acceleration costs are included in the Change Order.

§ 7.1.5 If a proposal for additional work is requested by the Owner from the Contractor which involves additional time, at the Owner's option, the Owner may extend the completion date for that portion of the Work included in the change, without extending the Contract Time for the remainder of the Work.

§ 7.1.6 Changes which involve credits to the Contract Sum shall include overhead, profit, general conditions, and bond and insurance costs.

§ 7.1.7 For any adjustments to the Contract Sum based on other than the unit price method, overhead, profit, and General Conditions combined shall be calculated at the following percentages of the cost attributable to the change in the Work:

.1 For the Contractor for Work performed by the Contractor's own forces, ten percent of the Cost .

.2 For the Contractor, for Work performed by the Contractor's Subcontractors five percent of the amount due the Subcontractor.

.3 For each Subcontractor or Sub-subcontractor involved, for Work performed by that Subcontractor's or Sub-subcontractor's own forces, ten percent of the Cost.

.4 For each Subcontractor, for Work performed by the Subcontractor's Sub-subcontractors, five percent of the amount due the Sub-subcontractor.

.5 Costs to which overhead, profit, and general conditions is to be applied shall be determined in accordance with Sub-Sections 7.3.7.1 through 7.3.7.5.

.6 When both additions and credits are involved in any one change, the allowance for overhead and profit shall be figured on the basis of the net increase, if any;

§ 7.1.8 In order to facilitate checking of quotations for extras or credits, all proposals shall be accompanied by:

.1 A complete itemization of costs including labor, material.

.2 Subcontractor's, Sub-subcontractor's and material suppliers for their portions of the work itemized to include labor, material.

.3 Labor costs shall be indicated hourly wage and fringe benefits. Labor hours shall be provided for each phase of the work.

.4 Material costs shall include unit costs and units required where applicable.

§ 7.1.9 The Contractor understands that Change Orders to the Contract which increase or decrease the Cost by $10,000 or more, or the time of completion by 30 days or more, will require written documentation by the Owner that the changes:

.1 were not reasonably foreseeable at the time the Contract was signed;

.2 were not within the contemplation of the Contract as signed; and

.3 are in the best interest of the Owner or region and authorized by law.

§ 7.1.10 The Contractor shall provide written notice to the Architect and the Owner if overtime labor rates are included in the computation of the cost of a proposed Change Order or Construction Change Directive.

§ 7.1.11 In the event that the Contractor and the Owner do not reach agreement on a Change Order or a Construction Change Directive, the Owner may, in its discretion, delete the labor, materials and equipment that are the subject of the Change Order or the Construction Change Directive from the Work to be performed under the Contract Documents. The Owner shall receive credit from the Contractor for the labor, materials, and equipment, including Contractor overhead and profit attributable to the deleted work. The Owner may complete the deleted work through another contractor or subcontractor.

§ 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 7.3.4.

§ 7.3.4 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine 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 7.3.4 shall be limited to the following:

.1 ~~Costs~~ Actual costs of labor, including applicable payroll taxes, fringe benefits required by agreement or custom, workers' compensation insurance, and other employee costs approved by the Architect;

.2 ~~Costs~~ Actual costs of materials, supplies, and equipment, including cost of transportation, whether incorporated or consumed;

.3 ~~Rental~~ Actual rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 ~~Costs~~ Actual costs of premiums for all bonds and insurance, permit fees, and sales, use, or similar taxes, directly related to the change; and

.5 ~~Costs~~ Actual costs of supervision and field office personnel directly attributable to the change. Cost of supervision, unless directly attributable to change, will not be allowable as an itemized cost for any additions (or credited for deletions) unless a change in the Contract Time is made.

Overtime when specifically authorized by the Owner shall be paid for by the Owner on the basis of a premium payment only, plus the cost of insurance and taxes based on the premium payment. Overhead and profit will not be paid by the Owner for overtime. Field tickets must be signed by the Owner or Architect for verification of overtime hours.

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§ 7.3.5 If the Contractor disagrees with the adjustment in the Contract Time, the Contractor may make a Claim in accordance with applicable provisions of Article 15.

§ 7.3.6 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.

§ 7.3.7 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.~~ Upon resolution of exact scope, Contract Sum change, and Contract Time change, a Change Order shall be prepared incorporating the Construction Change Directive.

§ 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 computed in accordance with Section 7.3.4 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,~~ increase or decrease, if any, with respect to that change. Also, if the amount of either the credit or the addition is in dispute, the amount of the other, non-disputed item may not be included in Applications for Payment. Overhead and profit will be included in credits to the same extent they are included in additive Change Orders.

§ 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.

§ 7.3.11 Change Orders that result in a net decrease in or credit to the Contract Sum must include a credit to the Owner for the Contractor's overhead and profit as described in Section 7.1.7.

§ 7.4 Minor Changes in the Work

The Architect may order minor changes in the Work that are consistent with the intent of the Contract Documents and do not involve an adjustment in the Contract Sum or an extension of the Contract Time. The Architect's order for minor changes shall be in writing. If the Contractor believes that the proposed minor change in the Work will affect the Contract Sum or Contract Time, the Contractor shall promptly notify the Architect and shall not proceed to implement the change in the Work. If the Contractor performs the Work set forth in the Architect's order for a minor change without prior notice to the Architect that such change will affect the Contract Sum or Contract Time, the Contractor waives any adjustment to the Contract Sum or extension of the Contract Time.

§ 7.5 SUBSTITUTIONS

After the award of the Project, a request by the Contractor for a substitution of materials or equipment in place of those specified in the Contract Documents will be considered only under one or more of the following conditions:

(a) Required for compliance with interpretation of code requirements or insurance regulations then existing.
(b) Unavailability of specified products, through no fault of the Contractor.
(c) Subsequent information discloses inability of specified products to perform properly or to fit in designated space.
(d) Manufacturer/fabricator refuses to certify or guarantee performance of specified product as required.
(e) When it is clearly seen, in the judgment of the Architect and with the Owner's approval, that a substitution would be substantially to the Owner's best interests, in terms of cost, time, or other considerations.

Substitution requests shall be written, timely, and accompanied by adequate technical and cost data. Requests shall include a complete description of the proposed substitution, name of the material or equipment for which it is to be substituted, drawings, cuts, performance and test data, and any other data or information necessary for a complete evaluation by the Architect.

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.~~working day, excluding weekends and legal holidays.

§ 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, commence the Work prior to the effective date of insurance required to be furnished by the Contractor and Owner.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time. The Contractor shall bear all additional costs incurred to meet the Contract Time, which may require working overtime without additional compensation.

§ 8.2.4 The Contractor shall reimburse the Owner for all fees or expenses, including without limitation, the Architect, engineers and legal expenses, for additional services necessitated by Contractor's failure to obtain Substantial Completion within the time established in the agreement, for more than two (2) inspections for Substantial Completion, or final inspection.

§ 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 (1) an act or neglect of the Owner or Architect, of an employee of either, or of a Separate Contractor; (2) by changes ordered in the Work; (3) by labor disputes, fire, unusual delay in deliveries, unavoidable casualties, adverse weather conditions documented in accordance with Section 15.1.6.2, or other causes beyond the Contractor's control; (4) by delay authorized by the Owner ~~pending mediation and binding dispute resolution;~~ or by other causes which the Architect and Owner determine, in their sole discretion, or (5) by other causes that the Contractor asserts, and the Owner Architect determines, justify delay, then the Contract Time shall be extended for such reasonable time as the Architect and Owner may determine.

§ 8.3.2 ~~Claims relating to time shall be made in accordance with applicable provisions of Article 15.~~The Contractor shall not be entitled to recover from the Owner, and hereby waives all rights that it or its Subcontractors or any other person may otherwise have to recovery, any costs, expenses and damages of any nature that it or its Subcontractors or any other person may suffer by reason of delay in the performance of the Work or any portion thereof, the extension of Contract Time granted herein being the Contractor's sole and exclusive remedy.

§ 8.3.3 ~~This Section 8.3~~ The Contractor shall not be entitled to any increase in the Contract Sum as a result of any delays in the progress of the Work. The Contractor's sole remedy for delay shall be an extension of time. This Section 8.3 does not preclude recovery of damages ~~for~~ or delay by ~~either party~~ the Owner under other provisions of the Contract Documents.

§ 8.3.4 Notwithstanding other provisions in this Contract, Contractor shall not be entitled to any recovery of damages arising out of any event or delay caused within Contractor's control and/or for "Acts of God", including without limitation adverse weather conditions (which shall include typical rain events that can be reasonably predicted through historical data) which prevents such early completion of the Work.

§ 8.3.5 Where a delay occurs that is beyond the Contractor's control and when the delay is not reasonably unacceptable, the Contractor has an affirmative duty to mitigate the effect of that delay on the progress of the Work. An extension of the Substantial Completion date will not be granted to the extent that the Contractor breaches said duty to mitigate.

ARTICLE 9 PAYMENTS AND COMPLETION

§ 9.1 Contract Sum

§ 9.1.1 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.

§ 9.1.2 If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are materially changed so that application of such unit prices to the actual quantities causes substantial inequity to the Owner or Contractor, the applicable unit prices shall be equitably adjusted.

§ 9.2 Schedule of Values

~~Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit a schedule of values to the Architect before the first Application for Payment, allocating the entire Contract Sum to the~~ At the pre-construction meeting, the Contractor shall submit to the Owner and the Architect a detailed schedule of values allocated various portions of the Work. The schedule of values shall be prepared in the form, and supported by the data to substantiate its accuracy, required by the Architect. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment. Any changes to the schedule of values shall be submitted to the Architect and supported by such data to substantiate its accuracy as the Architect may require, and unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's subsequent Applications for Payment.

§ 9.3 Applications for Payment

§ 9.3.1 At least ~~ten days~~ twenty (20) days before the Owner's submission date for the School Board's review and approval of such payment at the next School Board meeting or, if the Owner's School Board approves otherwise, before the date established for each progress payment, 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. The application shall be notarized, if required, and supported by all data substantiating the Contractor's right to payment that the Owner or Architect require, such as copies of requisitions, and releases and waivers of liens from Subcontractors and suppliers, and shall reflect retainage if provided for in the Contract Documents. The form of Application for Payment shall be a notarized AIA Document G702, Application and Certification for Payment, supported by AIA Document G703, Continuation Sheet.

§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 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 supplier, unless such Work has been performed by others whom the Contractor intends to pay. However, this Section will not apply to routine retainage the Contractor intends to withhold from the Subcontractor pursuant to the Subcontract.

§ 9.3.1.3 No interest will be paid upon retainage.

§ 9.3.1.4 Contractor shall submit all payment requests to the Architect for all work completed during the previous time period. Requests submitted late will not be processed until the following month. Contractor shall include the Contractor's waiver of lien for the full amount and partial subcontractor waivers of lien in the amounts of the previous payment request.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage, and transportation to the site, for such materials and equipment stored off the site. The Contractor shall submit requisitions from suppliers and Subcontractors to substantiate the amounts requested on the Application for Payment for materials or equipment stored on or off site. The Owner shall have no responsibility or liability to the Contractor for the safekeeping of materials and equipment stored at the site or off the site.

§ 9.3.3 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, suppliers, or other persons or entities that provided labor, materials, and equipment relating to the Work.

§ 9.3.4 The Contractor shall submit his application for payment as outlined in Section 9.3 on the first of the month, and the Owner will make payment accordingly promptly after receipt of the Architect's Certificate. Each partial payment request shall be made monthly and Contractor shall request payment of ninety percent (90%) of the portion of the Contract Sum properly allocable to labor, materials and equipment incorporated in the work less the aggregate of previous payments in each case. The Owner reserves the right to reduce retainage prior to substantial completion. Retainage shall not be reduced below 5% until all closeout documents as required in the Instruments of Service have been received and reviewed by the Architect.

§ 9.3.5 Before each certificate for payment is issued, the Contractor shall furnish to the Architect a complete statement of the amounts due to Subcontractors, parties supplying material, and for his own materials and labor, on AIA Document G702 and G702A "Application and Certificate for Payment."

§ 9.3.6 A Sworn "Contractor's Affidavit" shall be submitted with each payment request in sufficient form for the Owner to determine Contractor's right to payment. Each payment request shall include executed waivers of lien in conformity with information set forth on a properly completed Contractor's Affidavit. In the event that the Owner is satisfied with Contractor's payment procedures, the Owner may accept partial waivers of lien of Subcontractors and suppliers who were included in the immediate preceding payment. The Contractor shall submit waivers on a current basis, but the Owner may allow Subcontractors and suppliers to be not more than one payment late with their partial waivers.

§ 9.3.7 Upon giving ten (10) days' notice in writing to the Contractor, the full contract retainage may be reinstated, and the retention restored to the basis established in Section 9.3.4 if the manner of completion of the work and its progress do not remain satisfactory to the Owner, or if any surety of Contractor withholds its consent.

§ 9.3.8 All material necessary for the construction of this Project, delivered upon the premises, shall not be removed from the premises without written consent of the Architect.

§ 9.3.9 The Contractor's request for final payment shall include: (1) the Contractor's Final Lien Waiver in the full amount of the contract; and (2) final lien waivers in the full amount of their contracts from all subcontractors and suppliers for which final lien waivers have not previously been submitted.

§ 9.4 Certificates for Payment

§ 9.4.1 The Architect will, within seven days after receipt of the Contractor's Application for Payment, either (1) issue to the Owner a Certificate for Payment in the full amount of the Application for Payment, with a copy to the Contractor; or (2) issue to the Owner a Certificate for Payment for such amount as the Architect determines is properly due, and notify the Contractor and Owner of the Architect's reasons for withholding certification in part as provided in Section 9.5.1; or (3) withhold certification of the entire Application for Payment, and notify the Contractor and Owner of the Architect's reason for withholding certification in whole 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 in the Application for Payment, that, to the best of the Architect's knowledge, information, and belief, the Work has progressed to the point indicated, the quality of the Work is in accordance with the Contract Documents, and that the Contractor is entitled to payment in the amount certified. 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 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, 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 cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the 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 suppliers 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 either party disputes the Architect's decision regarding a Certificate for Payment ~~under Section 9.5.1~~, in whole or in part, that party may submit a Claim in accordance with Article 15.

§ 9.5.3 When the reasons for withholding certification are removed, certification will be made for amounts previously withheld.

§ 9.5.4 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 supplier 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 Contractor shall reflect such payment on its next Application for Payment.

§ 9.5.5 The Owner shall not be required to make payment unless in its own independent judgment it accepts the Architect's Certificate.

§ 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. In the event that the Owner elects to utilize an escrow agent, the Owner and the escrow agent may elect to make payments due the Contractor to the Contractor and its subcontractors.

§ 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 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 and suppliers 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 or supplier, except as may otherwise be required by law.

§ 9.6.5 ~~The Contractor's payments to suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.~~ Intentionally Deleted.

§ 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 or provided by 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, create any fiduciary liability or tort liability on the part of the Contractor for breach of trust, or entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

§ 9.6.8 Provided the Owner has fulfilled its payment obligations under the Contract Documents, the Contractor shall defend and indemnify the Owner from all loss, liability, damage or expense, including reasonable attorney's fees and litigation expenses, arising out of any lien claim or other claim for payment by any Subcontractor or supplier of any tier. Upon receipt of notice of a lien claim or other claim for payment, the Owner shall notify the Contractor. If approved by the applicable court, when required, the Contractor may substitute a surety bond for the property against which the lien or other claim for payment has been asserted.

§ 9.7 Failure of Payment

~~If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents, the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days' notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shutdown, delay and start-up, plus interest as provided for in the Contract Documents.~~Intentionally Deleted.

§ 9.8 Substantial Completion

§ 9.8.1 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.

§ 9.8.2 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. With respect to Work enumerated on the list accompanying the Certificate of Substantial Completion, the guarantee or warranty period shall start at the time of subsequent acceptance of this Work in writing by Owner.

§ 9.8.3 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.

§ 9.8.4 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; establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance; and 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.

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in the Certificate. Upon such acceptance, and consent of surety if any, the Owner shall make payment of retainage applying to the 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. The payment shall be sufficient to increase the total payments to 95 percent of the contract sum, less such amounts as the Architect shall determine for incomplete work and unsettled claims.

~~§ 9.9 Partial Occupancy or Use~~

~~§ 9.9.1 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 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.~~

~~§ 9.9.2 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.~~

~~§ 9.9.3 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.~~

§ 9.10 Final Completion and Final Payment

§ 9.10.1 Upon receipt of the Contractor's 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. 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 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.~~

§ 9.10.2 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, (3) a written statement that the Contractor knows of no 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, (5) documentation of any special warranties, such as manufacturers' warranties or specific Subcontractor warranties, and (6) if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts and 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, claim, security interest, or encumbrance. If a lien, claim, security interest, or encumbrance 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 the lien, claim, security interest, or encumbrance, including all costs and reasonable attorneys' fees.

~~§ 9.10.3 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, corrected, 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 the 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.~~

~~§ 9.10.4 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;~~
~~.3 terms of special warranties required by the Contract Documents; or~~
~~.4 audits performed by the Owner, if permitted by the Contract Documents, after final payment.~~

§ 9.10.5 Acceptance of final payment by the Contractor, a ~~Subcontractor, or a supplier,~~ 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.

§ 9.11 LIQUIDATED DAMAGES

The Contractor is solely responsible for substantially completing the Work by the scheduled Substantial Completion Date for each Phase of the Work. This responsibility includes all work of the Contractor and that of its Subcontractors and suppliers. The Contractor acknowledges that the Owner will suffer significant financial loss, and there will be disruption to the School Corporation community, if the Project is not complete on or before the Substantial Completion Date for the work set forth in the Contract Documents. The Contractor further acknowledges that the measure of such loss and the disruption to the School Corporation community would not be susceptible to precise calculation. To protect the Owner against said loss and disruption to the School Corporation community and not as a penalty, the Owner and the Contractor hereby agree that the Contractor and the Contractor's Surety, if any, shall be liable for and shall pay to the Owner, Liquidated Damages as per the Liquidated Damages Sliding Scale below for each calendar day of delay, per each School campus, per Phase in Substantial Completion. Substantial Completion for the Project refers to all scheduled work being a minimum 99% complete.

LIQUIDATED DAMAGES SLIDING SCALE

Original Awarded Bid Cost	Liquidated Damages per Calendar Day
$0 - $499,999.99	$500
$500,000.00 - $999,999.99	$600
$1,000,000.00 - $3,999,999.99	$700
$4,000,000.00 - $7,999,999.99	$800
$8,000,000.00 - $11,999,999.99	$900
$12,000,000.00 - $19,999,999.99	$1,000
$20,000,000.00 - Above	$1,500

§ 9.11.2 Payments of Liquidated Damages are in addition to other direct damages that may be incurred by the Owner and not a penalty. All such Liquidated Damages may be set-off against any monies that may be due the Contractor. The Owner's approval or making of progress payments or final payment, with or without knowledge that the Work was untimely, shall not constitute or be deemed a waiver of the Owner's rights or claims, or of the Owner's ability to receive Liquidated Damages under the Contract or common law.

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, a Subcontractor, or a Sub-subcontractor; 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 implement, 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 the owners and users of adjacent sites and utilities of the safeguards.

§ 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~~ shall. at its sole cost and expense, 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. The Contractor may make a Claim for the cost to remedy the damage or loss to the extent such damage or loss is 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 to the 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, notice of the injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding ~~21~~ twenty-one (21) days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.2.9 The Contractor, prior to commencing the work, shall submit to the Architect, in writing, a statement certifying that he is familiar with the Manual of Accident Prevention in Construction by the Associated General Contractors of America, current edition, and further that the Contractor will maintain at the project a copy of said publication and will strictly enforce the applicable requirements of same. Contractor will also state the name of the Contractor's Safety Engineer who will be responsible for enforcing all safety requirements.

§ 10.2.10 All Construction documents pertaining to this Work, and the joint and several phases of construction hereby contemplated, are to be governed, at all times, by applicable provisions of the Federal Law, including but not limited to the latest amendments of the following:

.1 Williams Steiger Occupational Safety & Health Act of 1970 Public Law 91 596;

.2 Part 1910 — Occupational Safety & Health Standards, Chapter XVII of Title 29, Code of Federal Regulations;

.3 Part 1518 — Safety & Health Regulations for Construction, Chapter XIII of Title 29, Code of Federal Regulations.

§ 10.3 Hazardous Materials and Substances

§ 10.3.1 The Contractor is responsible for compliance with any requirements included in the Contract Documents regarding hazardous materials or substances. 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 notify the Owner and Architect of the condition.

§ 10.3.1.1 The Contractor shall not cause or permit any "Hazardous Materials" (as defined herein) to be brought upon, kept or used in or about the Projects site(s) except to the extent such Hazardous Materials: (1) are necessary for the prosecution of the Work; and (2) have been approved in writing by the Owner. Any Hazardous Materials allowed to be used on the Project site(s) shall be used, stored, and disposed of in writing as directed in writing by the Owner. Any Hazardous Materials allowed to be used in the Project site(s) shall be used, stored, and disposed of in compliance with all applicable laws relating to such Hazardous Materials. Any unused or surplus hazardous Materials, as well as, any other Hazardous Materials that have been placed, released, or discharged on the Project site(s) by the Contractor or any of its employees, agents, suppliers, or subcontractors, shall be removed from the Project site(s) at the earlier of (1) completion of the Work requiring the use of such Hazardous Materials; (2) the completion of the Work as a whole; or (3) within twenty-four (24) hours following the Owner's demand for such removal. Such removal shall be undertaken by the Contractor at its sole cost and expense and shall be performed in accordance with all applicable laws. The Contractor shall immediately notify the Owner of any release or discharge of any Hazardous Materials on the Project site(s). The Contractor shall provide the Owner with copies of all warning labels on products that the Contractor or any of its subcontractors will be using in connection with the Work, and the Contractor shall be responsible for making any and all disclosures required under applicable "Community Right to Know" or similar laws. The Contractor shall not clean or service any tools, equipment, vehicles, materials, or other items in such a manner as to cause a violation of any laws or regulations relating to Hazardous Materials. All residue and waste materials resulting from any such cleaning or servicing shall be collected and removed from the Project site(s) in accordance with all applicable laws and regulations. The Contractor shall immediately notify the Owner of any citations, orders, or warnings issued to or received by the Contractor, or of which the Contractor otherwise becomes aware, that relate to any Hazardous Materials on the Project site(s). Without limiting any other indemnification provisions pursuant to law or specified in this Agreement, the Contractor shall indemnify, defend (at the Contractor's sole cost, and with legal counsel approved by the Owner), and hold the Owner and Architect harmless from any and all claims, demands, losses, damages, disbursements, liabilities, obligations, fines, penalties, costs, and expenses for removing and remedying the effect of any Hazardous Materials on, under, from, or about the Project site(s), arising out of or relating to, directly or indirectly, the Contractor's or its subcontractor's failures to comply with any of the requirements herein. As used herein, the term "Hazardous Materials" means any hazardous or toxic substances, materials, and wastes listed in the United States Department of transportation Materials Table, or listed by the Environmental Protection Agency as hazardous substances, and all substances, materials, or wastes that are or become regulated under federal, state, or local law.

§ 10.3.2 Upon receipt of the Contractor's 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 the material or substance or who are to perform the task of removal or safe containment of the 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 by the amount of the Contractor's reasonable additional costs of shutdown, 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.~~ Intentionally Deleted.

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for hazardous materials or substances the Contractor brings to the ~~site unless such materials or substances are required by the Contract Documents.~~ site. The

Owner shall be responsible for hazardous 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 reimburse the Owner for the cost and expense the Owner incurs (1) for remediation of hazardous materials or substances 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.

~~**§ 10.3.6** If, without negligence on the part of the Contractor, the Contractor is held liable by a government agency for the cost of remediation of a hazardous material or substance solely by reason of performing Work as required by the Contract Documents, the Owner shall reimburse the Contractor for all cost and expense thereby incurred.~~

§ 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 Insurance and Bonds

§ 11.1.1 The Contractor shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Contractor shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Owner, Architect, and Architect's consultants shall be named as additional insureds under the Contractor's ~~commercial general liability policy or as otherwise described~~ liability policies as required in the Contract Documents.

~~**§ 11.1.2** The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.~~

§ 11.1.2 The Contractor shall provide surety bonds of the types, for such penal sums, and subject to such terms and conditions as required by the Contract Documents. The Contractor shall purchase and maintain the required bonds from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is located.

§ 11.1.3 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

§ 11.1.4 Notice of Cancellation or Expiration of Contractor's Required Insurance. Within three (3) business days of the date the Contractor becomes aware of an impending or actual cancellation or expiration of any insurance required by the Contract Documents, the Contractor shall provide notice to the Owner of such impending or actual cancellation or expiration. Upon receipt of notice from the Contractor, the Owner shall, unless the lapse in coverage arises from an act or omission of the Owner, have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by the Contractor. The furnishing of notice by the Contractor shall not relieve the Contractor of any contractual obligation to provide any required coverage.

§ 11.2 Owner's Insurance

~~**§ 11.2.1** The Owner shall purchase and maintain insurance of the types and limits of liability, containing the endorsements, and subject to the terms and conditions, as described in the Agreement or elsewhere in the Contract Documents. The Owner shall purchase and maintain the required insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located.~~

§ 11.2.1. The Contractor shall purchase and maintain insurance covering the Owner's contingent liability for claims which may arise from operations under the contract and that will protect the Owner and the Architect and their agents and employees from and against all claims, damages, losses and expenses including attorney's fees and all other defense costs whether in legal or administrative actions.

§ 11.2.2 ~~Failure to Purchase Required Property Insurance.~~ ~~If the Owner fails to purchase and maintain the required property insurance, with all of the coverages and in the amounts described in the Agreement or elsewhere in the Contract Documents, the Owner shall inform the Contractor in writing prior to commencement of the Work. Upon receipt of notice from the Owner, the Contractor may delay commencement of the Work and may obtain insurance that will protect the interests of the Contractor, Subcontractors, and Sub-Subcontractors in the Work. When the failure to provide coverage has been cured or resolved, the Contract Sum and Contract Time shall be equitably adjusted. In the event the Owner fails to procure coverage, the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent the loss to the Owner would have been covered by the insurance to have been procured by the Owner. The cost of the insurance shall be charged to the Owner by a Change Order. If the Owner does not provide written notice, and the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain the required insurance, the Owner shall reimburse the Contractor for all reasonable costs and damages attributable thereto.~~ In any and all claims against the Owner or the Architect or any of their agents or employees by any employee of the contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the insurance obligation under this Section shall not be limited in any way by any limitation on the amount or type of damages, compensation or benefits payable by or for the contractor or any subcontractor under Workmen's Compensation Acts, disability benefit acts or other employee benefit acts.

§ 11.2.3 ~~Notice of Cancellation or Expiration of Owner's Required Property Insurance.~~ ~~Within three (3) business days of the date the Owner becomes aware of an impending or actual cancellation or expiration of any property insurance required by the Contract Documents, the Owner shall provide notice to the Contractor of such impending or actual cancellation or expiration. Unless the lapse in coverage arises from an act or omission of the Contractor: (1) the Contractor, upon receipt of notice from the Owner, shall have the right to stop the Work until the lapse in coverage has been cured by the procurement of replacement coverage by either the Owner or the Contractor; (2) the Contract Time and Contract Sum shall be equitably adjusted; and (3) the Owner waives all rights against the Contractor, Subcontractors, and Sub-subcontractors to the extent any loss to the Owner would have been covered by the insurance had it not expired or been cancelled. If the Contractor purchases replacement coverage, the cost of the insurance shall be charged to the Owner by an appropriate Change Order. The furnishing of notice by the Owner shall not relieve the Owner of any contractual obligation to provide required insurance.~~ The Contractor shall give the Owner the original policy and shall furnish the Architect memorandum copies of said policy. The Owner and Architect shall be the named insureds in this Protective Liability Policy. The Contractor shall protect the Owner and the Architect and their agents and employees from expenses, including attorney's fees, arising out of or resulting from the performance sickness, disease, or death, or injury to, or destruction of any tangible property (other than the Work itself) including the loss of use therefrom that is caused in whole or in part by any negligent act or omission of the Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, regardless of whether it is caused in whole or in part by a party to whom insurance is afforded pursuant to this Section.

§ 11.3 PROPERTY INSURANCE

§ 11.3.1 Builder's Risk Insurance is required and shall be purchased and maintained by the Owner until Substantial Completion.

§ 11.3.1.1 The policy required by this Section shall be a Completed Value All Risk Builder's Risk policy and shall cover all work (including that of all contractors) in the course of construction excluding temporary structures and materials used in the construction process stored on or within one hundred feet of the construction site and while awaiting installation. The policy shall be written in an amount equal to 100% of the total sum of all contracts. However, the policy is based on a $5,000 deductible, applicable to all loses for each occurrence. Therefore, the Contractor shall be solely responsible for any and all losses up to $5,000. Losses are adjustable with and payable to the Owner for his own account.

§ 11.3.1.2 Coverage under the policy required by this Section shall include, but not be limited to:

A. All Risk of Direct Physical Loss, including Fire and Extended Coverage (Lightning, wind storm, hail, explosion, riot, civil commotion, aircraft, vehicle and smoke).

B. Vandalism and Malicious Mischief.

§ 11.3.1.3 Coverage under the policy required by this Section shall not extend to:

A. The Contractors', Subcontractors', or the Architect's/Engineer's Tools, apparatus, machinery, scaffolding, hoists, forms, staging, shoring and other similar items commonly referred to as construction equipment, which may be on the site and the capital value of which is not included in the Work.
B. Property owned by employees of any of the foregoing.
C. Vehicles of any kind.
D. Trees and shrubs.
E. Drawings and specifications.

§ 11.3.1.5 The policy required by this Section by its terms or endorsement shall specifically permit and allow for beneficial or partial occupancy prior to completion or acceptance of the project by the Owner.

§ 11.3.1.6 The prompt repair or reconstruction of the Work as a result of any insured loss or damage shall be the Contractor's responsibility and shall be accomplished at no additional cost to the Owner or Architect. The contractor shall furnish the proper assistance in the adjustment and settlement of any loss. Loss will be adjustable with and payable to the party purchasing the Builder's Risk Insurance who shall be responsible for apportioning the loss proceeds to each and every entity involved in the loss to the extent of his interest. The policy shall contain a provision that the policy will not be canceled, changed or altered until at least 30 calendar days prior written notice has been given to the named insured.

§ 11.3 Waivers of Subrogation

§ 11.3.1 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; (2) the Architect and Architect's consultants; and (3) Separate Contractors, 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 those losses are covered by property insurance required by the Agreement or other property insurance applicable to the Project, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require similar written waivers in favor of the individuals and entities identified above from the Architect, Architect's consultants, Separate Contractors, subcontractors, and sub-subcontractors. The policies of insurance purchased and maintained by each person or entity agreeing to waive claims pursuant to this section 11.3.1 shall not prohibit this waiver of subrogation. This waiver of subrogation shall be effective as to a person or entity (1) even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, (2) even though that person or entity did not pay the insurance premium directly or indirectly, or (3) whether or not the person or entity had an insurable interest in the damaged property.

§ 11.3.2 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, to the extent permissible by such policies, the Owner waives all rights in accordance with the terms of Section 11.3.1 for damages caused by fire or other causes of loss covered by this separate property insurance.

§ 11.4 Loss of Use, Business Interruption, and Delay in Completion Insurance

The Owner, at the Owner's option, may purchase and maintain insurance that will protect the Owner against loss of use of the Owner's property, or the inability to conduct normal operations, due to fire or other causes of loss. The Owner waives all rights of action against the Contractor and Architect for loss of use of the Owner's property, due to fire or other hazards however caused.

§11.5 Adjustment and Settlement of Insured Loss

§ 11.5.1 A loss insured under the Owner's property insurance required by the Agreement 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 11.5.2. The ~~Owner shall pay the Architect and Contractor their just shares of insurance proceeds received by the Owner, and by appropriate agreements the Architect and Contractor shall make payments to their consultants and Subcontractors~~ Contractor shall pay the Subcontractors, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

§ 11.5.2 ~~Prior to settlement of an insured loss, the Owner shall notify the Contractor of the terms of the proposed settlement as well as the proposed allocation of the insurance proceeds. The Contractor shall have 14 days from receipt of notice to object to the proposed settlement or allocation of the proceeds. If the Contractor does not object, the Owner shall settle the loss and the Contractor shall be bound by the settlement and allocation. Upon receipt, the Owner shall deposit the insurance proceeds in a separate account and make the appropriate distributions. Thereafter, if no other agreement is made or the Owner does not terminate the Contract for convenience, the Owner and Contractor shall execute a Change Order for reconstruction of the damaged or destroyed Work in the amount allocated for that purpose. If the Contractor timely objects to either the terms of the proposed settlement or the allocation of the proceeds, the Owner may proceed to settle the insured loss, and any dispute between the Owner and Contractor arising out of the settlement or allocation of the proceeds shall be resolved pursuant to Article 15. Pending resolution of any dispute, the Owner may issue a Construction Change Directive for the reconstruction of the damaged or destroyed Work.~~ The Owner as fiduciary shall have the power to adjust and settle a loss with insurers.

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, the Contractor shall be entitled to an equitable adjustment to the Contract Sum and Contract Time as may be appropriate. If such Work is not in accordance with the Contract Documents, the costs of uncovering the Work, and the cost of correction, shall be at the Contractor's expense.

§ 12.2 Correction of Work

§ 12.2.1 Before Substantial Completion

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, discovered before 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~~ Final 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~~ Final 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 any 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~~ shall, at Contractor's sole cost and expense, correct it promptly after receipt of 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 2.5.

§ 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~~ Final Completion by the period of time between ~~Substantial~~ Final 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.~~ In the case of any Work performed in correcting defects pursuant to guarantees or warranties provided or referred to by this Article 12, the warranty or guarantee period shall begin anew from the date of the completion or correction of such Work.

§ 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 of the Owner or Separate Contractors, whether completed or partially completed, caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract ~~Documents.~~Documents and pay all attorney's fees and expenses related thereto immediately upon demand.

§ 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, excluding that jurisdiction's choice of law rules. If the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.~~
State of Indiana.

§ 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 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 the assignment.

§ 13.3 Rights and Remedies

§ 13.3.1 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.

§ 13.3.2 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 thereunder, except as may be specifically agreed upon in writing.

§ 13.3.3 The Owner and the Architect reserve the right to accept or reject any substitutions bid upon. If substitutions are not specifically accepted in writing, materials specified as "standard" shall be used in construction of this project.

§ 13.3.4 Any material specified by reference to the number, symbol or title of specific standards, such as Commercial Standards, Federal Specifications, trade association standards, or similar standards, shall comply with requirements in the latest revision thereof and any amendment of supplement thereto in effect on the date of the Instruments of Service, except as limited to type, class or grade, or modified in such reference by a given date. The standards related to, except as modified in the Specifications, shall have full force and effect as though printed in the Specifications.

§ 13.4 Tests and Inspections

§ 13.4.1 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 shall bear costs of tests, inspections, or approvals that do not become requirements until after bids are received or negotiations concluded. The Owner shall directly arrange and pay for tests, inspections, or approvals where building codes or applicable laws or regulations so require.

§ 13.4.2 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 13.4.1, 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 13.4.3,~~ shall be at the ~~Owner's~~ Contractor's expense.

§ 13.4.3 If procedures for testing, inspection, or approval under Sections 13.4.1 and 13.4.2 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. Notwithstanding any other term or provision in this Article 13 to the contrary, in the event that any testing or inspection of the Work or any part thereof reveals defects in materials or workmanship, then the Contractor shall remedy such defects and shall bear all costs and expenses associated with such testing which is related to determining whether such defects have been properly remedied.

§ 13.4.4 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.

§ 13.4.5 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.

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

§ 13.5 Interest

~~Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at the rate the parties agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.~~Any references in this Agreement to interest being assessed against the Owner are hereby deleted.

§ 13.7 REGULATIONS

§ 13.7.1 The Contractor and/or Subcontractor warrant/s that s/he is familiar with and s/he shall comply with Federal, State and local laws, statutes, ordinances, rules and regulations, School Board Rules and Policies, and the orders and decrees of any courts or administrative bodies or tribunals in any manner affecting the performance of the contract including without limitation Workmen's Compensation Laws, minimum salary and wage statutes and regulations, laws with respect to permits and licenses and fees in connection therewith, laws regarding maximum working hours, and, without limitation, such other laws and regulations as are specifically described below. Additionally, Contractor and subcontractor warrant that s/he shall comply with any amendments to such Federal, State and local laws, statutes, ordinances, rules and regulations that are enacted thereafter during the performance of the Work and under this Contract. To the extent that there are any violations of any of the applicable laws, rules, regulations and/or court orders/decrees mentioned herein, Contractor and Subcontractor shall be responsible for indemnifying and holding both the Owner and Architect free and harmless from all costs, fees and expenses incurred, directly or indirectly and including without limitation attorneys' fees, by the Owner or the Architect in responding to and complying with demands made by any of the governmental departments/agencies and/or the courts, or an aggrieved employee or person and such amounts may be withheld from the payments to be made on the project. It is the intention that the Owner and Architect shall suffer no time loss or other additional expenses in complying with any inquiry made with

regard to any compliance with the applicable laws, rules and regulations referenced herein. No plea of misunderstanding or ignorance thereof will be considered.

§ 13.7.1.1 Whenever required or upon the request of the Architect or Owner, the Contractor or subcontractor shall furnish the Architect and the Owner with satisfactory proof of compliance with said Federal, State and local laws, statutes, ordinances, rules, regulations, orders, and decrees.

§ 13.7.2 The Contractor and Subcontractors shall carefully examine the Occupational Safety and Health Act of 1970, published in May 1971, as issued by the Federal Register (OSHA), and the specific regulations governing procedures, techniques, safety precautions, equipment design, and the configuration of the same as required under this Act and the Contractor agrees as evidenced by his submission of a bid to comply with all terms of the Act and to perform and complete in a workmanlike manner all work required in full compliance with said Act. The Contractor is responsible to comply with OSHA and its regulations as amended in performing any work under the Contract Documents.

§ 13.7.3 The Contractor shall comply with all federal, state and local non-discrimination laws:

§ 13.7.3.2.1 Contractor 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, 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.

§ 13.7.3.2.2 Contractor, 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 or ancestry, age, physical or mental handicap unrelated to ability, or an unfavorable discharge from military service.

§ 13.7.15 No Smoking. In accordance with the Owner's Policy, smoking is prohibited on all School Corporation property.

7§ 13.7.17 The Contractor understands and acknowledges that its work, in whole or in part, will be performed on public school property where there may be direct, daily contact with school students. The Contractor further understands and acknowledges that the State of Indiana requires that all employees of vendors, licensees, contractors or others having direct, daily contact with students are subject to a criminal background check and may not be listed on the State Sex Offender Registry. Prior to allowing any of its employees who will be performing the scope of work access to school property, the Contractor agrees to provide the Owner, at the sole cost of the Contractor with the following:

(1) Evidence that each employee, agent, contractor or other person performing work on school property under this Agreement was subjected to a criminal background check in conformity with I.C. 20-26-5-10; that said persons are not listed on said Registry; and said persons have no criminal convictions for the offenses listed under I.C. 20-26-5-11(6);

(2) The Contractor will provide the Owner, upon request, a copy of the criminal background check conducted on each such person.

In the event the Contractor plans to subcontract with or use the services of another person or firm that may have direct, daily contact with students on school property, in order to fulfill its obligations under its Agreement with the Owner then in that event the Contractor will require all such persons or firms to comply with the provisions of this paragraph and I.C. 20-26-5-10.

In the event the Contractor fails to comply with the provisions of this paragraph and I.C. 20-26-5-10, and as a result a suit or claim is instituted by a student for harm caused by an employee of the Contractor, or caused by an employee of a subcontractor to the Contractor, then in that event the Contractor agrees to fully defend and indemnify, including reimbursement of attorney's fees and costs, the Owner against any such claims.

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 Termination by the Contractor

Intentionally Deleted. .3.

~~§ 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, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, 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;~~
- ~~.3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or~~
- ~~.4 The Owner has failed to furnish to the Contractor reasonable evidence as required by Section 2.2.~~

~~§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, their agents or employees, or any other persons or entities performing portions of the Work, 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, or 120 days in any 365-day period, whichever is less.~~

~~§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, as well as reasonable overhead and profit on Work not executed, and costs incurred by reason of such termination.~~

~~§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor, a Subcontractor, a Sub-subcontractor, or their agents or employees or any other persons or entities performing portions of the Work because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon seven additional days' notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.~~

§ 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 or suppliers in accordance with the respective agreements between the Contractor and the Subcontractors or suppliers;~~
- ~~.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or~~
- ~~.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.~~ If the Contractor shall institute proceedings or consent to proceedings requesting relief or arrangement under the Federal Bankruptcy Act or any similar or applicable federal or state law, or if a petition under any federal or state bankruptcy or insolvency law is filed against the Contractor and such petition is not dismissed within sixty (60) days after the date of said filing, or if the Contractor admits in writing his inability to pay his debts generally as they become due, or if he makes a general assignment for the benefit of his creditors, or if a receiver, liquidator, trustee or assignee is appointed on account of his bankruptcy or insolvency; or if a receiver of all or any substantial portion of the Contractor's properties is appointed; or if the Contractor abandons the Work; or if he fails, except in cases for which extension of time is provided, to prosecute promptly and diligently the Work or to supply enough properly skilled workmen or proper materials for the Work; or if he submits an Application for Payment, sworn statement, waiver of lien, affidavit or document of any nature whatsoever which is intentionally falsified; or if he fails to make prompt payment to Subcontractors or for materials or labor or otherwise breaches his obligations under any subcontract with a Subcontractor; or if a mechanic's or material man's lien or notice of lien is filed against any part of the Work or the site of the Project and not promptly bonded or insured over by the Contractor in a manner satisfactory to the Owner; or if the Contractor disregards any laws, statutes, ordinances, rules, regulations or orders of any governmental body or public or quasi-public authority having jurisdiction of the Work or the site of the Project; or if he otherwise violates any provision of the Contract Documents; then the Owner, without prejudice to any right or remedy available to the Owner under the Contract Documents or at law or in equity, the Owner may, after giving the Contractor and the surety under the Performance

Bond and under the Labor and Material Payment Bond described in Section 11.5, seven (7) days' written notice, terminate the employment of the Contractor. If requested by the Owner, the Contractor shall remove any part or all of his equipment, machinery and supplies from the site of the Project within seven (7) days after the date of such request, and in the event of the Contractor's failure to do so, the Owner shall have the right to remove or store such equipment, machinery and supplies at the Contractor's expense. In case of such termination, the Contractor shall not be entitled to receive any further payment for Work performed by the Contractor through the date of termination. The Owner's right to terminate the Owner-Contractor Agreement pursuant to this Section 14.2.1 shall be in addition to and not in limitation of any rights or remedies existing hereunder or pursuant hereto or at law or in equity.

§ 14.2.2 When any of the reasons described in Section 14.2.1 exist, and upon certification by the Architect that sufficient cause exists to justify such action, 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' 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~~ all costs to the Owner of completing the Work, then the Contractor shall be paid for all Work performed by the Contractor to the date of termination. If such costs to the Owner of completing the Work exceed such unpaid balance, the Contractor shall pay the difference to the ~~Owner. The amount~~ Owner immediately upon the Owner's demand. The costs to the Owner of completing the Work shall include, but not be limited to, the cost of any additional architectural, managerial and administrative services required thereby, any costs incurred in retaining another contractor or other subcontracts, any additional interest or fees which the Owner must pay by reason of a delay in the completion of the Work, attorneys' fees and expenses, and any other damages, costs, and expenses the Owner may incur by reason of completing the Work or any delay thereof. . The amount, if any, to be paid to the Contractor ~~or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application,~~ shall be certified by the Architect, upon application, in the manner provided in Section 9.4, and this obligation for payment shall survive termination of the Contract.

§ 14.2.5 The Owner may, upon seven (7) days written notice to the Contractor, terminate the Agreement between the Owner and Contractor without cause. Upon written request and submittal of the appropriate documentation as required by the Owner, the Owner shall pay the Contractor for all work performed by the Contractor to the date of termination that has been approved by the Owner. The Owner may, upon the Contractor executing such a confirmatory assignments as the Owner shall request, accept and assume all of the Contractor's obligations under all subcontracts executed in accordance with the terms of the Contract Documents that may accrue after the date of such termination and that the Contractor has incurred in good faith in connection with the Work. Upon receipt of notice of termination, the Contractor shall cease all operations on the date specified by the Owner, terminate subcontracts not assumed by the Owner, make no further orders of materials or equipment, complete work not terminated (if any), and provide such reports as may be requested by the Owner and the Architect as to the status of the Work and the Work remaining to be completed. The Owner's right to terminate the Contract under this Section shall be in addition to, and not in limitation of, its rights to stop the Work without terminating 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 shall be adjusted for increases in the cost and time caused by suspension, delay, or interruption under 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 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 Owner shall pay the Contractor for Work properly executed; costs incurred by reason of the termination, including costs attributable to termination of Subcontracts; and the termination fee, if any, set forth in the Agreement.

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 Claims

§ 15.1.1 Definition

A Claim is a demand or assertion by one of the parties to the Contract seeking, as a matter of right, payment of money, a change in the Contract Time, 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. This Section 15.1.1 does not require the Owner to file a Claim in order to impose liquidated damages in accordance with the Contract Documents.

§ 15.1.2 Time Limits on Claims

The Owner and Contractor shall commence all Claims and causes of action against the other and arising out of or related to the Contract, whether in contract, tort, breach of warranty or otherwise, in accordance with the requirements of the binding dispute resolution method selected in the Agreement and within the 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 15.1.2.

§ 15.1.3 Notice of Claims

§ 15.1.3.1 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered prior to expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by 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 under this Section 15.1.3.1 shall 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.

§ 15.1.3.2 Claims by either the Owner or Contractor, where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2, shall be initiated by notice to the other party. In such event, no decision by the Initial Decision Maker is required.

§ 15.1.4 Continuing Contract Performance

§ 15.1.4.1 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.

§ 15.1.4.2 The Contract Sum and Contract Time shall be adjusted in accordance with the Initial Decision Maker's decision, subject to the right of either party to proceed in accordance with this Article 15. The Architect will issue Certificates for Payment in accordance with the decision of the Initial Decision Maker.

§ 15.1.5 Claims for Additional Cost

If the Contractor wishes to make a Claim for an increase in the Contract Sum, notice as provided in Section 15.1.3 shall be given before proceeding to execute the portion of the Work that is the subject of the Claim. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

§ 15.1.6 Claims for Additional Time

§ 15.1.6.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, notice as provided in ~~Section 15.1.3 shall be given. The Contractor's Claim~~ herein shall be given within seven (7) calendar days after the event giving rise to the claim. The Contractor's claim shall include an estimate of cost and of probable effect of the delay on the progress of the Work. In the case of a continuing delay, only one ~~Claim~~ claim is necessary.

§ 15.1.6.2 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.

§ 15.1.7 Waiver of Claims for Consequential Damages

The Contractor ~~and Owner waive Claims against each other~~ waives Claims against the Owner and Architect 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~~

~~.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 15.1.7 shall be deemed to preclude assessment of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 Initial Decision

§ 15.2.1 Claims, excluding those where the condition giving rise to the Claim is first discovered after expiration of the period for correction of the Work set forth in Section 12.2.2 or arising under Sections 10.3, 10.4, and 11.5, 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 of any Claim. If an initial decision has not been rendered within 30 days after the Claim has been referred to the Initial Decision Maker, the party asserting the Claim may demand mediation and binding dispute resolution without a 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 the 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 ~~but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.~~subject to litigation.

§ 15.2.6 ~~Either party may file for mediation of an initial decision at any time, subject to the terms of Section 15.2.6.1.~~ **Intentionally Deleted.**

~~**§ 15.2.6.1** Either party may, within 30 days from the date of receipt of an initial decision, demand in writing that the other party file for mediation. If such a demand is made and the party receiving the demand fails to file for mediation within 30 days after receipt thereof, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.~~

§ 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** 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 15.1.7, shall be subject to mediation as a condition precedent to binding dispute resolution.~~

~~**§ 15.3.2** The parties shall endeavor to resolve their Claims by mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for mediation shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the mediation. The request may be made concurrently with the filing of binding dispute resolution proceedings but, in such event, mediation shall proceed in advance of binding dispute resolution proceedings, which shall be stayed pending mediation for a period of 60 days from the date of filing, unless stayed for a longer period by agreement of the parties or court order. If an arbitration is stayed pursuant to this Section 15.3.2, the parties may nonetheless proceed to the selection of the arbitrator(s) and agree upon a schedule for later proceedings.~~

~~**§ 15.3.3** Either party may, within 30 days from the date that mediation has been concluded without resolution of the dispute or 60 days after mediation has been demanded without resolution of the dispute, demand in writing that the other party file for binding dispute resolution. If such a demand is made and the party receiving the demand fails to file for binding dispute resolution within 60 days after receipt thereof, then both parties waive their rights to binding dispute resolution proceedings with respect to the initial decision.~~

~~**§ 15.3.4** The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. 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 arbitration as the method for binding dispute resolution in the Agreement, any Claim subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Agreement. The Arbitration shall be conducted in the place where the Project is located, unless another location is mutually agreed upon. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The party filing a notice of demand for arbitration must assert in the demand all Claims then known to that party on which arbitration is permitted to be demanded.~~

~~§ 15.4.1.1 A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the Claim would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the Claim.~~

~~§ 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.~~

~~§ 15.4.3 The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by parties to the Agreement, shall be specifically enforceable under applicable law in any court having jurisdiction thereof.~~

~~§ 15.4.4 Consolidation or Joinder~~

~~§ 15.4.4.1 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation, (2) the arbitrations to be consolidated substantially involve common questions of law or fact, and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).~~

~~§ 15.4.4.2 Subject to the rules of the American Arbitration Association or other applicable arbitration rules, either party may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.~~

ARTICLE 16 LIMIT TO AVOID INCORPORATION OF RESPONSIBILITY BY REFERENCE

§ 16.1 Where any specification which is incorporated herein by reference, through the words "and/or as directed by the Architect," or phrases having a similar effect appear to give the Architect the right to direct something other than that specified, the Architect has in fact no such right to except as it may be established in specific instances in portions of this Instruments of Service other than in said specifications.

ARTICLE 17 INCORPORATION OF CONTRACT TERMS WITH SUBCONTRACTORS

§ 17.1 Contractor agrees that s/he will be responsible to incorporate all of the terms and conditions herein, including all amendments to this Contract, with any and all of the Subcontractors as well as any Subcontractors retained by Subcontractors. Contractor acknowledges that it is the Owner's intent that all of the terms and conditions herein, including all amendments to this Contract, will be adhered to by the Contractor and all Subcontractors performing any Work in this project.

~~§ 15.4.4.3 The Owner and Contractor grant to any person or entity made a party to an arbitration conducted under this Section 15.4, whether by joinder or consolidation, the same rights of joinder and consolidation as those of the Owner and Contractor under this Agreement.~~

DRAFT AIA® Document A101™ – 2017 Exhibit A

Insurance and Bonds

This Insurance and Bonds Exhibit is part of the Agreement, between the Owner and the Contractor, dated the « » day of « » in the year « »
(In words, indicate day, month and year.)

for the following PROJECT:
(Name and location or address)

« Duneland School Corporation - General »
« »

THE OWNER:
(Name, legal status and address)

« Duneland School Corporation »« »
«601 West Morgan Avenue
Chesterton, Indiana 46304 »

THE CONTRACTOR:
(Name, legal status and address)

« »« »
« »

TABLE OF ARTICLES

A.1 GENERAL

A.2 OWNER'S INSURANCE

A.3 CONTRACTOR'S INSURANCE AND BONDS

A.4 SPECIAL TERMS AND CONDITIONS

ARTICLE A.1 GENERAL

The ~~Owner and~~ Contractor shall purchase and maintain insurance, and provide bonds, as set forth in this ~~Exhibit.~~ Exhibit from companies lawfully authorized to do business in the jurisdiction in which the Project is located. As used in this Exhibit, the term General Conditions refers to AIA Document A201™–2017, General Conditions of the Contract for Construction.

ARTICLE A.2 OWNER'S INSURANCE

§ A.2.1 General

Prior to commencement of the Work, the Owner shall secure the insurance, and provide evidence of the coverage, required under this Article A.2 and, upon the Contractor's request, provide a copy of the property insurance policy or policies required by Section A.2.3. The copy of the policy or policies provided shall contain all applicable conditions, definitions, exclusions, and endorsements.

§ A.2.2 Liability Insurance

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.

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

This document is intended to be used in conjunction with AIA Document A201™-2017, General Conditions of the Contract for Construction. Article 11 of A201™-2017 contains additional insurance provisions.

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The Owner shall be responsible for purchasing and maintaining the Owner's usual general liability insurance.

§ A.2.3 Required Property Insurance

§ A.2.3.1 Unless this obligation is placed on the Contractor pursuant to Section A.3.3.2.1, the Owner shall purchase and maintain, from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located, property insurance written on a builder's risk "all-risks" completed value or equivalent policy form and sufficient to cover the total value of the entire Project on a replacement cost basis. The Owner's property insurance coverage shall be no less than the amount of the initial Contract Sum, plus the value of subsequent Modifications and labor performed and materials or equipment supplied by others. The property insurance shall be maintained until Substantial Completion and thereafter as provided in Section A.2.3.1.3, unless otherwise provided in the Contract Documents or otherwise agreed in writing by the parties to this Agreement. This insurance shall include the interests of the Owner, Contractor, Subcontractors, and Sub-subcontractors in the Project as insureds. ~~This insurance shall include the interests of mortgagees as loss payees.~~The policy shall be based on a $5,000 deductible, applicable to all losses for each occurrence. The Contractor shall be solely response for any and all losses up to $5,000 per loss. Losses are payable to the Owner for Owner's own account.

§ A.2.3.1.1 Causes of Loss. The insurance required by this Section A.2.3.1 shall provide coverage for direct physical loss or damage, and shall not exclude the risks of fire, explosion, theft, vandalism, malicious mischief, collapse, earthquake, flood, ~~or windstorm.~~ and debris removal including demolition occasioned by enforcement of any legal requirements, or windstorm and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of an insured loss. The insurance shall also provide coverage for ensuing loss or resulting damage from error, omission, or deficiency in construction methods, design, specifications, workmanship, or materials. Sub-limits, if any, are as follows:
(Indicate below the cause of loss and any applicable sub-limit.)

Causes of Loss	Sub-Limit

§ A.2.3.1.2 Specific Required Coverages. The insurance required by this Section A.2.3.1 shall provide coverage for loss or damage to falsework and other temporary structures, and to building systems from testing and startup. The insurance shall also cover debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and reasonable compensation for the Architect's and Contractor's services and expenses required as a result of such insured loss, including claim preparation expenses. Sub-limits, if any, are as follows:
(Indicate below type of coverage and any applicable sub-limit for specific required coverages.)

Coverage	Sub-Limit

§ A2.3.1.2.1 Coverage shall not extend to:

A. The Contractors', Subcontractors', or the Architect's/Engineer's Tools, apparatus, machinery, scaffolding, hoists, forms, staging, shoring and other similar items commonly referred to as construction equipment, which may be on the site and the capital value of which is not included in the Work.
B. Property owned by employees of any of the foregoing.
C. Vehicles of any kind.
D. Trees and shrubs.
E. Drawings and specifications.

§ A2.3.1.2.2 The policy by its terms or endorsement shall specifically permit and allow for beneficial or partial occupancy prior to completion or acceptance of the project by the Owner.

§ A2.3.1.2.3 The prompt repair or reconstruction of the Work as a result of any insured loss or damage shall be the Contractor's responsibility and shall be accomplished at no additional cost to the Owner or Architect. The contractor shall furnish the proper assistance in the adjustment and settlement of any loss. Loss will be adjustable with and payable to the party purchasing the Builder's Risk Insurance who shall be responsible for apportioning the loss proceeds to each and every entity involved in the loss to the extent of his interest. The policy shall contain a provision

that the policy will not be canceled, changed or altered until at least 30 calendar days prior written notice has been given to the named insured.

§ A.2.3.1.3 Unless the parties agree otherwise, upon Substantial Completion, the Owner shall continue the insurance required by Section A.2.3.1 or, if necessary, replace the insurance policy required under Section A.2.3.1 with property insurance written for the total value of the Project that shall remain in effect until expiration of the period for correction of the Work set forth in Section 12.2.2 of the General Conditions.

§ A.2.3.1.4 Deductibles and Self-Insured ~~Retentions. If the insurance required by this Section A.2.3 is subject to deductibles or self-insured retentions, the Owner shall be responsible for all loss not covered because of such deductibles or retentions.~~Retentions.. The policy shall be based on a $5,000 deductible, applicable to all losses for each occurrence. The Contractor shall be solely response for any and all losses up to $5,000 per loss. Losses are payable to the Owner for Owner's own account.

§ A.2.3.2 Occupancy or Use Prior to Substantial Completion. The ~~Owner's occupancy or use of any completed or partially completed portion of the Work prior to Substantial Completion shall not commence until the insurance company or companies providing the insurance under Section A.2.3.1 have consented in writing to the continuance of coverage. The Owner and the Contractor shall take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance, unless they agree otherwise in writing.~~policy by its terms or endorsement shall specifically permit and allow for beneficial or partial occupancy prior to completion or acceptance of the Project by the Owner.

§ A.2.3.3 Insurance for Existing Structures
If the Work involves remodeling an existing structure or constructing an addition to an existing structure, the Owner shall purchase and maintain, until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, "all-risks" property insurance, on a replacement cost basis, protecting the existing structure against direct physical loss or damage from the causes of loss identified in Section A.2.3.1, notwithstanding the undertaking of the Work. The Owner shall be responsible for all co-insurance penalties.

§ A.2.4 Optional Extended Property Insurance.
The Owner shall purchase and maintain the insurance selected and described below.
(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. For each type of insurance selected, indicate applicable limits of coverage or other conditions in the fill point below the selected item.)

[« »] § A.2.4.1 Loss of Use, Business Interruption, and Delay in Completion Insurance, to reimburse the Owner for loss of use of the Owner's property, or the inability to conduct normal operations due to a covered cause of loss.

« »

[« »] § A.2.4.2 Ordinance or Law Insurance, for the reasonable and necessary costs to satisfy the minimum requirements of the enforcement of any law or ordinance regulating the demolition, construction, repair, replacement or use of the Project.

« »

[« »] § A.2.4.3 Expediting Cost Insurance, for the reasonable and necessary costs for the temporary repair of damage to insured property, and to expedite the permanent repair or replacement of the damaged property.

« »

[« »] § A.2.4.4 Extra Expense Insurance, to provide reimbursement of the reasonable and necessary excess costs incurred during the period of restoration or repair of the damaged property that are over and above the total costs that would normally have been incurred during the same period of time had no loss or damage occurred.

« »

[« »] § A.2.4.5 Civil Authority Insurance, for losses or costs arising from an order of a civil authority prohibiting access to the Project, provided such order is the direct result of physical damage covered under the required property insurance.

« »

[« »] § A.2.4.6 Ingress/Egress Insurance, for loss due to the necessary interruption of the insured's business due to physical prevention of ingress to, or egress from, the Project as a direct result of physical damage.

« »

[« »] § A.2.4.7 Soft Costs Insurance, to reimburse the Owner for costs due to the delay of completion of the Work, arising out of physical loss or damage covered by the required property insurance: including construction loan fees; leasing and marketing expenses; additional fees, including those of architects, engineers, consultants, attorneys and accountants, needed for the completion of the construction, repairs, or reconstruction; and carrying costs such as property taxes, building permits, additional interest on loans, realty taxes, and insurance premiums over and above normal expenses.

« »

§ A.2.5 Other Optional Insurance.

The Owner shall purchase and maintain the insurance selected below.

(Select the types of insurance the Owner is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance.)

[« »] § A.2.5.1 Cyber Security Insurance for loss to the Owner due to data security and privacy breach, including costs of investigating a potential or actual breach of confidential or private information. *(Indicate applicable limits of coverage or other conditions in the fill point below.)*

« »

[« »] § A.2.5.2 Other Insurance

(List below any other insurance coverage to be provided by the Owner and any applicable limits.)

Coverage	Limits

ARTICLE A.3 CONTRACTOR'S INSURANCE AND BONDS

§ A.3.1 General

§ A.3.1.1 Certificates of Insurance. The Contractor shall provide certificates of insurance acceptable to the Owner evidencing compliance with the requirements in this Article A.3 at the following times: (1) prior to commencement of the Work; (2) upon renewal or replacement of each required policy of insurance; and (3) upon the Owner's written request. An additional certificate evidencing continuation of commercial liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment and thereafter upon renewal or replacement of such coverage until the expiration of the periods required by Section A.3.2.1 and Section A.3.3.1. The certificates will show the Owner as an additional insured on the Contractor's Commercial General Liability and excess or umbrella liability policy or policies.

§ A.3.1.2 Deductibles and Self-Insured Retentions. The Contractor shall disclose to the Owner any deductible or self-insured retentions applicable to any insurance required to be provided by the Contractor.

§ A.3.1.3 Additional Insured Obligations. To the fullest extent permitted by law, the Contractor shall cause the commercial general liability coverage to include (1) the Owner, 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 for which loss occurs during completed operations. The additional insured coverage shall be primary and non-contributory to any of the Owner's general liability insurance policies and shall apply to both ongoing and completed operations. To the extent commercially available, the additional insured coverage shall be no less than that provided by Insurance Services Office, Inc. (ISO) forms CG 20 10 07 04, CG 20 37 07 04, and, with respect to the Architect and the Architect's consultants, CG 20 32 07 04. The Contractor shall also cause the automobile liability policy to include the Owner, the Architect and the Architect's consultants as additional insureds.

§ A.3.2 Contractor's Required Insurance Coverage

§ A.3.2.1 The Contractor shall purchase and maintain the following types and limits of insurance from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:
(If the Contractor is required to maintain insurance for a duration other than the expiration of the period for correction of Work, state the duration.)

«Coverages shall be maintained without interruption from date of commencement of the Work until 60 days after the date of Final Completion or for such other period for maintenance of completed operations coverage as specified in the Contract Documents. With respect to the Contractor's completed operations coverage, until 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 »

§ A.3.2.2 Commercial General Liability

§ A.3.2.2.1 Commercial General Liability insurance for the Project written on an occurrence form with policy limits of not less than «One Million Dollars » ($ «1,000,000 ») each occurrence, «Two Million Dollars » ($ «2,000,000 ») general aggregate, and «One Million Dollars » ($ «1,000,000 ») aggregate for products-completed operations hazard, providing coverage for claims including

.1 damages because of bodily injury, sickness or disease, including occupational sickness or disease, and death of any person;

.2 personal injury and advertising injury;

.3 damages because of physical damage to or destruction of tangible property, including the loss of use of such property;

.4 bodily injury or property damage arising out of completed operations; and

.5 the Contractor's indemnity obligations under Section 3.18 of the General Conditions.

.6 Liability insurance should be written on the comprehensive general liability basis, and shall include, but not be limited to the following sub-lines:

A. Premises and Operations including X, C, U coverages (explosion, collapse, underground).

B. Products and Completed Operations to be maintained for two (2) years after Final Completion.

C. Independent Contractor's Protective.

D. Broad Form Comprehensive General Liability Endorsement:

1. Contractual Liability, including contractors' obligation under Section 3.18.
2. Personal Injury & Advertising Injury Liability
3. Premises Medical Payments
4. Fire Legal Liability - Real Property
5. Broad Form Property Damage Liability (including Completed Operations)
6. Incidental Medical Malpractice Liability

7. Additional Persons Insured, including employees for personal and advertising injury.
8. Extended Bodily Injury Liability

.10 If liability insurance is written under the new simplified form - Commercial General Liability, the above listed coverages should be included.

.11 If the General Liability coverages are provided by a Commercial General Liability Policy on a claims-made basis, the policy date or retroactive date shall predate the contract; the termination date of the policy shall be no earlier than the termination date of coverages required to be maintained after final payment, certified in accordance with Section 9.10.2, and an extended period endorsement "Supplemental Tail," must be purchased.

.12 In any and all claims against the Owner or the Architect, or any of their officers, directors, board members, officials, agents or employees, by any employee or Contractor, any subcontractor, anyone directly or indirectly employed by any of them, or anyone for whose acts any of them may be liable, the insurance obligation under this Section shall not be limited in any way by any limitation on the amount or type of damages, compensation, or benefits payable by or for the Contractor or subcontractor under the Worker's Compensation Act, disability benefit acts or other employees benefits acts.

§ A.3.2.2.2 The Contractor's Commercial General Liability policy under this Section A.3.2.2 shall not contain an exclusion or restriction of coverage for the following:

.1 Claims by one insured against another insured, if the exclusion or restriction is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim.

.2 Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor.

.3 Claims for bodily injury other than to employees of the insured.

.4 Claims for indemnity under Section 3.18 of the General Conditions arising out of injury to employees of the insured.

.5 Claims or loss excluded under a prior work endorsement or other similar exclusionary language.

.6 Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language.

.7 Claims related to residential, multi-family, or other habitational projects, if the Work is to be performed on such a project.

.8 Claims related to roofing, if the Work involves roofing.

.9 Claims related to exterior insulation finish systems (EIFS), synthetic stucco or similar exterior coatings or surfaces, if the Work involves such coatings or surfaces.

.10 Claims related to earth subsidence or movement, where the Work involves such hazards.

.11 Claims related to explosion, collapse and underground hazards, where the Work involves such hazards.

§ A.3.2.3 Automobile Liability covering vehicles owned, and non-owned vehicles used, by the Contractor, with policy limits of not less than «One Million Dollars » ($ «1,000,000 ») per accident, for bodily injury, death of any person, and property damage arising out of the ownership, maintenance and use of those motor vehicles along with any other statutorily required automobile coverage.

§ A.3.2.4 ~~The Contractor may achieve the required limits and coverage for Commercial General Liability and Automobile Liability through a combination of primary and excess or umbrella liability insurance, provided such primary and excess or umbrella insurance policies result in the same or greater coverage as the coverages required under Section A.3.2.2 and A.3.2.3, and in no event shall any excess or umbrella liability insurance provide narrower coverage than the primary policy. The excess policy shall not require the exhaustion of the underlying limits only through the actual payment by the underlying insurers.~~Umbrella Excess Liability insurance in the amount of Two Million Dollars ($2,000,000) over commercial general liability insurance, automobile liability insurance and Employer's Liability insurance.

§ A.3.2.5 Workers' Compensation at statutory limits.

§ A.3.2.6 Employers' Liability with policy limits not less than «One Million Dollars » ($ «1,000,000 ») ~~each accident,~~ «One Million Dollars » ($ «1,000,000 ») each employee, and «One Million Dollars » ($ «1,000,000 ») policy limit.

§ A.3.2.7 Jones Act, and the Longshore & Harbor Workers' Compensation Act, as required, if the Work involves hazards arising from work on or near navigable waterways, including vessels and docks

§ A.3.2.8 If the Contractor is required to furnish professional services as part of the Work, the Contractor shall procure Professional Liability insurance covering performance of the professional services, with policy limits of not less than «One Million Dollars » ($ «1,000,000 ») per claim and «One Million Dollars » ($ «1,000,000 ») in the aggregate.

§ A.3.2.9 If the Work involves the transport, dissemination, use, or release of pollutants, the Contractor shall procure Pollution Liability insurance, with policy limits of not less than «One Million Dollars » ($ «1,000,000 ») per claim and «One Million Dollars » ($ «1,000,000 ») in the aggregate.

~~§ A.3.2.10 Coverage under Sections A.3.2.8 and A.3.2.9 may be procured through a Combined Professional Liability and Pollution Liability insurance policy, with combined policy limits of not less than ($) per claim and ($) in the aggregate.~~

~~§ A.3.2.11 Insurance for maritime liability risks associated with the operation of a vessel, if the Work requires such activities, with policy limits of not less than ($) per claim and ($) in the aggregate.~~

~~§ A.3.2.12 Insurance for the use or operation of manned or unmanned aircraft, if the Work requires such activities, with policy limits of not less than ($) per claim and ($) in the aggregate.~~

§ A.3.3 Contractor's Other Insurance Coverage

§ A.3.3.1 Insurance selected and described in this Section A.3.3 shall be purchased from an insurance company or insurance companies lawfully authorized to issue insurance in the jurisdiction where the Project is located. The Contractor shall maintain the required insurance until the expiration of the period for correction of Work as set forth in Section 12.2.2 of the General Conditions, unless a different duration is stated below:

(If the Contractor is required to maintain any of the types of insurance selected below for a duration other than the expiration of the period for correction of Work, state the duration.)

« The Contractor shall purchase and maintain insurance covering the Owner's contingent liability for claims which may arise from operations under the Agreement and that will protect the Owner and the Architect and their respective officers, directors, board members, its agents and employees from and against all claims, damages, losses and expenses including attorney's fees and all other defense costs whether in legal or administrative actions arising (a) out of or resulting from the performance of the work provided that any such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury or to destruction of tangible property (other than the work itself) including the loss of use resulting therefrom and (b) out of any claim made by any employee of the contractor or any subcontractor or by the Illinois Department of Labor for the amount of any wages or salaries which should have been paid to such employees and interest thereon, fines or other assessments relating to such violation, pursuant to provisions of the Prevailing Wage Act, 820 ILCS 130/0.01 et seq., regardless of whether or not it is caused in part by a party to whom insurance is afforded pursuant to this department. »

§ A.3.3.2 The Contractor shall purchase and maintain the following types and limits of insurance in accordance with Section A.3.3.1.

(Select the types of insurance the Contractor is required to purchase and maintain by placing an X in the box(es) next to the description(s) of selected insurance. Where policy limits are provided, include the policy limit in the appropriate fill point.)

[« »] § A.3.3.2.1 Property insurance of the same type and scope satisfying the requirements identified in Section A.2.3, which, if selected in this section A.3.3.2.1, relieves the Owner of the responsibility to purchase and maintain such insurance except insurance required by Section A.2.3.1.3 and Section A.2.3.3. The Contractor shall comply with all obligations of the Owner under Section A.2.3 except to the extent provided below. The Contractor shall disclose to the Owner the amount of any deductible, and the Owner shall be responsible for losses within the deductible. Upon request, the Contractor shall provide the Owner with a copy of the property insurance policy or policies required. The Owner shall

adjust and settle the loss with the insurer and be the trustee of the proceeds of the property insurance in accordance with Article 11 of the General Conditions unless otherwise set forth below:
(Where the Contractor's obligation to provide property insurance differs from the Owner's obligations as described under Section A.2.3, indicate such differences in the space below. Additionally, if a party other than the Owner will be responsible for adjusting and settling a loss with the insurer and acting as the trustee of the proceeds of property insurance in accordance with Article 11 of the General Conditions, indicate the responsible party below.)

« »

[« »] § A.3.3.2.2 Railroad Protective Liability Insurance, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for Work within fifty (50) feet of railroad property.

[« »] § A.3.3.2.3 Asbestos Abatement Liability Insurance, with policy limits of not less than « » ($ « ») per claim and « » ($ « ») in the aggregate, for liability arising from the encapsulation, removal, handling, storage, transportation, and disposal of asbestos-containing materials.

[« »] § A.3.3.2.4 Insurance for physical damage to property while it is in storage and in transit to the construction site on an "all-risks" completed value form.

[« »] § A.3.3.2.5 Property insurance on an "all-risks" completed value form, covering property owned by the Contractor and used on the Project, including scaffolding and other equipment.

[« »] § A.3.3.2.6 Other Insurance
(List below any other insurance coverage to be provided by the Contractor and any applicable limits.)

Coverage	Limits

§ A.3.3.3 Other Insurance Requirements

§ A3.3.3.1 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 of the Contractor by this Exhibit A 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 this Exhibit A. 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. On the Certificate of Insurance, delete in the cancellation provision the following words, 'Endeavor to' and 'but failure to mail such notice shall impose no obligation or liability of any kind upon the company, its agents or representatives.

§ A3.3.3.2 The insurance company issuing the comprehensive general liability insurance coverage required for the performance of this contract shall be licensed to do business in Illinois with Best's Insurance Guide (current edition) rating of "A" or better and satisfactory to the Owner.

§ A3.3.3.3 The Contractor shall name the Owner and the Architect and each of their respective officers, directors, officials, board members, agents and employees as additional insureds on the Contractor's general liability policy for claims arising from the Contractor's operations, the automobile liability policy and the excess/ umbrella liability policy. The foregoing policies shall be endorsed to be primary over any other insurance which the additional insureds may have and shall contain a severability of interests clause. The Contractor shall require each of its subcontractors to comply with the requirements of this Section A3.3.3.3.

§ A.3.4 Performance Bond and Payment Bond

The Contractor shall provide surety bonds, from a company or companies lawfully authorized to issue surety bonds in the jurisdiction where the Project is ~~located,~~ located with a A.M. Best rating of "A" and with a surety company for which the Owner has no objection. The Contractor's performance bond and labor and materials payment bond shall be in the amount of one hundred percent (100%) of the Contract Sum, as follows:

(Specify type and penal sum of bonds.)

Type	Penal Sum ($0.00)
Payment Bond	See above.
Performance Bond	See above.

Payment and Performance Bonds shall be AIA Document A312™, Payment Bond and Performance Bond, or contain provisions identical to AIA Document A312™, current as of the date of this Agreement.

§ A3.4.1 The Contractor shall deliver the required bonds to the Owner not later than ten days following the date of notification of the Award of Contract or if the Work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

§ A3.4.2 The Contractor 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. Such bonds shall be in the form of American Institute of Architect's Document A-311 or a similar form worded exactly the same as Doc. A-311 and shall bear the same date as, or a date subsequent to, the date of the Contract. The bonds shall be issued by a bonding company licensed to operate in the State of Illinois and approved by the Owner.

§ A3.4.3 The failure of the Contractor to supply the required bonds within 10 days after the prescribed Agreement forms are presented for signature, or if the bonding company finds that the Contractor is NOT bondable, shall constitute a default, and the Owner may award the Contract to the next responsible low bidder.

§ 3.4.5 If at any time the Owner becomes dissatisfied with any Surety or Sureties then upon the Bonds, or for any other reason such Bonds shall cease to be adequate security for the Owner, the Contractor shall, within five (5) days after notice to do so, substitute acceptable Bonds in such forms and sum and signed by such other Sureties as may be satisfactory to the Owner. No further payments shall be deemed due nor shall be made until the new Sureties shall have qualified.

§ A3.4.6 Whenever the Contractor shall be and is declared by the Owner to be in default under the Contract, the Surety and Contractor are each responsible to make full payment to the Owner for any and all additional services of the Architect as which are required as a result of the Contractor's default and in protecting the Owner's right under the Agreement with the Contractor.

§ A3.4.7 The Contractor must within ten (10) days after the execution of this Agreement furnish a Performance Bond agreeing to pay not less than the prevailing wage for work to be performed in accordance with the Contract and the laws of the State of Illinois, and agreeing to pay all sums of money due for labor, materials, apparatus, fixtures or machinery and transportation with respect thereto, as in said Payment Bond provided, each dated the same day as the Agreement, in the forms prescribed by the Owner and each in an amount equal to the Contract Sum with a corporate Surety or Sureties acceptable to the Owner authorized to do business in the State of Illinois. These Bonds shall be maintained by the Contractor and shall remain in full force and effect until final acceptance of the work by the Owner or sixty (60) days following the date of Final Payment, whichever occurs later. The Contractor shall agree and shall cause the Surety to agree to be bound by each and every provision of the Contract Documents.

§ A3.4.8 In the event the Surety will make any assignment for the benefit of creditors or commit any act of bankruptcy, or if it shall be declared bankrupt or if it shall file a voluntary petition in bankruptcy or shall in the opinion of the Owner be insolvent, the Contractor shall agree forthwith upon request of the Owner to furnish and maintain other corporate Surety with respect to such bonds satisfactory to the Owner.

ARTICLE A.4 SPECIAL TERMS AND CONDITIONS

Special terms and conditions that modify this Insurance and Bonds Exhibit, if any, are as follows:

§ A.4.1 The Contractor is responsible for determining that subcontractors are adequately insured against claims arising out of or relating to the Work. The premium cost and charges for such insurance shall be paid by ~~each Subcontractor.~~

»

SECTION 01100

SUMMARY

PART 1 – GENERAL

1.1 PROJECT

A. Project Name: Alternative Classroom Renovation at: Chesterton Middle School.
B. Owner's Name: Duneland School Corporation.
C. The Project consists of the classroom renovations including:
   1. Mechanical installation of owner supplied equipment.
   2. Finish and ceiling installation – by other
D. The contractor for this project will also be responsible for:
   1. Coordination with mechanical equipment manufacturers for all issues related to installation of all pre-purchased equipment covered under this project (under separate contract), including, but not limited to:
      a. Midwest Applied Solutions
         1) Pre-Purchased VRF cassettes - Anticipated delivery date of July 9, 2021*
         2) Condensing units - Anticipated delivery date of July 9, 2021*
         3) Roof-top Dedicated Outside Air System (DOAS) unit - Anticipated delivery date of September 1, 2021*

      *Some items of the pre-purchase may be shipped separately, dates to be determined.

1.2 CONTRACT DESCRIPTION

A. Work covered by Contract Documents: As defined in the contract documents.
B. Definitions. The following terms are used throughout the Contract Documents. The work will be governed in accord with the definitions.
   1. Fabricated: Fabricated pertains to items specifically assembled or made of selected materials or components to meet individual design requirements.
   2. Manufactured: Manufactured means standard units, usually mass produced by an established manufacturer of the respective item.
   3. Provide: Provide means furnish and install.
   4. Shop fabricated or shop made: Shop fabricated or shop made refers to items made by a Contractor or Subcontractor in their own Shop.
C. Insurance
   1. Designated Purchaser:
      a. Owner shall purchase and maintain Builder's Risk Insurance in accord with the General Conditions.
      b. The Owner's insurance will be subject to a deductible of $5,000 per occurrence.
D. Contracts
   1. The Owner will award a single construction contract for all work specified in the Contract Documents.
   2. Upon award of the construction contract, the owner will issue a Letter of Intent to award a Construction Contract to the approved contractor. This Letter of Intent shall serve as a notice to proceed with the project according to the terms and conditions set forth in the Contract Documents, until the work under Contract Documents is completed. . The contractor shall commence all construction services as specified in the contract documents upon receipt of the Letter of Intent.

1.3 DUTIES OF CONTRACTOR

A. The contractor shall be responsible for providing and paying for:
   1. Labor, materials and equipment.
   2. Tools, construction equipment and machinery.
   3. Temporary water, heat and other utilities required for construction.
   4. Other facilities and services necessary for proper execution and completion of work.
B. The contractor shall be responsible for paying and securing all permits, governmental fees and licenses other than primary building permit necessary for the proper execution and completion of the Project.

C. The contractor shall comply with all codes, ordinances, rules, regulations, orders and other legal requirements of the public authorities which govern the performance of the work under the Contract Documents.
D. The contractor shall coordinate and have completed all inspections required by public authorities relating to the performance of the work under the Contract Documents including, but not limited to:
   1. Illinois Department of Public Health (IDPH) for all rough-in and final inspections of plumbing and food service work, as required.
   2. All inspections required in Section 01400 to be performed by a Testing and Inspection Agency.
E. The contactor shall have duty to promptly submit written notice to the Architect of any known or observed variances of the Contract Documents from legal requirements that may govern the work. Upon notice to the Architect, appropriate modifications will be made to the Contract Documents to account for the legal requirements. In the event the contractor fails to provide notice of any variances, he shall assume responsibility for any work known to be contrary to those legal requirements.
   1. The contractor shall enforce strict discipline and maintain good order among employees and subcontractors. Contractor shall not employ unfit person of those not skilled in the assigned task
F. The contractor acknowledges that the Project is exempt from all State and Local use taxes. It shall be the duty of the contractor to: 1) obtain a sales tax exemption certificate number from the Owner; 2) place exemption certificate number on invoices for materials incorporated in work; 3) furnish copies of invoices to Owner upon request 4) file a notarized statement that all purchases made under exemption certificate were entitled to be exempt with Owner upon completion of work; and 5) pay any penalties assessed for the improper use of exemption certificate number.

1.4 OWNER OCCUPANCY

A. The date of Substantial Completion shall be no later than August 10, 2021, 5:00 p.m. Note: Substantial Completion for this project refers to all scheduled work being a minimum 99% complete.
B. The date of Final Completion shall be no later than September 10, 2021, 5:00 p.m. Note: Final Completion for this project refers to all scheduled work, punch list and closeout items being 100% complete.
C. The Architect’s and their consultants’ services will terminate sixty (60) days after (1) the date of Substantial Completion of the Work or (2) the anticipated date of Substantial Completion identified in Specifications, whichever is earlier. Any work required of the Architect and their consultants after this date will be back-charged to the contractor by the Owner.
D. Refer to General Conditions for Liquidated Damages.

1.5 JOB OPERATIONS

A. Project Security:
   1. The contractor shall provide necessary precautions such as fences or barriers to protect Owner's personnel or members of the general public in the areas in which construction activity is on-going.
   2. The contractor shall securely close-off all areas of construction after working hours to prevent entry by unauthorized persons.
B. Project Hours:
   1. No time restrictions will be implemented. However, at any time, the Owner may choose to restrict work hours if the Owner/District feels the contractor is causing disruption to the learning environment, etc.
   2. Contractor to comply with Town’s noise ordinance.

1.6 WORK LIMITATIONS

A. All spaces around where work will be done may be occupied by Owner's personnel. Contractor shall limit the scope of its work during times of owner occupancy to prevent disturbing Owner.
B. Contractor shall schedule work in such a manner as to not disrupt mechanical or electrical systems for the existing adjacent buildings during times of Owner occupancy.
C. Contractor shall give Owner a minimum of three (3) days' notice before commencing work in Owner occupied area.

1.7 CONTRACTOR USE OF SITE AND PREMISES

A. Contractor shall confine work at the Project site as permitted by: 1) Law; 2) Permits; 3) the Contract Documents; 4) As instructed by Owner or Owner's representative; and 5) As required for Owner's use of adjacent facilities.
B. Confer with Owner's representative and obtain full knowledge of all Project site rules and regulations affecting work.
C. Contractor shall conform to the Project Site rules and regulations while engaged in its work.
D. Contractor acknowledges that the Project Site rules and regulations take precedence over other rules and regulations that may exist outside such jurisdiction.
E. Contractor shall be obligated to permit the Owner's representative to examine the contractor's list of employees, including those of his subcontractors and their agents, working on the Project Site. Contractor shall
    1. Keep all vehicles, mechanized or motorized equipment locked and secured at all times when parked and unattended on Owner's premises.
    2. Contractor shall not, under any circumstance, leave any vehicle unattended with its motor or engine running, or with its ignition key in place.
    3. All traffic control subject to Owner's representative's approval.
F. Do not unreasonably encumber site with materials or equipment.
G. Contractor shall assume full responsibility for protection safety and safekeeping of products stored on premises.
H. Contractor shall move all stored products or equipment which interferes with operations of Owner or other subcontractors.
I. Contractor shall obtain and pay for the use of additional storage or work areas needed for operations.
J. Contractor shall limit use of the Project Site for work and storage to areas depicted in the drawing or area approved in advance by Owner.
K. The contractor acknowledges that adjacent sites may be used by the Owner or members of the general public requiring contractor to maintain appropriate safety measures.
L. The contractor shall provide access to and from the Project Site as required by law and by Owner:
M. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.

1.8 SUBSTANCE ABUSE PREVENTION POLICY

A. Pursuant to the Substance Abuse Prevention on Public Works Act (820 IL CS 265/1, et seq.), employees of the contractor and employees of the contractor and employees of any subcontractor are prohibited from the use of drugs or alcohol , as defined in the Act, while performing on any public works project.
B. The contractor and any subcontractor shall file with the public body engaged in the construction of the public works: a copy of the substance abuse prevention program along with a cover letter certifying that their program meets the requirements of the Act or a letter certifying that the contractor or subcontractor has a collective bargaining agreement in effect dealing with the subject matter of this Act. A certification form is attached and must be completed by the contractor and each subcontractor to this contract.

1.9 WORK SEQUENCE

A. Construction services as specified herein shall commence upon issuance of the Letter of Intent to Award a Construction Contract.
B. All Shop Drawings to be submitted to the Architect within 21 calendar days upon issuance of the Letter of Intent.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

END OF SECTION

SECTION 01200

PRICE AND PAYMENT PROCEDURES

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Procedures for preparation and submittal of applications for progress payments.
B. Change order procedures.

1.2 RELATED SECTIONS
A. Section 01210 - Allowances: Payment procedures relating to allowances.
B. Section 01780 - Closeout Submittals.

1.3 SCHEDULE OF VALUES
A. Submit a printed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet or Architect approved similar.
B. Submit Schedule of Values in duplicate within 15 days after of the Letter of Intent.
C. Include in each line item the amount of Allowances specified. For unit cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
D. Submit separate quantities and amounts for material and labor for each respective line item.
E. Revise schedule to list approved Change Orders, with each Application For Payment.
F. Support values given with data to substantiate their correctness.
G. Submit quantities of designated materials.
H. List quantities of materials specified under unit prices.
I. Include in the line items a total amount of Contractor's overhead and profit.
J. Payment for materials stored on or off site will be limited to those materials listed separately in Schedule of Values.
K. Form of Submittal
    1. Submit typewritten Schedule of Values on 8-1/2 x 11 paper format.
    2. Utilize the Table of Contents of this Project Manual.
    3. Identify each line item with number and title of the specification Section.
    4. Separate costs under the various phases.
L. Preparation
    1. Itemize separate line cost for each of following cost items:
        a. Overhead and profit.
        b. Bonds.
        c. Insurance.
        d. General Requirements.
        e. Site mobilization.
    2. Itemize separate line item cost for work specified in each section of the specifications. Identify work of:
        a. Contractor's own labor forces.
        b. All subcontractors.
        c. All major suppliers of products or equipment.
    3. Break down installed costs into:
        a. Delivered cost of product, with taxes paid.
        b. Labor cost.
    4. For each line item which has an installed value of more than $10,000.00 break down costs to list amount of labor and amount of materials under each item.
        a. Contractor, subcontractor or supplier.
        b. Specification section number.
        c. Description of work or material.
        d. Quantity.
        e. Unit Price.
        f. Scheduled value.
        g. % of Contract.
    5. Round off figures to nearest ten dollars.

6. Make sum of total costs of all items listed in Schedule equal to total contract sum.

M. Review and Resubmittal
   1. After review by Architect, revise and resubmit Schedule as directed by Architect.
   2. Follow original submittal procedure.

N. Update
   1. Update Schedule of Values when:
      a. Change in cost occurs.
      b. Change of subcontractor or supplier occurs.
      c. Change of product or equipment occurs.
   2. Provide written justification for any changes requested by contractor.

1.4 APPLICATIONS FOR PROGRESS PAYMENTS

A. Payment Period: Submit at intervals stipulated in the Agreement.
B. Present required information in typewritten form.
C. Form: AIA G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet including continuation sheets when required or Architect approved equal.
D. For each item, provide a column for listing each of the following:
   1. Item Number.
   2. Description of work.
   3. Scheduled Values.
   4. Previous Applications.
   5. Work in Place and Stored Materials under this Application.
   6. Authorized Change Orders.
   7. Total Completed and Stored to Date of Application.
   8. Percentage of Completion
   9. Balance to Finish.
   10. Retainage.
E. Each item on the application for payment shall include retainage in the amount of 10% of the total work completed and stored to date of application. Upon reaching Substantial Completion, and with prior authorization of the Owner and the Architect, the retainage may be reduced to 5% for each item that is deemed substantially complete on the subsequent application for payment.
F. Execute certification by signature of authorized officer.
G. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products
H. List each authorized Change Order as a separate line item, for each respective subcontractor or material supplier listing Change Order number and dollar amount as for an original item of Work.
I. Submit three pencil copies of each Application for Payment for review and approval by Architect and Owner.
J. Revise Application and Certificate of payment as directed by Architect.
K. Once pencil copy has been approved by Architect, send three copies along with supporting documentation to the corporate office of the Architect.
L. Include the following with the application:
   1. Transmittal letter as specified for Submittals in Section 01300.
   2. Construction progress schedule, revised and current as specified in Section 01300.
   3. Partial release of liens from Contractor for current period.
      a. Release of liens to be provided on forms approved by the Architect prior to the first payment being submitted.
   4. Partial release of liens from all Subcontractors and vendors from prior period.
      a. Release of liens to be provided on forms approved by the Architect prior to the first payment being submitted.
   5. Affidavits attesting to off-site stored products, with original invoices. Statement of transfer of title upon payment and insurance coverage specifically identifying stored items.
M. When Architect requires substantiating information, submit data justifying dollar amounts in question. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

1.5 CHANGE ORDER PROCEDURES

A. Promptly implement Change Order procedures.
   1. Provide full written data required to evaluate changes.
   2. Maintain detailed records of work done on time-and-material/force account basis.
   3. Provide full documentation to Architect.

B. Designate in writing the member of Contractor's organization:
   1. Who is authorized to accept changes in Work.
   2. Who is responsible for informing others in Contractor's employ of authorization of changes in Work.
   3. If other than the Owner, the Owner will designate in writing the person(s) authorized to execute Change Orders.

C. Initiation of Contract Changes:
   1. Requests for change by the Contractor shall be initiated in writing.
   2. Subcontractors initiating a request for change shall direct their requests to the Contractor.
   3. The Architect will review and direct the Contractor's requests for change to the Owner or Owner's Representative with recommendations.
   4. Requests for change affecting contract sum or contract completion shall be made prior to starting any changes to the construction work or purchasing of materials. Failure to make appropriate written requests will invalidate any claims for additional costs or time for said work.

D. Owner Authorizes:
   1. The Owner or Owner's Representative, having considered the necessity of the requested change and availability of funds will authorize the Architect to prepare a request for proposal (RFP).

E. Architect Prepares Request for Proposal:
   1. The Architect, following consultation with the Contractor regarding subcontracts which will be affected by the proposed change, will prepare a RFP for Contractor response.
   2. Two sets of the RFP and Supplemental Drawings and Specifications for each proposed change are transmitted to the Contractor.

F. Contractors Prepare Proposals:
   1. Detailed Breakdown of Material Equipment and Labor:
      a. The Contractor or Subcontractor whose work is affected by a proposed change shall prepare a proposal for change.
      b. The detailed breakdown shall be prepared in accordance with the Contract Documents.
      c. If a change affects work covered by agreed on prices, such prices shall be used as the basis for adjustments to the contract sum.
      d. In all other cases, adjustments to the contract sum shall be based on the Contractor's direct cost, including costs of material, labor, equipment, bonds and taxes as applicable.
      e. Labor rates shall be itemized on the detailed breakdown indicating the trade base wage rate, total union fringe benefits, FICA, unemployment compensation insurance and workmen's compensation insurance. Labor charges shall not include costs for inefficiencies of construction supervision or labor.
      f. Change order adjustments to the contract developed above shall include amounts for overhead and profit which do not exceed average amounts indicated in the Schedule of Values, or an amount of 15%, whichever is less, and that no overhead and profit shall be deducted from the total price for changes reducing the cost of the contract. If the changed work is performed by a subcontractor, no more than 10% may be added to the subcontractor's costs for overhead and profit. An additional not to exceed 5% may be included for the Contractor's overhead and profit on all work provided directly by a subcontractor employed on the project.

G. Contractor Reviews:
   1. Reviews: The Contractor shall review all proposals for:
      a. Conformance with the RFP to ensure that all items and only those items of work affected by the proposed change are included.

b. Assurance that the proposals are submitted in conformance with the Contract Documents.

2. Transmittal: The Contractor shall forward to the Architect three complete sets of proposals with its recommendation regarding the proposal.
   a. In making recommendations, the Contractor shall certify that the price is appropriate and if it is not appropriate, shall state the reasons for not certifying the price.
   b. Proposals, complete with all required information, shall be submitted to the Architect within three weeks of the date of the RFP in order to receive further consideration.

H. Architect Reviews:
1. The Architect reviews the Contractor's proposals for completeness and conformance with the RFP and Contract Documents. Proposals which are incomplete or have inadequate detailed breakdowns will be returned to the Contractors for resubmission.
2. The Architect will review and, when appropriate, approve all price proposals recommending Owner approve issuance of a change order.
3. When the Architect considers the costs or quantities to be inappropriate to the work requested, the Architect will notify the Contractor in writing of the concerns and the Contractor will provide the necessary backup materials to justify the submittal or modify the submittal.
4. Submittals not properly justified will not be forwarded to the Owner and written notice as to the reasons will be forwarded to the Contractor. After 30 days of said written notification and no further response by the Contractor, the request will be considered inappropriate and will receive no further consideration.

I. Architect Issues Change Order:
1. The Architect, having received what is believed to be an appropriate and acceptable Contractor proposal for the proposed change and having received Owner's approval to issue a change order, the Architect will issue a Change Order.
2. The Change Order package prepared by the Architect for submittal to the Owner shall contain the following items:
   a. Three originals of the Change Order form with appropriate original signatures, along with supporting documentation including, but not limited to:
      1) Request for Proposal with signatures.
      2) Pristine copy of drawings and specifications.
      3) On changes initiated by the Architect, a letter explaining the circumstances related to the need for the change.
      4) On Owner requested Change Orders, a letter of request signed by the Owner's Representative.
      5) Change Order Authorization Form for Owner's Signature and permanent record in accord with Public Act 85-1295. When required on public work--for changes greater than $10,000.00 or 30 Days.

J. Owner Approves or disapproves Change Order: For change in Contract Sum and/or Contract Time.

K. One copy of approved Change Order with original signatures will be returned to the Contractor, or notice and explanation as to why it has been rejected will be forwarded to the Contractor.

1.6 APPLICATION FOR FINAL PAYMENT

A. Submit all closeout documents and comply with all requirements as put forth in Section 01780 - Closeout Submittals.

B. Once closeout submittal have been approved by Architect, prepare Application for Final Payment as specified for progress payments, identifying total adjusted Contract Sum, previous payments, and sum remaining due; including properly executed Consent of Surety.

C. Application for Final Payment will not be considered until the following have been accomplished:
1. All closeout procedures specified in Section 01780.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

END OF SECTION

SECTION 01210

ALLOWANCES

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Cash allowances.
B. Payment and modification procedures relating to allowances.

1.2 RELATED SECTIONS
A. Section 01200 - Price and Payment Procedures: Additional payment and modification procedures.

1.3 SELECTION AND PURCHASE
A. At the earliest practical date after award of the Contract, advise Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.
C. Purchase products and systems selected by Architect from the designated supplier.
D. Any unused allowance funds will be credited back to Owner by Change Order prior to close out.

1.4 SUBMITTALS
A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
C. Submit time sheets and other documentation to show labor time and cost for installation of allowance items that include installation as part of the allowance.
D. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.5 COORDINATION
A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.
B. Architect Responsibilities:
   1. Consult with Contractor for consideration and selection of products, suppliers, and installers.
   2. Select products in consultation with Owner and transmit decision to Contractor.
   3. Prepare Allowance Authorization.
C. Contractor Responsibilities:
   1. Assist Architect in selection of products, suppliers, and installers.
   2. Obtain proposals from suppliers and installers and offer recommendations.
   3. On notification of which products have been selected, execute purchase agreement with designated supplier and installer.
   4. Arrange for and process shop drawings, product data, and samples. Arrange for delivery.

1.6 CASH ALLOWANCES
A. Costs Included in cash allowances:
   1. Allowances shall cover the cost to the Contractor of materials and equipment delivered to the site and all required taxes, less applicable trade discounts.
   2. Contractor's costs for unloading and handling at the site, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Base Bid and not in the allowances.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Allowance No. 1: Cash Allowance: Include the stipulated sum of $5,000 for use upon Owner's instructions.

END OF SECTION

SECTION 01300

ADMINISTRATIVE REQUIREMENTS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Preconstruction meeting.
B. Site mobilization meeting.
C. Progress meetings.
D. Construction progress schedule.
E. Progress photographs.
F. Coordination drawings.
G. Submittals for review, information, and project closeout.
H. Number of copies of submittals.
I. Submittal procedures.

1.2 RELATED SECTIONS

A. Document 00700 - General Conditions: Dates for applications for payment.
B. Section 01100 - Summary: Stages of the Work, Work covered by each contract, occupancy.
C. Section 01200 - Price and Payment Procedures:
D. Section 01325 - Construction Progress Schedule: Form, content, and administration of schedules.
E. Section 01700 - Execution Requirements: Additional coordination requirements.
F. Section 01780 - Closeout Submittals: Project record documents.

1.3 PROJECT COORDINATION

A. Project Coordinator: Contractor.
B. Cooperate with the Contractor in allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
C. During construction, coordinate use of site and facilities through the Contractor.
D. Comply with procedures for intra-project communications; submittals, reports and records, schedules, coordination drawings, and recommendations; and resolution of ambiguities and conflicts.
E. Comply with instructions of the Contractor for use of temporary utilities and construction facilities.
    1. Direct and check-out of utilities, operational systems and equipment.
    2. Record dates of start of operation of systems and equipment.
F. Coordinate field engineering and layout work under instructions of the Contractor.
G. Develop and implement procedure for review and processing of applications for progress and final payments: Submit recommendation to Architect for Certification to Owner for Payment.
H. Establish on-site lines of authority and communication; schedule and conduct project meetings among:
    1. Owner's Representative.
    2. Architect.
    3. Subcontractors.
I. Cost Control:
    1. Maintain cost accounting records for authorized work performed under Unit Costs.
    2. Develop and implement procedure for review and processing of applications for progress and final payments: Submit recommendation to Architect for Certification to Owner for Payment.
J. Administer processing of:
    1. Shop drawings, product data and samples.
    2. Field drawings.
    3. Coordination drawings.
    4. Closeout submittals.
K. Maintain Reports and Records at Job Site:
    1. Daily log of progress of work, available to Architect and Owner.
    2. Verify that all subcontractors maintain record documents on a current basis.

3. At completion of Project, assemble record documents from all subcontractors and deliver to the Architect in accordance with Section 01780.
4. Assemble documentation for handling of claims and disputes.

L. Contractor to verify that specified cleaning is done during progress of work and at the completion of each subcontractor's work.
M. Make the following types of submittals to Architect through the Project Coordinator:
1. Requests for interpretation.
2. Requests for substitution.
3. Shop drawings, product data, and samples.
4. Submittals for information.
5. Test and inspection reports.
6. Design data.
7. Manufacturer's instructions and field reports.
8. Applications for payment and change order requests.
9. Progress schedules.
10. Coordination drawings.
11. Closeout submittals.

N. Upon contractor's determination of Substantial Completion of work or portion thereof, notify Architect in writing as to project status and request inspection and compilation of punch list of incomplete or unsatisfactory items.
O. Upon Architect's Certification of Date of Substantial Completion, supervise correction and completion of work within specified period.
P. Upon Contractor's determination that Work is finally complete:
1. Submit written notice to Architect and Owner, that Work is ready for final inspection.
2. Secure and transmit to Architect required closeout submittals as put forth in Section 01780.

Q. Contractor to turn over to Architect for approval all items for closeout as put forth in Section 01780.

PART 2 - PRODUCTS - NOT USED

PART 3 – EXECUTION

3.1 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting within 10 days of date of Letter of Intent.
B. Attendance Required:
1. Owner.
2. Architect.
3. Contractor:
4. Field Superintendent
5. Project Manager
6. Safety Representative.
7. Contractor's Major Subcontractors.

C. Minimum Agenda:
1. Items required to be submitted by Contractor at Preconstruction Meeting:
a. Fully executed bonds and Insurance Certificates
b. List of major Subcontractors and suppliers.
c. Tentative construction schedule.
d. Letter from Project Safety Representative certifying that he/she will be empowered as the Contractor's Safety Engineer, is responsible for enforcing all safety requirements and is familiar with the Manual of Accident Prevention in Construction by the Associated General Contractors of America, current edition, and further that the Contractor will maintain at the project a copy of said publication and will strictly enforce the applicable requirements of same.

2. Distribute and discuss documents required to be submitted by Contractor at Preconstruction meeting.
3. Execution of Owner-Contractor Agreement.
4. Identify critical work sequencing.
5. Discussion of schedule of values, and progress schedule.
6. Discussion of list of Subcontractors, list of Products, schedule of values, and progress schedule.
7. Designation of responsible personnel representing the parties to Contract; Owner, Architect and Contractor.
8. Establish chain of Authority.
9. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, Change Orders, and Contract closeout procedures.
10. Scheduling.
    a. Discuss major equipment deliveries and priorities.
11. Review of use of premises:
    a. Office and storage areas.
    b. Access to site and facilities.
12. Owner's requirements.
13. Security procedures.
14. Review requirements of and procedures for maintaining record documents.
15. Architect will record minutes and distribute copies within five days after meeting to participants, with copies to Contractor, Owner, participants, and those directly affected by decisions made.

3.2 SITE MOBILIZATION MEETING

A. Contractor will schedule a meeting at the Project site prior to Contractor occupancy.
B. Attendance Required:
    1. Contractor.
    2. Owner.
    3. Architect.
    4. Special Consultants.
    5. Contractor's Superintendent.
    6. Major Subcontractors.
    7. Safety Representative.
C. Agenda:
    1. Use of premises by Owner and Contractor.
    2. Owner's requirements and occupancy prior to completion.
    3. Construction facilities and controls provided by Owner.
    4. Temporary utilities provided by Owner.
    5. Survey and building layout.
    6. Security and housekeeping procedures.
    7. Schedules.
    8. Application for payment procedures.
    9. Procedures for testing.
    10. Procedures for maintaining record documents.
    11. Requirements for start-up of equipment.
    12. Inspection and acceptance of equipment put into service during construction period.
    13. Establish safety and first aid procedures.
    14. Procedures and reviews of mock-up panels.
D. Contractor will record minutes and distribute copies within five (5) days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.3 PROGRESS MEETINGS

A. Contractor will schedule and administer meetings throughout progress of the Work at maximum bi-monthly intervals.
B. Contractor will make arrangements for meetings, prepare agenda with copies for participants 5 business days in advance of meeting date, preside at meetings.
C. Attendance Required: Job superintendent, major Subcontractors and suppliers, Owner, Architect, as appropriate to agenda topics for each meeting.
D. Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems which impede planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Review of off-site fabrication and delivery schedules.
   7. Maintenance of progress schedule.
   8. Corrective measures to regain projected schedules.
   9. Planned progress during succeeding work period.
   10. Coordination of projected progress.
   11. Maintenance of quality and work standards.
   12. Effect of proposed changes on progress schedule and coordination.
   13. Other business relating to Work.
   14. Process Payment Requests Monthly.
E. Contractor shall record minutes and distribute copies within Five (5) calendar days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4 CONSTRUCTION PROGRESS SCHEDULE - See Section 01325

3.5 PROGRESS PHOTOGRAPHS

A. Provide photographs of site and construction throughout progress of.
B. Take photographs on the first day of each week.
C. Take photographs as evidence of existing project conditions as follows:
   1. Interior views.
   2. Exterior views.
D. Prints: Electronic format.
E. Deliver prints with each Application for Payment with transmittal letter specified in this Section.
F. Deliver one set of prints each to Architect and Project record documents file.

3.6 COORDINATION DRAWINGS

A. Conduct coordination meetings in accordance with each respective section as work progresses. Contractor shall coordinate with Architect for such meetings.
B. Provide information required by Contractor for preparation of coordination drawings.
C. Review drawings prior to submission to Architect.

3.7 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
   1. Product data.
   2. Shop drawings.
   3. Samples for selection.
   4. Samples for verification.
B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.
C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01780 - CLOSEOUT SUBMITTALS.

3.8 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
   1. Design data.
   2. Certificates.
   3. Test reports.
   4. Inspection reports.
   5. Manufacturer's instructions.
   6. Manufacturer's field reports.
   7. Other types indicated.
B. Submit for Architect's knowledge as contract administrator or for Owner.

3.9 SUBMITTALS FOR PROJECT CLOSEOUT

A. When the following are specified in individual sections, submit them at project closeout:
   1. Project record documents.
   2. Operation and maintenance data.
   3. Warranties.
   4. Bonds.
   5. Lien Waivers.
   6. Other types as indicated.
B. Submit for Owner's benefit during and after project completion.

3.10 NUMBER OF COPIES OF SUBMITTALS

A. Documents for Review or for information:
   1. The Contractor has the option of providing Submittals for review or for information either as a hard copy or electronically as outlined below.
   2. If Submittal is provided as a hard copy:
      a. Submit the number of copies which the Contractor requires, plus three copies which will be retained by the Architect.
   3. If Submittal is provided electronically:
      a. Deliver one copy of submittal to Architect via email or Compact Disc in PDF file format.
      b. At Architect’s discretion, the reviewed submittal, with any corrections, will be returned as one electronic copy in PDF format, or as one hard copy delivered to the Contractor.
B. Documents for Project Closeout: Shall be submitted as hard copies only. Make one reproduction of submittal originally reviewed. Submit one extra of submittals for information.
C. Samples: Submit the number specified in individual specification sections; one of which will be retained by Architect.
   1. After review, produce duplicates.
   2. Retained samples will not be returned to Contractor unless specifically so stated.

3.11 SUBMITTAL PROCEDURES

A. Sequentially number the transmittal form and clearly indicate the respective specification section number for reference. Revise submittals with original number and a sequential alphabetic suffix.
B. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.
C. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents.
D. Deliver submittals to Architect at business address or via email.
E. Schedule submittals to expedite the Project, and coordinate submission of related items.
F. For each submittal for review, allow 10 days excluding delivery time to and from the Contractor.

G. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.
H. Provide space for Contractor and Architect review stamps.
I. Shop drawings which incorporate, in part or in whole, direct reproductions of the contract documents, are not acceptable and will be returned, without review, to the contractor, for resubmittal.
J. All shop drawings which are poorly prepared or hand written will be returned, without review, to the contractor for resubmittal. Architect's determination of properly prepared shop drawings is final.
K. Electronic Media/Files
    1. Construction drawings for this project have been prepared by the Architect and Engineer utilizing the following Computer Aided Drawing (CAD) System: Auto Cad Release 2015.
    2. Contractors and Subcontractors may purchase electronic media files of the Contract Documents.
    3. Upon request to purchase electronic media or files, the Contractor shall complete the "Request for Electronic Drawing Files" issued by the Architect and issue the appropriate fee to the Architect.
    4. Sheets can be formatted to provide background information only, background plus various layers of equipment; or of complete sheets as issued for construction.
    5. The Contractor may utilize these CAD Drawings in the preparation of their Shop Drawings and as built drawings only.
    6. The information issued is provided in a good faith effort to expedite the Project and simplify the efforts of the Contractor with no guarantee by the issuer as to the accuracy or correctness of the information provided. The Architect accepts no responsibility or liability for the Contractor's or subcontractor's use of these CAD documents.
    7. The use of these CAD documents by the Contractor(s) does not relieve them of their responsibility to field measure existing conditions and to properly fit the work to the Project.
    8. These documents will be provided when purchased for the convenience of the Contractor and this Project. Ownership and use of the issued documents are governed by the terms of the General Conditions.
L. Submittals
    1. **Submit all submittals within 21 calendar days after date of Letter of Intent.** Failure to do so may cause scheduled contractor payments to be withheld.
    2. **Submit all manufacturer's letter's confirming prompt ordering of all material and equipment within 21 calendar days after date of Letter of Intent.** Failure to do so may cause scheduled contractor payments to be withheld. Confirmation Letters are to include the following:
        a. Order date.
        b. Manufacturing date.
        c. Delivery date.
        d. Confirmation that no factors will deter delivery on schedule.
        e. Any other pertinent information.
    3. Submit four prints of shop drawings, and number of copies of product data and samples which Contractor requires for distribution and future submission under Section 01700 plus one copy which will be retained by Architect.
    4. Submit number of samples specified in each of specification sections.
    5. Accompany submittals with transmittal letter, in duplicate, containing:
        a. Date.
        b. Project title and number.
        c. Contractor's name and address.
        d. Relevant Specification section number.
        e. The number of shop drawings, product data and samples submitted.
        f. Notification of any deviations from Contract Documents.
        g. Other pertinent data.

6. Submittals shall include:
    a. Date and revision dates.
    b. Project title and number.
    c. Names of:
        1) Architect
        2) Architect's consultant(s)
        3) Subcontractor
        4) Sub-subcontractor.
        5) Supplier.
        6) Manufacturer.
        7) Separate detailer when pertinent.
    d. Identification of product or material.
    e. Relation to adjacent structure or material.
    f. Field dimensions, clearly identified as such.
    g. Specification section and page number.
    h. Specified standards, such as ASTM number or Federal Specification.
    i. A blank space, 4" x 6" for Architect's stamp.
    j. Identification of previously approved deviation(s) from Contract Documents.
    k. Identification of color selections required and color selection charts.
7. All shop drawing submittals received by the Architect which do not bear the contractor's approval stamp and initials or signatures will be returned, without review, to the contractor, for resubmittal.
8. All shop drawing submittals which do not contain a reproducible transparency set of the submittal will be returned without review, to the contractor, for resubmittal.

M. Resubmission Requirements
1. Shop Drawings:
    a. Definition: Shop Drawings are original drawings prepared by Contractor, subcontractor, sub-subcontractor, supplier or distributor, which illustrates some portion of the work, showing fabrication, layout, setting or erection details.
    b. Revise initial drawings as directed and resubmit in accordance with submittal procedures.
    c. Indicate on drawings all changes which have been made in addition to those requested by Architect.
    d. Clearly indicate by revision number and date, each resubmittal of each shop drawing.
    e. When revised for resubmission, identify all changes made since previous submission.
    f. Shop drawings which incorporate, in part or in whole, direct reproductions of the contract documents, will NOT be accepted and will be returned without review.
2. Product data and samples: Submit new data and samples as specified for initial submittal.
3. Make all resubmittals within 10 business days after date of Architect's previous review.

N. Distribution of Submittals After Review
1. Contractor will distribute copies of shop drawings and product data which carry Architect's stamp to:
    a. Contractor's file.
    b. Job site file.
    c. Record documents file.
    d. Subcontractors.
    e. Suppliers.
    f. Fabricators.
    g. Other contractors as required.
2. Distribute samples as directed in accordance with Contract Documents.
3. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

O. Contractor Responsibilities
   1. Review shop drawings, product data and samples prior to submission to the next level of authority.
   2. Verify:
      a. Field dimensions and drawing dimensions.
      b. Field construction criteria.
      c. Catalog numbers and similar data.
      d. Compliance of items submitted with Contract Documents.
      e. Dimensions and elevations requirements necessary to properly install product.
   3. Coordinate each submittal with requirements of:
      a. The Work.
      b. The Contract Documents.
      c. The work of other subcontractors.
   4. Contractor's responsibility for errors and omissions in submittals is not relieved by Architect/Engineer's review of submittals.
   5. Notify Architect in writing prior to submission and specifically on the submittal, of proposed deviations in submittals from contract requirements.
   6. Contractor's responsibility for notifying Architect of deviations and for correcting deviations not properly identified in submittals is not relieved by Architect's review of improperly documented submittals.
   7. Do not begin any work which requires submittals without having Architect's stamp and initials or signature indicating review.
   8. After Architect's review, make response required by Architect's stamp and distribute copies. Indicate by transmittal that copy of approved data has been distributed.
   9. Subcontractors:
      a. Subcontractors send their submittals to the Contractor.
      b. Contractor reviews and initials submittals for compliance with scope, coordination and integration with the work of all other subcontractors.
      c. Contractor transmits his reviewed copies of subcontractor's submittals to Architect.
      d. Contractor retains copy of submittals after review by Architect and distributes copies to submitting subcontractor and to other subcontractors for coordination and integration.
      e. Contractor: Enforce resubmission requirements.

P. Architect's Duties
   1. Review submittals within 10 business days.
   2. Review for compliance to design concept of project.
   3. Review all requests for proposed deviations. Obtain Owner's concurrence and respond to Contractor's request.
   4. Review of separate item does not constitute review of an assembly in which item functions.
   5. Affix stamp, date, and initials or signature certifying to review of submittal, and with instructions for contractor response.
   6. Return submittals to Contractor for response or distribution.
   7. Select product colors upon receipt of all shop drawings and submittals requiring color selections.

Q. Submittals not requested will not be recognized or processed.

END OF SECTION

SECTION 01325

CONSTRUCTION PROGRESS SCHEDULE

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Preliminary schedule.
B. Construction progress schedule, bar chart type.

1.2 RELATED SECTIONS
A. Section 01100 - Summary: Work sequence.

1.3 REFERENCES
A. AGC (CPM) - The Use of CPM in Construction - A Manual for General Contractors and the Construction Industry; Associated General Contractors of America; 1976.

1.4 PRECONSTRUCTION MEETING
A. Within 10 days after date of Agreement, submit preliminary schedule defining planned operations for the first 90 days of Work, with a general outline for remainder of Work
B. If preliminary schedule requires revision after review, submit revised schedule within 10 days.
C. Within 20 days after review of preliminary schedule, submit draft of proposed complete schedule for review.
    1. Include written certification that major contractors have reviewed and accepted proposed schedule.
        a. Within 10 days after joint review, submit complete schedule.
D. Submit updated schedule every 30 days or as requested by Architect.
E. Submit the number of opaque reproductions that Contractor requires, plus one copy which will be retained by Architect and Owner. Furnish additional copies when directed.
F. Submit under transmittal letter form specified in Section 01300.

1.5 QUALITY ASSURANCE
A. Scheduler: Contractor's personnel or specialist Consultant specializing in CPM scheduling with five years minimum experience in scheduling construction work of a complexity comparable to this Project, and having use of computer facilities capable of delivering a detailed graphic printout within 48 hours of request.

1.6 SCHEDULE FORMAT
A. Listings: In chronological order according to the start date for each activity. Identify each activity with the applicable specification section number.
B. Diagram Sheet Size: Maximum 11x17 inches or width required.
C. Sheet Size: Minimum of 8-1/2 x 11 inches, Maximum of 24" x 36".
D. Scale and Spacing: To allow for notations and revisions.

1.7 START OF CONSTRUCTION SERVICES
A. Construction services as specified herein shall commence upon issuance of the Letter of Intent to Award a Construction Contract.

PART 2 – PRODUCTS - NOT USED

PART 3 – EXECUTION

3.1 PRELIMINARY SCHEDULE

A. Prepare (preliminary) schedule in the form of a horizontal bar chart.

3.2 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.
B. Identify each item by specification section number.
C. Identify work of separate stages and other logically grouped activities.
D. Provide sub-schedules for each stage of Work identified in Section 01100.
E. Provide sub-schedules to define critical portions of the entire schedule.
F. Include conferences and meetings in schedule.
G. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the first day of each month.
H. Provide separate schedule of submittal dates for shop drawings, product data, and samples, owner-furnished products, Products identified under Allowances, and dates reviewed submittals will be required from Architect. Indicate decision dates for selection of finishes.
I. Indicate delivery dates for owner-furnished products.
J. Coordinate content with schedule of values specified in Section 01200.
K. Provide legend for symbols and abbreviations used.

3.3 BAR CHARTS

A. Include a separate bar for each major portion of Work or operation.
B. Identify the first work day of each week.

3.4 NETWORK ANALYSIS

A. Prepare network analysis diagrams and supporting mathematical analyses using the Critical Path Method.
B. Illustrate order and interdependence of activities and sequence of work; how start of a given activity depends on completion of preceding activities, and how completion of the activity may restrain start of subsequent activities.
C. Mathematical Analysis: Tabulate each activity of detailed network diagrams, using calendar dates, and identify for each activity:
    1. Preceding and following event numbers.
    2. Activity description.
    3. Estimated duration of activity, in maximum 15 day intervals.
    4. Earliest start date.
    5. Earliest finish date.
    6. Actual start date.
    7. Actual finish date.
    8. Latest start date.
    9. Latest finish date.
    10. Total and free float; float time shall accrue to Owner and to Owner's benefit.
    11. Monetary value of activity, keyed to Schedule of Values.
    12. Percentage of activity completed.
    13. Responsibility.
D. Analysis Program: Capable of compiling monetary value of completed and partially completed activities, accepting revised completion dates, and re-computation of all dates and float.
E. Required Reports: List activities in sorts or groups:
    1. By preceding work item or event number from lowest to highest.
    2. By amount of float, then in order of early start.
    3. By responsibility in order of earliest possible start date.
    4. In order of latest allowable start dates.
    5. In order of latest allowable finish dates.

6. Contractor's periodic payment request sorted by Schedule of Values listings.
7. Listing of basic input data which generates the report.
8. Listing of activities on the critical path.

3.5 REVIEW AND EVALUATION OF SCHEDULE

A. Participate in joint review and evaluation of schedule with Architect at each submittal.
B. Evaluate project status to determine work behind schedule and work ahead of schedule.
C. After review, revise as necessary as result of review, and resubmit within 5 days.

3.6 UPDATING SCHEDULE

A. Maintain schedules to record actual start and finish dates of completed activities.
B. Indicate progress of each activity to date of revision, with projected completion date of each activity.
C. Annotate diagrams to graphically depict current status of Work.
D. Identify activities modified since previous submittal, major changes in Work, and other identifiable changes.
E. Indicate changes required to maintain Date of Substantial Completion.
F. Submit reports required to support recommended changes.
G. Provide narrative report to define problem areas, anticipated delays, and impact on the schedule. Report corrective action taken or proposed and its effect including the effects of changes on schedules of separate contractors.

3.7 DISTRIBUTION OF SCHEDULE

A. Distribute copies of updated schedules to Contractor's project site file, to Subcontractors, suppliers, Architect, Owner, and other concerned parties.
B. Instruct recipients to promptly report, in writing, problems anticipated by projections shown in schedules.

END OF SECTION

SECTION 01400

QUALITY REQUIREMENTS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. References and standards.
B. Quality assurance submittals.
C. Mock-ups.
D. Control of installation.
E. Tolerances.
F. Testing and Inspection Agencies.
G. Manufacturers' field services.

1.2 RELATED SECTIONS

A. Section 01210 - Allowances: Allowance for payment of testing services.
B. Section 01300 - Administrative Requirements: Submittal procedures.
C. Section 01600 - Product Requirements: Requirements for material and product quality.

1.3 SUBMITTALS

A. Design Data: Submit for Architect's knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
B. Test Reports: After each test/inspection, promptly submit five copies of report to Architect and to Contractor.
    1. Include:
        a. Date issued.
        b. Project title and number.
        c. Testing laboratory name and address.
        d. Name and signature of inspector.
        e. Date and time of sampling or inspection.
        f. Record of temperature and weather.
        g. Identification of product and specifications section.
        h. Location in the Project.
        i. Type of test/inspection.
        j. Date of test/inspection.
        k. Results of test/inspection.
        l. Conformance with Contract Documents.
        m. When requested by Architect, provide interpretation of results.
    2. Test reports are submitted for Architect's knowledge as contract administrator or for the Owner, for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
C. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
    1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
    2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.
D. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
E. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
    1. Submit report in duplicate within 30 days of observation to Architect for information.
    2. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

F. Erection Drawings: Submit drawings for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.
   2. Data indicating inappropriate or unacceptable Work may be subject to action by Architect or Owner.

1.4 REFERENCES AND STANDARDS - See Section 01425

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.1 CONTRACTOR CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
B. Comply with manufacturers' instructions, including each step in sequence.
C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
E. Have Work performed by persons qualified to produce required and specified quality.
F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.
G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

3.2 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
B. Comply with manufacturer's tolerances. Should manufacturer's tolerances conflict with Contract Documents, request clarification from Architect before proceeding.
C. Where specified tolerances within individual sections exceed those accepted by the Manufacturer, comply with the more astringent tolerances specified.
D. Adjust products to appropriate dimensions; position before securing products in place.

3.3 TESTING AND INSPECTION

A. See individual specification sections for testing and inspection required.
B. Testing Agency Duties:
   1. Test samples of mixes submitted by Contractor.
   2. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   3. Acquaint Architect's personnel with testing procedures and with all special conditions encountered at the site.
   4. Perform specified inspections, sampling and testing of products in accordance with specified standards.
   5. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   6. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
   7. Perform additional tests and inspections required by Architect.
   8. Attend preconstruction meetings and progress meetings as directed by Architect.
   9. Submit reports of all tests/inspections specified.

10. Obtain written acknowledgement of each inspection, sampling and test made from subcontractor whose work is being tested.

C. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

D. Contractor Responsibilities:
   1. Provide to agency at designated location, adequate samples of materials proposed to be used which require testing, along with proposed mix designs.
   2. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
      a. Monitor or direct superintendent to monitor each inspection, sampling and test.
      b. Provide laboratory with written acknowledgement of each inspection, sampling or test.
      c. Within 24 hours notify Architect in writing of reasons for not acknowledging laboratory field procedures.
   3. Furnish copies of mill test reports.
   4. Furnish verification of compliance with contract requirements for materials and equipment
   5. Provide incidental labor and facilities:
      a. To provide access to Work to be tested/inspected.
      b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
      c. To facilitate tests/inspections.
      d. To provide storage and curing of test samples.
   6. Notify Architect and laboratory 48 hours prior to expected time for operations requiring testing/inspection services.
   7. Employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   8. Arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
   9. Correct work which is defective or which fails to conform to the Contract Documents in accordance with the General conditions. Corrective work shall not delay the project schedule or the work of other subcontractors.
   10. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect. Payment for re testing will be charged to the Contractor by deducting testing charges from the Contract Price.

3.4 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Submit qualifications of observer to Architect 30 days in advance of required observations.
   1. Observer subject to approval of Architect.
   2. Observer subject to approval of Owner.

C. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.

3.5 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

B. If, in the opinion of Architect, it is not practical to remove and replace the Work, Architect will direct an appropriate remedy or adjust payment.

END OF SECTION

SECTION 01425

REFERENCE STANDARDS

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Requirements relating to referenced standards.
B. Reference standards full title and edition date.

1.2 RELATED SECTIONS
A. Document 00700 - General Conditions: Reference standards.

1.3 QUALITY ASSURANCE
A. For products or workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.
B. Conform to reference standard of date of issue specified in this section, except where a specific date is established by applicable code.
C. Obtain copies of standards when required by the Contract Documents.
D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.
E. Should specified reference standards conflict with Contract Documents, request clarification from the Architect before proceeding.
F. Neither the contractual relationships, duties or responsibilities of the parties in Contract nor those of the Architect shall be altered by the Contract Documents by mention or inference otherwise in any reference document.

PART 2 – CONSTRUCTION INDUSTRY ORGANIZATION DOCUMENTS

2.1 AA – ALUMINUM ASSOCIATION, INC.
A. AA ADM-1 - Aluminum Design Manual; 2000.
B. AA DAF-45 - Designation System for Aluminum Finishes; 2003.
C. AA SAAA-46 - Standards for Anodized Architectural Aluminum; 1978.
D. AA BDAS-516161 - Behavior and Design of Aluminum Structures; 1992.

2.2 AABC -- ASSOCIATED AIR BALANCE COUNCIL
A. AABC MN-1 - AABC National Standards for Total System Balance; 2002.

2.3 AAMA -- AMERICAN ARCHITECTURAL MANUFACTURERS ASSOCIATION
A. AAMA/NWWDA 101/I.S.2 - Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors; 1997 with revisions contained in "reprinting" of 12/99.
B. AAMA 303 - Voluntary Specification for Poly (Vinyl Chloride) (PVC) Exterior Profile Extrusions; 2000.
C. AAMA 501 - Methods of Test for Exterior Walls; 1994.
D. AAMA 501.1 - Standard Test Method for Exterior Windows, Curtain Walls and Doors for Water Penetration Using Dynamic Pressure; 1994 (part of AAMA 501).
E. AAMA 501.2 - Field Check of Metal Storefronts, Curtain Walls, and Sloped Glazing Systems for Water Leakage; 1994 (part of AAMA 501).
F. AAMA 501.3 - Field Check of Water Penetration Through Installed Exterior Windows, Curtain Walls, and Doors by Uniform Air Pressure Difference (part of AAMA 501); 1994.
G. AAMA 603.8 - Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum; 1998.
H. AAMA 605.2 - Voluntary Specification for High Performance Organic Coatings on Architectural Aluminum Extrusions and Panels; 1998.
I. AAMA 606.1 - Voluntary Guide Specifications and Inspection Methods for Integral Color Anodic Finishes for Architectural Aluminum; 1976.

J. AAMA 607.1 - Voluntary Guide Specification and Inspection Methods for Clear Anodic Finishes For Architectural Aluminum; 1977.
K. AAMA 608.1 - Voluntary Guide Specification and Inspection Methods for Electrolytically Deposited Color Anodic Finishes for Architectural Aluminum; 1977.
L. AAMA 609 - Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum; 2002.
M. AAMA 610.1 - Voluntary Guide Specification for Cleaning and Maintenance of Painted Aluminum Extrusions and Curtain Wall Panels; 1979.
N. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 1998.
O. AAMA 701/702 - Combined Voluntary Specifications for Pile Weatherstrip and Replaceable Fenestration Weatherseals; 2000.
P. AAMA 800 - Voluntary Specifications and Test Methods for Sealants; 1992, Addendums 1994, 2000.
Q. AAMA 802.3 - Compound (Part of AAMA 800); 1992.
R. AAMA 803.3 - Voluntary Specifications and Test Methods for Narrow Joint Seam Sealer (Part of AAMA 800); 1992.
S. AAMA 804.3 - Sealants: Back Bedding Mastic Type Glazing Tapes (Part of AAMA 800); 1992.
T. AAMA 806.3 - Tape (Part of AAMA 800); 1992.
U. AAMA 807.3 - Glazing Tape (Part of AAMA 800); 1992.
V. AAMA 809.2 - Sealants: Non-Drying Sealant (Part of AAMA 800); 1992.

PART 3 – EXECUTION – NOT USED

END OF SECTION

SECTION 01600

PRODUCT REQUIREMENTS

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. General product requirements.
B. Transportation, handling, storage and protection.
C. Product option requirements.
D. Substitution limitations and procedures.
E. Procedures for Owner-supplied products.
F. Spare parts and maintenance materials.

1.2 RELATED SECTIONS
A. Document 00100 - Instructions to Bidders: Product options and substitution procedures prior to bid date.
B. Section 01400 - Quality Requirements: Product quality monitoring.

1.3 REFERENCES
A. NFPA 70 - National Electrical Code; National Fire Protection Association; 2002.

1.4 SUBMITTALS
A. Proposed Products List: Submit list of major products proposed for use, with name of manufacturer, trade name, and model number of each product; submit 3 copies to Architect.
   1. Submit within 20 days after date of Letter of Intent.
   2. For products specified only by reference standards, list applicable reference standards.
B. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
C. Shop Drawing Submittals: Prepared specifically for this Project.
D. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.
E. Indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
F. Provide name and address of similar projects on which product was used and date of installation.
G. Provide detailed description and drawings illustrating construction methods.
H. Provide itemized comparison and accurate cost data of proposed substitution in comparison with product or method specified.
I. Provide data relating to changes in contracts, coordination issues, and construction schedules.
J. Manufacturer's Instructions: When Contract Documents specify that installation shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to all parties involved in the installation, including three copies to the Architect.

PART 2 – PRODUCTS

2.1 NEW PRODUCTS
A. Provide new products unless specifically required or permitted by the Contract Documents.
B. Motors: Refer to Section 15065, NEMA MG 1 Type. Specific motor type is specified in individual specification sections.
C. Materials and Equipment Incorporated Into The Work
   1. NO MATERIAL OR PRODUCT SHALL BE DELIVERED TO, PROVIDED FOR OR INSTALLED ON PROJECT WHICH CONTAINS ANY ASBESTOS OR ASBESTOS-CONTAINING MATERIAL.
   2. Conform to project specifications and standards.
   3. Comply with size, make, type and quality specified.

4. Manufactured and fabricated products:
   a. Design, fabricate and assemble in accord with best engineering and shop practices.
   b. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
   c. Two or more items of the same kind shall be identical from the same manufacturer.
   d. All parts of systems shall be from the same manufacturer to the greatest extent practicable.
   e. Adhere to equipment capacities, sizes and dimensions shown or specified unless variations are specifically approved by Change Order.

2.2 PRODUCT OPTIONS

A. Base all bids on providing all products exactly as specified.
B. Products Specified by Reference Standards or by Description Only: Use any product meeting those standards or description.
C. Products Specified by Naming One or More Manufacturers: Use a product of one of the manufacturers named and meeting specifications, no options or substitutions allowed.
D. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

2.3 SPARE PARTS AND MAINTENANCE PRODUCTS

A. Provide spare parts, maintenance, and extra products of types and in quantities specified in individual specification sections.
B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 – EXECUTION

3.1 SUBSTITUTION PROCEDURES

A. Instructions to Bidders specify time restrictions for submitting requests for substitutions during the bidding period. Comply with requirements specified in this section.
B. Architect will consider requests for substitutions only within 20 days after date of Letter of Intent.
C. Substitutions may be considered at a later date only when a product becomes unavailable through no fault of the Contractor.
D. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.
E. For products specified only by reference or performance standards, select any product which meets or exceeds standards, by any manufacturers, subject to the Architect's approval.
F. For products specified by naming several products or manufacturers, select any product and manufacturer named which conforms to the intent of the documents.
G. Substitutions, Bidder/Contractor Options
   1. Prior to Bid Opening: The Architect will consider written requests to amend the bidding documents to add products not specified provided such requests are received at least 10 calendar days prior to bid opening date. Requests received after that time will not be considered. When a request is approved, the Architect will issue an appropriate addendum not less than three calendar days prior to the bid opening.
   2. With Bid: A bidder may propose substitutions with his bid by completing the Substitution Sheet with the Bid Form, subject to the provisions stated thereon. Architect will review Substitution Sheet of low bidder and recommend approval or rejection by Owner prior to award of Contract.
   3. After Award of Contract: No substitutions will be considered after Notice of Award except under one or more of the following conditions:
      a. Substitutions required for compliance with final interpretations of code requirements or insurance regulations.
      b. Unavailability of specified products, through no fault of Contractor or subcontractor.

c. Subsequent information discloses inability of all specified products to perform properly or to fit in designated space.
d. Manufacturer/fabricator refusal to certify or guarantee performance of specified product as specified.
e. When a substitution would be substantially beneficial to the Owner.

H. A request for substitution constitutes a representation that the submitter:
1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Will provide the same warranty for the substitution as for the specified product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

I. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

J. Substitution Submittal Procedure:
1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence. Burden of proof is on proposer.
3. The Architect will notify Contractor in writing of decision to accept or reject request.
4. Complete data substantiating compliance of proposed substitution with Contract Documents.
5. For products:
a. Product identification, including manufacturer's name and address.
b. Manufacturer's literature:
1) Product description.
2) Performance and test data.
3) Reference standards.
c. Samples.
d. Name and address of similar projects on which product was used and date of installation.
6. For construction methods:
a. Detailed description of proposed method.
b. Drawings illustrating methods.
7. Itemized comparison of proposed substitutions with product or method specified.
8. Data relating to changes in construction schedules.
9. Identify:
a. Other contract affected.
b. Changes or coordination required.
10. Accurate cost data on proposed substitution in comparison with product or method specified.

K. Provide cost data that is complete and includes all related costs under Bidder/Contractor contract, but excludes:
1. Costs under separate contracts.
2. Architect's redesign.
3. Administrative costs of Architect.

3.2 OWNER-SUPPLIED PRODUCTS

A. See Section 01100 - Summary for identification of Owner-supplied products.

B. Owner's Responsibilities:
1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
2. Arrange and pay for product delivery to site.
3. On delivery, inspect products jointly with Contractor.

4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
5. Arrange for manufacturer's warranties, inspections, and service.

C. Contractor's Responsibilities:
1. Review Owner reviewed shop drawings, product data, and samples.
2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.3 TRANSPORTATION AND HANDLING

A. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.
B. Transport and handle products in accordance with manufacturer's instructions.
C. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.
D. Arrange for transportation and deliveries of materials and equipment in accordance with approved current construction schedules and in ample time to facilitate inspection prior to installation.
E. Coordinate deliveries to avoid conflict with work and condition at site.
F. Deliver products in undamaged condition in original containers or packaging, with identifying labels intact and legible. Clearly mark partial deliveries of component parts of assemblies or equipment to permit easy identification of parts and to facilitate assembly.
G. Lift packages, equipment, or components only at designated lift points.
H. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.
I. Provide equipment and personnel, including those furnished by Owner, to handle products by methods to prevent soiling, disfigurement, or damage.
J. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.4 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.
B. Store and protect products in accordance with manufacturer's instructions.
C. Store with seals and labels intact and legible.
D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product. Materials may be new or used at Contractor's option, but shall be non-staining, non-hazardous, and of sufficient strength and durability for proposed use.
E. Submittals
1. Request for allocation of storage space.
2. List of materials and equipment to be stored.
3. Proposed location for storage.
4. Special storage requirements.
5. Schedule of anticipated storage dates.

F. For exterior storage of fabricated products, place on sloped supports above ground.
G. Provide bonded off-site storage and protection when site does not permit on-site storage or protection. Off-site storage will be permitted only on Owner's prior written authorization in accordance with General Conditions.
H. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
I. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
J. Prevent contact with material that may cause corrosion, discoloration, or staining.
K. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.
L. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

M. Locate storage areas where authorized by Architect, Contractor will resolve conflicts in storage requirements of all subcontractors. Do not inhibit use of:
   1. Fire exits.
   2. Fire lanes.
   3. Parking.
   4. Work of other contractors.
   5. Owner.

N. Provide separate storage for combustible and non-combustible products. Store combustible materials in accordance with Fire Protection Agency's regulations.

O. Remove all temporary storage, contents and utilities at completion of construction activities or when requested by the Architect.

END OF SECTION

SECTION 01700

EXECUTION REQUIREMENTS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.
B. Pre-installation meetings.
C. Cutting and patching.
D. Cleaning and protection.
E. Starting of systems and equipment.
F. Demonstration and instruction of Owner personnel.
G. Closeout procedures, except payment procedures.

1.2 RELATED SECTIONS

A. Section 01300 - Administrative Requirements: Submittals procedures.
B. Section 01400 - Quality Requirements: Testing and inspection procedures.
C. Section 01500 - Temporary Facilities and Controls: Temporary exterior enclosures.
D. Section 01780 - Closeout Submittals: Project record documents, operation and maintenance data, warranties, and bonds.
E. Section 07840 - Firestopping.
F. Section 17800 - HVAC Systems: Testing, Adjusting and Balancing

1.3 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
    1. On request, submit documentation verifying accuracy of survey work.
    2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents. Include the following data:
    3. Architect may at any time require written verifications of grades, lines and levels by a licensed surveyor as work progresses.
    4. All areas found to be non-conforming to the Contract Documents shall be corrected by the responsible Contractor.
    5. Submit surveys and survey logs for the project record.
C. Cutting and Patching: Submit written request in advance of cutting or alteration which affects:
    1. Structural integrity of any element of Project.
    2. Integrity of weather exposed or moisture resistant element.
    3. Efficiency, maintenance, or safety of any operational element.
    4. Visual qualities of sight exposed elements.
    5. Work of Owner or separate Contractor.
    6. Include in request:
        a. Identification of Project.
        b. Location and description of affected work.
        c. Necessity for cutting or alteration.
        d. Contractor and crafts to execute the work.
        e. Description of proposed work and products to be used.
        f. Extent of refinishing.
        g. Alternatives to cutting and patching.
        h. Effect on work of Owner or separate Contractor.
        i. Written permission of affected separate Contractor.
        j. Date and time work will be executed.
D. Designation of party responsible for cost of cutting and patching.
E. When conditions of work, or schedule, indicate change of materials or methods, submit recommendation to Architect, including:
    1. Condition indicating change.
    2. Recommendation for alternative materials or methods.

3. Submittals specified for substitutions.

F. Submit written notice to Architect, designating time work will be uncovered, to provide for observation.

G. Payment for Costs:
   1. Costs caused by ill-timed or defective work, or work not conforming to Contract Documents, including costs for additional services of Architect - party responsible for ill timed, rejected or non-conforming work.
   2. Work done by change order, other than defective or non-conforming work - Owner.

1.4 QUALIFICATIONS

A. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

B. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located.

1.5 PROJECT CONDITIONS

A. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

B. Dust Control: Execute work by methods to minimize raising dust from construction operations. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

C. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
   1. Minimize amount of bare soil exposed at one time.
   2. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
   3. Construct fill and waste areas by selective placement to avoid erosive surface silts or clays.
   4. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

D. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.

E. Pest Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.

F. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.

G. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.

1.6 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work which are indicated diagrammatically on Drawings. Follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 – PRODUCTS

2.1 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.
B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.
C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01600.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.
B. Verify that demolition is complete in alterations areas and areas are ready for installation of new work.
C. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.
D. Examine and verify specific conditions described in individual specification sections.
E. Verify in field all measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or mis-fabrication.
F. Verify that utility services are available, of the correct characteristics, and in the correct locations.
G. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.
B. Seal cracks or openings of substrate prior to applying next material or substance.
C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.3 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a pre-installation meeting at the site prior to commencing work of the section.
B. Require attendance of parties directly affecting, or affected by, work of the specific section.
C. Notify Architect four days in advance of meeting date.
D. Prepare agenda and preside at meeting:
    1. Review conditions of examination, preparation and installation procedures.
    2. Review coordination with related work.
E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.4 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.
B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.
D. Control datum for survey is that established by Owner provided survey.
E. Protect survey control points prior to starting site work; preserve permanent reference points during construction.
F. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.
G. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.
H. Utilize recognized engineering survey practices.
I. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.
J. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
    1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
    2. Grid or axis for structures.
    3. Building foundation, column locations, and ground floor elevations.
K. Periodically verify layouts by same means.
L. Maintain a complete and accurate log of control and survey work as it progresses.
M. On completion of foundation walls and major site improvements, prepare a certified survey illustrating dimensions, locations, angles, and elevations of construction and site work.

3.5 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.
B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.
C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.
D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.
E. Make neat transitions between different surfaces, maintaining texture and appearance.

3.6 CUTTING AND PATCHING

A. Execute cutting and patching including excavation and fill to complete the work, to uncover work in order to install improperly sequenced work, to remove and replace defective or non-conforming work, to remove samples of installed work for testing when requested, to provide openings in the work for penetration of mechanical and electrical work, to execute patching to complement adjacent work, and to fit products together to integrate with other work.
B. Execute work by methods to avoid damage to other work, and which will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.
C. Employ original installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
D. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.
E. Restore work with new products in accordance with requirements of Contract Documents.
F. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
G. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07840, to full thickness of the penetrated element.
H. Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
I. Make neat transitions. Patch work to match adjacent work in texture and appearance. Where new work abuts or aligns with existing, perform a smooth and even transition.
J. In addition to contract requirements, upon written instructions of Architect.
    1. Uncover work to provide for observation of covered work.

2. Remove samples of installed materials for testing.

K. Do not endanger work by cutting or altering work or any part of it.
L. Do not cut or alter work without written consent of Architect.
M. Patch or replace surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. Repair substrate prior to patching finish. Finish patches to produce uniform finish and texture over entire area. When finish cannot be matched, refinish entire surface to nearest intersections.

3.7 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.
B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.
C. Broom and vacuum clean interior areas prior to start of surface finishing and continue cleaning to eliminate dust.
D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.8 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.
B. Provide special protection where specified in individual specification sections.
C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.
D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.
F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
G. Prohibit traffic from landscaped areas.
H. Remove protective coverings when no longer needed; reuse or recycle plastic coverings if possible.

3.9 STARTING SYSTEMS

A. Coordinate schedule for start-up of various equipment and systems with Architect and Owner's Representative..
B. Notify Architect and owner two days prior to start-up of each item.
C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
D. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
E. Verify that wiring and support components for equipment are complete and tested.
F. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.
G. When specified in individual specification Sections, require manufacturer and/or equipment supplier to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
H. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of Substantial Completion.

B. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.
C. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.
D. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.
E. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
F. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
G. The amount of time required for instruction on each item of equipment and system is that specified in individual sections.
H. Air and Water Testing, Adjusting and Balancing
    1. Testing, adjusting and balancing will be part of the mechanical contract.
    2. The mechanical subcontractor will perform services specified in Division 15.
    3. Reports will be submitted by the Mechanical subcontractor to the Architect indicating observation and results of test and indicating compliance or non-compliance with the specified requirements and with the requirements of the Contract Documents.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.
B. Testing, adjusting, and balancing HVAC systems: See Section 15990 and 01400.

3.12 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.
    1. Clean areas to be occupied by Owner prior to final completion before Owner occupancy.
B. Use cleaning materials that are non-hazardous.
C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.
D. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.
E. Clean filters of operating equipment.
F. Clean debris from roofs, gutters, downspouts, and drainage systems.
G. Clean site; sweep paved areas, rake clean landscaped surfaces.
H. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.
I. Contractor provide final cleaning at completion of work, or at such other times as directed by the Architect, remove all waste, debris, rubbish, tools, equipment, machinery and surplus materials. Clean all sight exposed surfaces; leave work clean and ready for occupancy.
J. Safety Requirements
    1. Standards: Maintain project in accord with following safety and insurance standards:
        a. Federal and state regulations.
        b. National Fire Protection Association (NFPA).
    2. Hazards Control:
        a. Store volatile wastes in covered metal containers and remove from premises daily.
        b. Prevent accumulation of wastes which create hazardous conditions.
        c. Provide adequate ventilation during use of volatile or noxious substances.
    3. Conduct cleaning and disposal operations to comply with Federal and State anti-pollution laws.
        a. Do not burn or bury rubbish and waste materials on project site.
        b. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
        c. Do not dispose of wastes into streams or waterways.

K. Submittals
   1. Manufacturer's recommendations for cleaning specified products.
   2. Proposed cleaning products for products where manufacturer's recommendations are not specified.
L. Materials
   1. Select and use all cleaning materials and equipment with care to avoid scratching, marring, defacing, staining or discoloring surfaces cleaned.
   2. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
   3. Use cleaning materials only on surfaces recommended by cleaning material manufacturer.
M. Final Cleaning
   1. Employ experienced workers or professional cleaners for final cleaning.
   2. Remove grease, dust, dirt, stains, labels, fingerprints, protection and other foreign materials from sight-exposed finished surfaces.
      a. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed surfaces, and of concealed spaces to insure performance.
   3. Repair, patch and touch up marred surfaces to specified finish, to match adjacent surfaces.
   4. Soft broom clean all exposed concrete surfaces clean; other paved areas with soft or stiff broom as directed. Rake clean other surfaces on grounds.
   5. Sweep and mop clean all resilient, quarry and ceramic flooring.
   6. Vacuum all carpeting.
   7. Remove ice and snow from access to buildings.
   8. Replace air handling and conditioning filters if units were operated during construction.
   9. Clean all ductwork used for temporary heating.
   10. Clean windows and mirrors to be free from labels, dust, fingerprints and other foreign materials.
   11. Maintain finally cleaned areas until project, or designated portion thereof, is accepted by Owner.

3.13 CLOSEOUT PROCEDURES

A. Make submittals that are required by governing or other authorities.
   1. Provide copies to Architect and Owner.
B. Contractor to determine items to be listed for completion or correction in Contractor's Notice of Substantial Completion.
C. Notify Architect when work is considered ready for Substantial Completion.
D. Submit written certification that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's review.
E. Substantial Completion Meeting will be scheduled by Architect. Architect will issue notice of meeting.
   1. Agenda will consist of the inspection, discussion of the punch list, determination of final completion dates, and the date and time the Owner will take occupancy. Architect will also review the requirements for contractor closeout in accord with the contract documents.
   2. Upon completion of this meeting, the Architect shall prepare the Certificate of Substantial Completion with the completed punch list and forward the package to the Contractor.
F. Owner will occupy all of the building as specified in Section 01100.
G. Contractor will correct items of work listed in punch list and comply with requirements for access to Owner-occupied areas.
H. Notify Architect when work is considered finally complete.
I. Accompany Architect on final inspection.
J. Complete items of work determined by Architect's final inspection.

END OF SECTION

SECTION 01780

CLOSEOUT SUBMITTALS

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Project Record Documents.
B. Operation and Maintenance Data.
C. Warranties and bonds.

1.2 RELATED SECTIONS
A. Conditions of the Contract: Performance bond and labor and material payment bonds, warranty, and correction of work.
B. Section 01300 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.
C. Section 01700 - Execution Requirements: Contract closeout procedures.
D. Individual Product Sections: Specific requirements for operation and maintenance data.
E. Individual Product Sections: Warranties required for specific products or Work.

1.3 SUBMITTALS
A. Substantial Completion
    1. When Contractor considers work substantially complete, submit written declaration to Architect that work, or designated portion thereof, is substantially complete. Include list of items to be completed or corrected.
    2. Architect will make a preliminary inspection within seven business days after receipt of Contractor's declaration.
    3. Upon determining that work is substantially complete, Architect will:
        a. Prepare a punch list of items to be completed or corrected, as determined by the inspection.
        b. Prepare and process a certificate of substantial completion, containing:
            1) Date of substantial completion.
            2) Punch list of items to be completed or corrected.
            3) The time within which punch list items shall be completed or corrected.
            4) Date and time Owner will take occupancy of project or designated portion thereof.
            5) Responsibilities of Owner and Contractor for:
                a) Insurance
                b) Utilities.
                c) Operation and maintenance of mechanical, electrical and other systems.
                d) Maintenance and cleaning.
                e) Security
            6) Signatures of:
                a) Architect
                b) Contractor.
                c) Owner.
    4. Contractor:
        a. Complete all work listed for completion or correction within designated time.
        b. Perform final cleaning in accordance with 01700.
    5. At time of inspection, should substantial completion not be certified, complete the work and resubmit declaration in accord with Paragraph A.1 above.
B. Final Completion
    1. Contractor:
        a. Submit written declaration to Architect that:
            1) Work complies with all aspects of Contract Documents.
            2) All items on substantial completion punch list have been completed or corrected.
            3) All tools, construction equipment and surplus materials have been removed from site.
            4) Required surveys have been completed and verified.
    2. Architect will make final inspection with Contractor to ensure completion of all contract requirements.

3. When Architect considers that all work is finally complete in accordance with contract document requirements, he will prepare and process closeout documents.

C. Application for Final Payment
   1. Contractor submit duly executed:
      a. Final Affidavit and Sworn Statement.
      b. Contractor's Final Waiver of Lien.
      c. Separate releases of waivers of liens for all subcontractors, suppliers and others with lien rights against property of Owner, together with complete list of those parties.
      d. Final accounting statement, reflecting all adjustments to contract sum.
         1) Original contract sum.
         2) Additions and deductions resulting from:
            a) All change orders.
            b) Deductions for uncorrected work.
            c) Deductions for liquidated damages.
      e. Total contract sum, as adjusted.
      f. Previous payments.
      g. Sum remaining due.
   2. Architect will process final statement in accordance with Conditions of the Contract.

D. Project Record Documents: Submit documents to Architect with claim for final Application for Payment.
   1. Accompany submittal with transmittal letter, in duplicate, containing:
      a. Date.
      b. Project title and number.
      c. Contractor's name and address.
      d. Title and number of each record document.
   2. Certification that each document submitted is complete and accurate.
      a. Signature of contractor, or his authorized representative.
   3. Submit 1 copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   4. Submit one hard copy set and two Compact Disc containing electronic copies (in PDF file format) of revised final documents in final form within 10 days after final inspection.

E. Operation and Maintenance Data:
   1. The contractor shall cause each mechanical and electrical subcontractor to provide the Contractor with three hard copies and one electronic copy of all operating manuals at the time of delivery of each major piece of equipment.
   2. Submit two copies of preliminary draft or proposed formats and outlines of contents before start of Work. Architect will review draft and return one copy with comments.
   3. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit completed documents within ten days after acceptance.
   4. Submit 1 copy of completed documents 15 days prior to final inspection. This copy will be reviewed and returned after final inspection, with Architect comments. Revise content of all document sets as required prior to final submission.
   5. Submit two hard copy sets and two Compact Disc containing electronic copies (in PDF file format) of revised final documents in final form within 10 days after final inspection.

F. Warranties and Bonds:
   1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
   2. Make other submittals within ten days after Date of Substantial Completion, prior to final Application for Payment.
   3. For items of Work for which acceptance is delayed beyond Date of Substantial Completion, submit within ten days after acceptance, listing the date of acceptance as the beginning of the warranty period.

4. Because the warranty period begins with the issuance of the final payment from The District to the general contractor, all warranties should include the verbiage "…for a period of (X) year(s) after the date The District issues the final payment to the General Contractor…"

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.1 PROJECT RECORD DOCUMENTS

A. Contractor and all subcontractors shall maintain an accurate record of deviations and changes from the Contract Documents which occur in the work.
B. Indicate all such deviations and changes on a record set of the Contract Documents and turn same over to the Architect and Owner upon completion of the Work all such documents and information such as final shop drawings and sketches, marked prints and similar data indicating the as-built conditions.
C. Create an electronic copy of all approved Project Record Documents in PDF file format and deliver to Architect and Owner on Compact Disc.
D. Compact Discs: High quality CD-R format Compact Disc formatted for use by Microsoft Windows based computers. Rewriteable Compact Discs will not be accepted. Provide labels on all Compact Discs listing the Owner's name, Project name, Contractor's name, Date of Submittal, and the title "Project Record Documents".
E. Maintain on site one set of the following record documents; record actual revisions to the Work:
    1. Drawings.
    2. Project Manual.
    3. Interpretations and supplemental instructions.
    4. Specifications.
    5. Addenda.
    6. Change Orders and other modifications to the Contract.
    7. Reviewed shop drawings, product data, and samples.
    8. Manufacturer's instruction for assembly, installation, and adjusting.
    9. Other modifications to contract.
    10. Field test records.
    11. All schedules.
    12. Correspondence file.
F. Ensure entries are complete and accurate, enabling future reference by Owner.
G. Store record documents separate from documents used for construction.
H. Record information concurrent with construction progress.
I. File documents in format in accord with Project Manual Table of Contents.
J. Do not use record documents for field construction purposes.
K. Make documents available at all times for inspection by Architect and Owner.
L. Plans and sections of all concealed work, particularly concealed piping and conduit, and deviations from conditions shown on the contract drawings, shall be shown and dimensioned on the "as-built" drawings.
M. Contractor shall develop layout drawings for all concealed work that is schematically indicated on contract drawings.
N. Provide red colored pencils or felt marking pens for marking devices.
O. Do not permanently conceal any work until specified information has been recorded.
P. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
    1. Manufacturer's name and product model and number.
    2. Product substitutions or alternates utilized.
    3. Changes made by Change Order or Field Order.
    4. Other matters not originally specified.

Q. Label each record document "PROJECT RECORD DOCUMENTS" in large print. Keep record documents current.
R. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
   1. Measured depths of foundations in relation to finish first floor datum.
   2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
   3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
   4. Field changes of dimension and detail.
   5. Changes made by change order.
   6. Details not on original Contract drawings.
S. Shop Drawings: Maintain as record documents; legibly annotate drawings to record changes made after review.
T. Completed Work Survey: Requirements specified in Section 01700 - Execution Requirements.

3.2 OPERATION AND MAINTENANCE DATA

A. Compile product data and related information appropriate for Owner's maintenance and operation of products and equipment provided under the Contract.
B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.
D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Coordinate drawings with information in Product Record Documents to assure correct illustration of completed installation. Do not use Project Record Documents as maintenance drawings.
E. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
F. Warranty, Bond, and Service Contract: Provide information sheet for Owner's personnel with proper procedures in event of failure and instances which might affect validity of warranties of bonds.

3.3 OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES

A. Submit three hard copies and two Compact Discs with electronic copies (in PDF file format) of complete manual in final form.
B. For Each Product, Applied Material, and Finish:
   1. Product data, with catalog number, size, composition, and color and texture designations.
   2. Information for re-ordering custom manufactured products.
C. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
D. Moisture protection and weather-exposed products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.
E. Additional information as specified in individual product specification sections.
F. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

3.4 OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS

A. Submit three hard copies and two Compact Discs with electronic copies (in PDF file format) of complete manual in final form.
B. For Each Item of Equipment and Each System:
   1. Description of unit or system, and component parts.
   2. Identify function, normal operating characteristics, and limiting conditions.

3. Include performance curves, with engineering data and tests.
4. Complete nomenclature and model number of replaceable parts.

C. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
D. Include color coded wiring diagrams as installed.
E. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
F. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
G. Provide servicing and lubrication schedule, and list of lubricants required.
H. Include manufacturer's printed operation and maintenance instructions.
I. Include sequence of operation by controls manufacturer.
J. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
K. Provide control diagrams by controls manufacturer as installed.
L. Provide Contractor's coordination drawings, with color coded piping diagrams as installed.
M. Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
N. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
O. Include test and balancing reports.
P. Additional Requirements: As specified in individual product specification sections.

3.5 OPERATION AND MAINTENANCE MANUALS

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
B. Prepare data in the form of an instructional manual.
C. Submit one copy of completed instruction manual 15 business days prior to final inspection or acceptance.
   1. Copy will be returned after final inspection or acceptance, with comments.
D. Binders: Commercial quality, 8-1/2 x 11 inch three D side ring binders with durable plastic covers; 2 inch maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
E. Compact Discs: High quality CD-R format Compact Disc formatted for use by Microsoft Windows based computers. Rewriteable Compact Discs will not be accepted. Provide labels on all Compact Discs listing the Owner’s name, Project name, Contractor’s name, Date of Submittal, and the title “Operation and Maintenance Manuals”.
F. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
G. Provide tabbed dividers for each separate product and system, with typed description of product and major component parts of equipment.
H. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
I. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
J. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
K. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
   1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
   2. Part 2: Operation and maintenance instructions arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:

a. Significant design criteria.
b. List of equipment.
c. Parts list for each component.
d. Operating instructions.
e. Maintenance instructions for equipment and systems.
f. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.

3. Part 3: Project documents and certificates, including the following:
   a. Shop drawings and product data.
   b. Air and water balance reports.
   c. Certificates.
   d. Photocopies of warranties and bonds.

L. Provide a listing in Table of Contents for design data, with tabbed dividers and space for insertion of data.

M. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect, Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

3.6 WARRANTIES AND BONDS

A. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

C. Co-execute submittals when required.

D. Retain warranties and bonds until time specified for submittal.

E. Manual: Bind in commercial quality 8-1/2 x 11 inch three D side ring binders with durable plastic covers and provide electronic copies of all warranties and bonds in PDF file format on two Compact Discs.

F. Compact Discs: High quality CD-R format Compact Disc formatted for use by Microsoft Windows based computers. Rewriteable Compact Discs will not be accepted. Provide labels on all Compact Discs listing the Owner’s name, Project name, Contractor’s name, Date of Submittal, and the title “Warranties and Bonds”.

G. Binder Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.

H. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.

I. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

END OF SECTION

SECTION 03505

SELF-LEVELING UNDERLAYMENT

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Liquid applied cementitious self-leveling floor underlayment.

1.2 REFERENCES
A. Unless otherwise noted the most current issue of the reference shall be used.
B. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS
A. See Section 01300 – Administrative Requirements, for submittal procedures.
B. Product Data: Provide physical characteristics, product limitations
C. Manufacturer's Instructions: Indicate mix instructions.

1.4 QUALITY ASSURANCE
A. Applicator Qualifications: Company specializing in performing the work of this section and approved by the manufacturer.

1.5 REGULATORY REQUIREMENTS
A. Conform to applicable code for combustibility or flame spread requirements.

1.6 ENVIRONMENTAL REQUIREMENTS
A. Do not install underlayment until floor penetrations and peripheral work are complete.
B. Maintain ambient temperatures of 50 degrees for 24 hours before, during and 72 hours after installation of underlayment.
C. During the curing process, ventilate spaces to remove excess moisture.

PART 2 – PRODUCTS

2.1 MANUFACTURERS
A. Cementitious Underlayment:
   1. Ardex Engineered Cements. Inc.: www.ardex.com.
   2. Dayton Superior Corporation: www.daytonsuperior.com
   3. Dependable Chemical Co., Inc.: www.floorprep.com.
   4. Substitutions: See Section 01600 - Product Requirements.

2.2 ACCESSORIES
A. Provide all primers, cleaners, bonding agents or any other accessory materials recommended by the manufacturer for the intended installation.

2.3 MIXING
A. Site mix materials in accordance with manufacturer's instructions.
B. Mix to achieve following characteristics:
   1. Density: 100 lb/cu ft minimum dry density.
   2. Compressive strength: 1,000 psi minimum.
   3. Surface burning characteristics: Flame spread/smoke developed index of 0/0 in accordance with ASTM E 84.
C. Mix to self-leveling consistency.

PART 3 – EXECUTION

3.1 EXAMINATION
A. Verify that substrate surfaces are clean, dry, unfrozen, do not contain petroleum bi-products or other compounds detrimental to underlayment material bond to substrate.

3.2 PREPARATION
A. Remove substrate surface irregularities. Fill voids and deck joints with latex based filler. Finish smooth.
B. Vacuum clean surfaces.
C. Prime substrate in accordance with manufacturer's instructions. Allow to dry.

3.3 APPLICATION
A. Install underlayment in accordance with manufacturer's instructions.
B. Install underlayment as required, or as directed by the Architect, to correct any imperfections or irregularities which have caused the floor to be out of level.

3.4 CURING
A. Air cure in accordance with manufacturer's instructions.

3.5 APPLICATION TOLERANCE
A. Top Surface: Level to 1/8 inch in 5 feet.

3.6 PROTECTION OF FINISHED WORK
A. Do not permit traffic over unprotected floor underlayment surfaces.

3.7 SCHEDULES
A. Level all floor surfaces which will receive new flooring materials.

END OF SECTION

SECTION 04065

MORTAR AND MASONRY GROUT

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Mortar for masonry.
B. Grout for masonry.

1.2 RELATED SECTIONS
A. Section 04810 - Unit Masonry Assemblies: Installation of mortar and grout.

1.3 REFERENCES
A. Unless otherwise noted the most current issue of the reference shall be used.
B. ACI 530/ASCE 5/TMS 402 - Building Code Requirements For Masonry Structures; American Concrete Institute International;
C. ACI 530.1/ASCE 6/TMS 602 - Specification for Masonry Structures; American Concrete Institute International.
D. ASTM C 5 - Standard Specification for Quicklime for Structural Purposes.
E. ASTM C 199 - Test Method for Pier Test for Refractory Masonry.
F. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
G. ASTM C 387 - Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete.
H. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout.
I. ASTM E514 -90 - Standard Test Method for Water Penetration and Leakage Through Masonry
J. ASTM C 1384 - Standard Specification for Modifiers for Masonry Mortars.
K. ASTM C 1388 - Standard Test Method for Compressive Strength of Laboratory Constructed Masonry Prisms.
L. Contractor to verify that specified cleaning is done during progress of work and at the completion of each subcontractor's work.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C 270 is to be used. Also include required environmental conditions and admixture limitations.
C. Samples: Submit two samples of mortar, illustrating mortar color and color range.
D. Contractor shall retain the services of an independent testing laboratory to test, evaluate and report on the following:
    1. Submit reports on mortar indicating compliance with component mortar materials to requirements of ASTM C 270 and test and evaluation reports per ASTM C 780.
    2. Reports: Submit reports on grout indicating compliance with component grout materials to requirements of ASTM C 476 and test and evaluation reports to requirements of ASTM C
E. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
F. Manufacturer's Instructions: Submit packaged dry mortar manufacturer's installation instructions.

1.5 QUALITY ASSURANCE
A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.
    1. Maintain one copy of each document on project site.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
B. Cold Weather Requirements: Comply with recommendations of ACI 530.1
C. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.
D. Hot Weather Requirements: Comply with recommendations of ACI 530.1

PART 2 – PRODUCTS

2.1 MATERIALS

A. Masonry Cement: ASTM C 91, Type S.
   1. Colored Mortar: Premixed cement as required to match Architect's sample.
B. Portland Cement: ASTM C 150, Type I – Normal, or Type II - Moderate; standard gray color.
C. Blended Cement: ASTM C 595, Type IP or i(PM) for type I or II cement.
D. Packaged Dry Mortar: ASTM C 387, using gray color cement.
E. Hydrated Lime: ASTM C 207, Type S or M.
F. Mortar Aggregate: ASTM C 144, standard masonry type.
G. Grout Aggregate: ASTM C 404.
H. Pigments for Colored Mortar: Iron or chromium oxides with demonstrated stability and colorfastness. Do not use carbon black.
   1. ASTM C 979: Pigment shall not exceed 10% of the weight of portland cement.
   2. Colors: As required to match Architect's color samples.
   3. Acceptable products:
      a. Soloman Colors: www.solomoncolors.com
      b. Davis Colors: www.concretestains.com
      c. Color Solutions, Inc.: www.dynamiccolorsolutions.com
      d. Prism Pigments: www.prismpigments.com
      e. Western Lime and Cement Co.
   4. Substitutions: See Section 01600 - Product Requirements.
I. Water: Clean and potable.
J. Accelerating Admixture: Not Permitted.
K. Moisture-Resistant Admixture: Water repellent compound designed to reduce capillarity; Integral liquid polymeric admixture for mortar added during mixing, capable of achieving a Class E Rating when evaluated using ASTM E 514 with the test extended to 72 hours, using the rating criteria specified in ASTM E 514.
L. Bonding Agent: Latex type.

2.2 MORTAR MIXES

A. Mortar for Unit Masonry: ASTM C 270, Property Specification.
   1. Interior, loadbearing masonry: Type M or S.
   2. Interior, non-loadbearing masonry: Type N.
   3. Pointing mortar: Prehydrated Type N with maximum 2 percent ammonium stearate or calcium stearate per cement weight.

2.3 MORTAR MIXING

A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C 270 and in quantities needed for immediate use.
B. Maintain sand uniformly damp immediately before the mixing process.
C. Add mortar color in accordance with manufacturer's instructions. Provide uniformity of mix and coloration.

D. Do not use anti-freeze compounds to lower the freezing point of mortar. Do not use set accelerators unless approved in writing by The Brick Institute of America (BIA), National Concrete Masonry Association (NCMA), ASTM C 270, the Architect of Record and the Engineer of Record. The use of admixtures does not relax cold weather protection requirements.
E. If water is lost by evaporation, re-temper only within two hours of mixing.
F. Use mortar within two hours after mixing at temperatures of 90 degrees F, or two-and-one-half hours at temperatures under 40 degrees F.

2.4 GROUT MIXES

A. Bond Beams and Lintels: 3,000 psi strength at 28 days; 8-10 inches slump; provide grout in accordance with ASTM C 476. Use or fine grout in accordance with ACI 530 and 530.1.
B. Engineered Masonry: Unless otherwise noted provide grout with 3,000 psi strength at 28 days; 7-8 inches slump; mix in accordance with ASTM C 476.
   1. Coarse grout for spaces with smallest horizontal dimension greater than 2 inches.

2.5 GROUT MIXING

A. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C 476
B. Add admixtures in accordance with manufacturer's instructions; mix uniformly.
C. Do not use anti-freeze compounds to lower the freezing point of grout. Do not use set accelerators unless approved in writing by The Brick Institute of America (BIA), National Concrete Masonry Association (NCMA), ASTM C 270, the Architect of Record and the Engineer of Record. The use of admixtures does not relax cold weather protection requirements.

PART 3 – EXECUTION

3.1 PREPARATION

A. Apply bonding agent to existing smooth finish concrete surfaces.
   1. Plug clean-out holes for masonry with brick or masonry units to match adjacent surfaces. Brace masonry for wet grout pressure.
B. Request inspection of spaces to be grouted.

3.2 INSTALLATION

A. Install mortar and grout to requirements of Section 04810; and in accordance with ACI 530.1/ASCE 6.
B. Work grout into masonry cores and cavities to eliminate voids.
C. Do not install grout in lifts greater than 16 inches without consolidating grout by rodding.
D. Do not displace reinforcement while placing grout.
E. Remove excess mortar from grout spaces.

3.3 GROUTING

A. Use either high-lift or low-lift grouting techniques, at Contractor's option, in accordance with ACI 530.1.
B. Consolidate grout with a mechanical vibrator on any grout pours greater than 12 inches in height; and in accordance with ACI 530.1. Grout pours 12 inches or less in height shall be mechanically vibrated or puddled. Do not over consolidate.
C. When grouting is stopped for 1 hour or longer, stop the grout pour 1 1/2 inches below the top of the masonry to create a shear key.
D. Pour grout only after reinforcing is in place. Prevent displacement of bars as grout is poured.
E. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.
F. Place grout for spanning elements in single, continuous pour.

3.4 FIELD QUALITY CONTROL

A. Test and evaluate mortar in accordance with ASTM C 780 procedures.
   1. Test with same frequency as specified for masonry units.
B. Test and evaluate grout in accordance with ASTM C 1019 procedures.
   1. Test with same frequency as specified for masonry units.
C. Prism Tests: Test masonry and mortar panels for compressive strength in accordance with ASTM C 1388, and for flexural bond strength in accordance with ASTM C 1072 or ASTM E 518; perform tests and evaluate results as specified in individual masonry sections
   1. Prepare set of prisms for testing at 7 days and 1 set for testing at 28 day

END OF SECTION

SECTION 04810

UNIT MASONRY ASSEMBLIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Concrete Masonry Units.
B. Reinforcement and Anchorage.
C. Flashings.
D. Accessories.

1.2 RELATED SECTIONS

A. Section 04065 - Mortar and Masonry Grout.
B. Section 05120 - Structural Steel: accessories for masonry construction.
C. Section 07900 - Joint Sealers: Backing rod and sealant at control and expansion joints.

1.3 REFERENCES

A. Unless otherwise noted the most current issue of the reference shall be used.
B. ACI 530/ASCE 5/TMS 402 - Building Code Requirements for Masonry Structures; American Concrete Institute International.
C. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International.
D. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
E. ASTM D 1667 - Standard Specification for Flexible Cellular Materials—Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam)
F. ASTM - D2240 - Standard Test Method for Rubber Property-Durometer Hardness
G. ASTM D 2287 - Standard Specification for Nonrigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds
H. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
I. ASTM A 641/A 641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
J. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
K. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
L. ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction.
M. ASTM C 27 - Standard Classification of Fireclay and High-Alumina Refractory Brick.
N. ASTM C 34 - Standard Specification for Structural Clay Load Bearing-Wall Tile.
O. ASTM C 55 - Standard Specification for Concrete Brick; 2001a.
P. ASTM C 56 - Standard Specification for Structural Clay Non-Load-Bearing Tile.
Q. ASTM C 62 - Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).
R. ASTM C 67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
S. ASTM C 91 - Standard Specification for Masonry Cement.
T. ASTM C 126 - Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units.
U. ASTM C 129 - Standard Specification for Nonloadbearing Concrete Masonry Units.
V. ASTM C 140 - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units.
W. ASTM C 144 - Standard Specification for Aggregate for Masonry Mortar.
X. ASTM C 150 - Standard Specification for Portland Cement.
Y. ASTM C 207 - Standard Specification for Hydrated Lime for Masonry Purposes.
Z. ASTM C 212 - Standard Specification for Structural Clay Facing Tile.
AA. ASTM C 270 - Standard Specification for Mortar for Unit Masonry.
BB. ASTM C 315 - Standard Specification for Clay Flue Linings.
CC. ASTM C 404 - Standard Specification for Aggregates for Masonry Grout.
DD. ASTM C 476 - Standard Specification for Grout for Masonry.

EE. ASTM C 530 - Standard Specification for Structural Clay Nonloadbearing Screen Tile.
FF. ASTM C 652 - Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
GG. ASTM C 744 - Standard Specification for Prefaced Concrete and Calcium Silicate Masonry Units.
HH. ASTM C 780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
II. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
JJ. ASTM E 514-90 - Standard Test Method for Water Penetration and Leakage Through Masonry

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and all flashings including accessories and primer.
C. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Comply with provisions of ACI 530/ASCE 5/TMS 402 and ACI 530.1/ASCE 6/TMS 602, except where exceeded by requirements of the contract documents.
   1. Maintain one copy of each document on project site.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.
B. Handle and store ceramic glazed masonry units and pre-faced concrete block units in protective cartons or trays. Do not remove from protective packaging until ready for installation.
C. Stack masonry units, anchors, ties and miscellaneous accessories on wood pallets or blocking above ground and protect from exposure to weather at all times.
D. Cover brick, all masonry units and all reinforcing and accessories with covers that permit air circulation and prevent moisture infiltration.
E. Any materials not protected at all times will be marked rejected and shall be removed from the site by the contractor within 24 hours. All transportation and replacement costs and delays in the schedule will be the sole responsibility of the contractor and at no additional cost to the owner.
F. Clean all materials of dirt, mud, ice, rust, or other foreign substances immediately prior to using.

PART 2 – PRODUCTS

2.1 CONCRETE MASONRY UNITS

A. Acceptable Manufacturers:
   1. Best Block Co.; www.bestblock.net.
   2. Chicago Block and Brick; www.chicagoblock.com
   3. Northfield Block; www.northfieldblock.com
   4. Trenwyth Industries; www.trenwyth.com
   5. Valley Block & Supply Co., Inc., Elgin, IL 60123.
B. 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.

C. Load Bearing Concrete Masonry units: Comply with referenced standards and as follows:
   1. Size: Unless otherwise noted provide standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
   2. Load-Bearing Units: ASTM C 90, medium weight.
      a. Hollow block with nominal 1 3/8 inches shell thickness unless indicated otherwise on contract drawings.
      b. Exposed faces: Manufacturer's standard color and texture where indicated.

D. Non-Load Bearing Units: Comply with referenced standards and as follows:
   1. Hollow block, as indicated unless otherwise noted.
   2. Size: Unless otherwise noted provide standard units with nominal face dimensions of 16 x 8 inches and nominal depths as indicated on the drawings for specific locations.
   3. Load-Bearing Units: ASTM C 129, medium weight.
      a. Hollow block with nominal 1 3/8 inches shell thickness unless indicated otherwise on contract drawings.
      b. Exposed faces: Manufacturer's standard color and texture where indicated.

2.2 MORTAR AND GROUT MATERIALS

A. Mortar and grout: As specified in Section 04065.

2.3 REINFORCEMENT AND ANCHORAGE

A. Manufacturers of Joint Reinforcement and Anchors:
   1. Dur-O-Wal: www.dur-o-wal.com.
   2. Heckmann Building Products, Inc: www.heckmannbuildingprods.com.
   3. Hohmann & Barnard, Inc: www.h-b.com.
   4. Masonry Reinforcing Corporation of America: www.wirebond.com.
   5. Substitutions: See Section 01600 - Product Requirements.

B. Reinforcing Steel: ASTM A 615/A 615M Grade 60 deformed billet bars.

C. Vertical Structural Reinforcing Steel: type as specified in Section 03200; size as indicated on drawings; uncoated finish.

D. Interior Single Wythe Joint Reinforcement: Contractor option of Truss or ladder type; ASTM A 82 steel wire, mill galvanized to ASTM A 641/A 641M, Class 3; 0.1483 inch side rods with 0.1483 inch cross rods; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

E. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from masonry face.
   1. Concrete frame: Dovetail anchors of bent steel strap, nominal 1 inch width x 0.06 in thick, with trapezoidal wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.
   2. Steel frame: Crimped wire anchors for welding to frame, minimum 0.25 inch thick, with triangular wire ties 0.1875 inch thick, hot dip galvanized to ASTM A 153/A 153M, Class B.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.2 PREPARATION

A. Determine requirements for temporary bracing of walls which require bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

B. Consult and coordinate masonry work with other crafts to avoid future cutting and patching.

3.3 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.
B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
C. Concrete Masonry Units:
   1. Bond: Running.
   2. Coursing: One unit and one mortar joint to equal 8 inches.
   3. Mortar Joints: Concave at all locations unless otherwise noted.

3.4 PLACING AND BONDING

A. Lay solid masonry units in full bed of mortar, with full head joints, uniformly jointed with other work.
B. Provide cleanouts minimum 8 inches long and 1 brick high, 24 inches on center in the course immediately above any flashing.
C. Lay hollow masonry units with full face shell bedding on head and bed joints.
D. Lay first course of all masonry above steel and concrete surfaces in full bed of mortar.
E. Lay all concrete masonry units dry.
F. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.
G. Remove excess mortar as work progresses.
H. Interlock intersections and external corners, except for units laid in stack bond.
I. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
J. Do not use broken, chipped or cracked units where exposed to view.
K. Where necessary to stop off a horizontal run of masonry, rack back one-half block length or one half brick length in each course. Toothing is not permitted,
L. Where fresh masonry joints partially or totally set masonry, clean exposed surface of set material and remove loose mortar and foreign material prior to laying fresh masonry.
M. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
N. Fill mortar joints flush where wall tile or resilient base is scheduled. All other joints shall be tooled as scheduled above in coursing.
O. Isolate interior masonry partitions from vertical structural framing members and exterior walls with open one-half inch joint with joint filler. Maintain continuous joint reinforcement through installation.
P. Isolate masonry partitions from vertical structural framing members with a control joint.
Q. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible filler.
R. Extend and anchor all masonry walls to underside of floors, beams or roof structure, unless otherwise indicated.
S. Brick up solid wherever beams bear on masonry, except where otherwise indicated.
T. Provide soft joints at all dissimilar materials. Rake back mortar at dissimilar materials to provide sufficient width to depth ratio for soft joint. Provide backer rod or bond breaker tape and sealant as specified in Section 07900 - Joint Sealers

3.5 CLEANOUTS

A. Provide cleanouts in exterior masonry wythes in every course immediately above through wall flashings.
   1. Cleanouts are to occur every third brick horizontally for exterior brick wythes.
   2. Cleanouts are to occur every second block horizontally for exterior CMU wythes.

3.6 REINFORCEMENT AND ANCHORAGE – GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
C. Place continuous joint reinforcement in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 6 inches.
E. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
F. For exterior multiple wythe systems, reinforce stack bonded brick and concrete masonry units of any configuration with an additional layer of horizontal reinforcing within the outer wythe. Install at 16 inches on center vertically and alternate with cross wythe reinforcing.
G. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches horizontally and 24 inches vertically.

3.7 REINFORCEMENT AND ANCHORAGE - SINGLE WYTHE MASONRY

A. Install horizontal joint reinforcement 16 inches on center.
B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
C. Place continuous joint reinforcement in first and second joint below top of walls.
D. Lap joint reinforcement ends minimum 6 inches.
E. Do not continue horizontal joint reinforcement through control and expansion joints.
F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
G. Secure wall to decking above as shown on drawings to guard against lateral movement.

3.8 LINTELS

A. Install loose steel lintels over openings.
    1. Connect lintel to bearing plate where indicated.
    2. Build masonry tight to all encased surfaces of lintels.
B. Install reinforced unit masonry lintels over openings where steel or pre-cast concrete lintels are not scheduled.
    1. Openings to 42 inches: Place two, No. 5 reinforcing bars 1 inch from bottom web.
    2. Do not splice reinforcing bars.
    3. Allow masonry lintels to attain specified strength before removing temporary supports.
C. Maintain minimum 8 inch bearing on each side of opening.

3.9 GROUTED COMPONENTS

A. Reinforce bond beams with 2, No. 5 bars, 1 inch from bottom web, unless indicated otherwise.
B. Lap splices minimum 48 bar diameters. No lap splices are permitted in bond beams over masonry openings.
C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
D. Place and consolidate grout fill without displacing reinforcing.
E. At bearing locations, fill masonry cores with grout for a minimum 2 courses below and 24 inches horizontally for lintels and 3 courses below and 24 inches horizontally for beams unless noted otherwise on drawings.

3.10 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control and expansion joints.
B. Form all Control Joints with Jamb blocks.
C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
D. Control joints shall align with wall discontinuities such as window and door jambs.
E. Size control joint in accordance with Section 07900 for sealant performance.

F. Control and Expansion joints are to be spaced no more than 20 feet apart; and must be within 2 feet of one side of exterior building corners; AS INDICATED ON DRAWINGS. In the absence of indications on drawings, the Contractor shall contact the Architect in writing for direction as to where to place the joints prior to proceeding with the work of this section. Any masonry engaged by the contractor without such notification shall be repaired by the Contractor at no cost to the Owner and as directed by the Architect.

3.11 BUILT-IN WORK

A. As work progresses, install built-in metal door frames, glazed frames, window frames, and anchor bolts and other items to be built into the work and furnished under other sections. Frame installing contractor shall coat inside of frames to be installed in masonry or to be grouted, with bituminous coating prior to installation as noted. Apply wet to 18.0 mils (450 microns) in one or two coats. Total dry film thickness of not less than 12 mils (300 microns) or in excess of 30 mils.
B. Install built-in items plumb, level, and true to line.
C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame jamb voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
D. Grout all spaces around built-in items solid
E. Do not build into masonry construction organic materials that are subject to deterioration.

3.12 TOLERANCES

A. Construct unit masonry assemblies in strict accordance with ACI 530.1, but not less than tolerances below.
B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch.
C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft and 1/2 inch in 20 ft or more.
D. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft and 1/4 inch in 10 ft; 1/2 inch in 30 ft.
F. Maximum Variation of Joint Thickness: 1/8 inch in 3 ft.
G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.

3.13 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.
B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.14 CLEANING

A. Remove excess mortar and mortar smears as work progresses.
B. Replace defective or discolored mortar. Match adjacent work.
C. Clean soiled surfaces with cleaning solution.
D. Replace chipped or broken units where exposed to view.
E. Use non-metallic tools in cleaning operations.

3.15 PROTECTION OF FINISHED WORK

A. Without damaging completed work, provide protective boards at exposed external corners, which are subject to damage by construction activities and maintain until substantial completion of masonry.

END OF SECTION

SECTION 05120

STRUCTURAL STEEL

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Structural steel framing members, and accessories.
B. Grouting under base plates.

1.2 RELATED SECTIONS
A. Section 03300 - Cast in Place Concrete: Supply of anchors for casting into concrete.
B. Section 04810 - Steel Unit Masonry Assemblies: Supply of anchors for embedding into masonry
C. Section 05210 - Steel Joists.
D. Section 05310 - Steel Deck: Support framing for small openings in deck.
E. Section 05500 - Metal Fabrications: Steel fabrications affecting structural steel work.
F. Section 07815 - Sprayed-On Fireproofing: Fireproof protection to framing and metal deck systems.

1.3 REFERENCES
A. Unless noted otherwise, the most current issue of reference shall be used.
B. AISC S303 - Code of Standard Practice for Steel Buildings and Bridges; American Institute of Steel Construction, Inc.
C. AISC S348 - Specification for Structural Joints Using ASTM A325 or A490 Bolts.
D. AISC S329 - RCSC's Allowable Stress Design Specification for Structural Joints Using ASTM A325 or A490 Bolts; American Institute of Steel Construction, Inc.
E. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.
F. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
G. ASTM A 325 - Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
H. ASTM A 490 - Standard Specification for Structural Bolts, Alloy Steel, Heat-Treated, 150 ksi Minimum Tensile Strength.
I. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
J. ASTM A 501 - Standard Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
K. ASTM A 563 - Standard Specification for Carbon and Alloy Steel Nuts.
L. ASTM A 992/A 992M - Standard Specification for Structural Steel Shapes.
M. ASTM A992/A992M Standard Specification for Steel for Structural Shapes for Use in Building Framing.
N. ASTM E 94 - Standard Guide for Radiographic Examination.
O. ASTM E 142 - Standard Method for Controlling Quality of Radiographic Testing.
P. ASTM E 164 - Standard Practice for Ultrasonic Contact Examination of Weldments.
Q. ASTM E 709 - Standard Guide for Magnetic Particle Examination.
R. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society.
S. AWS D1.1 - Structural Welding Code - Steel; American Welding Society.
T. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); Society for Protective Coatings.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Shop Drawings for review:
   1. Indicate profiles, sizes, spacing, and locations of structural members, openings, attachments, and fasteners.
   2. Connections.
   3. Indicate cambers and loads.
   4. Indicate welded connections with AWS A2.4 welding symbols. Indicate net weld lengths.

C. Erection Procedure: Submit descriptive data to illustrate the structural steel erection procedure, including the sequence of erection and temporary staging and bracing for information.
D. Manufacturer's Mill Certificate: Certify that products meet or exceed specified requirements for information.
E. Mill Test Reports: Indicate structural strength, destructive test analysis and non-destructive test analysis for information.
F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months for information.
G. Fabricate structural steel in accordance with Section 6 of AISC S303 and Chapter M of AISC M016.

1.5 QUALITY ASSURANCE

A. Fabricate structural steel in accordance with Section 6 of AISC S303 and Chapter M of AISC M016.
B. Comply with Section 10 of AISC "Code of Standard Practice for Steel Buildings and Bridges" for architecturally exposed structural steel.
C. Fabricator: Company specializing in performing the work of this section with minimum 5 years of documented experience.
D. Erector: Company specializing in performing the work of this section with minimum 5 years of documented experience.
E. Design connections not detailed on the drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located. Provide signed and sealed connection design calculations if requested by Architect/Structural Engineer of Record (SER).

1.6 REGULATORY REQUIREMENTS

A. Comply with Illinois Steel Procurement Act, As Amended (Illinois Revised Statutes, Ch. 48, Par. 1801 ET SEQ.).

1.7 DELIVERY, STORAGE AND PROTECTION

A. Store structural steel members at project site above ground on platforms, skids or other supports.
B. Store other materials in a watertight and dry place, until ready for use in the work.
C. Store packaged materials in their original unbroken package or container.
D. Do not allow dirt, mud or other foreign materials to collect on structural steel. Steel materials shall be clean from all debris and ready to receive finishes prior to erection.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Steel Bars Angles, Plates, Channels, and Rod: ASTM A 36/A 36M.
B. Rolled Steel Structural Shapes: ASTM A 992/A 992M.
C. Cold-Formed Structural Tubing: ASTM A 500, Grade B.
D. Hot-Formed Structural Tubing: ASTM A 501, seamless.
E. Pipe: ASTM A 53/A 53M, Grade B, Finish black unless otherwise noted.
F. High-Strength Bolts, Nuts, and Washers: ASTM A 325 (ASTM A 325M), Type 1, medium carbon, plain.
G. High-Strength Structural Bolts: ASTM A 490 (ASTM A 490M), with matching ASTM A 563 (ASTM A 563M) nuts and ASTM F 436 washers; Type 1 alloy steel.
H. Anchor Bolts: ASTM A 307, Grade C.
I. Shop and Touch-Up Primer: complying with VOC limitations of authorities having jurisdiction. Lead and Chromate-free, non-asphaltic, rust inhibiting primer.
J. Welding Materials: AWS D1.1; type required for materials being welded.
K. Sliding Bearing Plates: Lower Element - PTFE Sliding Surface Bonded to Carbon Steel Plate. Upper Element - 316 Stainless Steel Plate with ZB Finish on Sliding Surface Face.

L. Grout: Non-shrink, non-metallic aggregate type, complying with ASTM C 1107 and capable of developing a minimum compressive strength of 7,000 psi at 28 days.
M. Shop and Touch-Up Primer: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.
N. Touch-Up Primer for Galvanized Surfaces: Fabricator's standard, complying with VOC limitations of authorities having jurisdiction.

2.2 FABRICATION

A. Shop fabricate to greatest extent possible.
B. Dimensional tolerances shall be as permitted in the AISC S303.
C. Perform thermal cutting by machine to greatest extent possible. Plane thermally cut edges to be welded.
D. Fabricate connections for bolt, nut, and washer connectors.
E. Develop required camber for members. . Fabricator shall maintain record of beams cambered and actual measured camber provided in fabricated members.
F. Bearing Plates: Provide bearing plates under lintels, beams and joists resting on walls. Provide bearing plates loose. Where size is not indicated on plans provide plate 1/2 x 8" x width of wall minus 1".
G. Opening Framing: Provide frames at all floor and roof openings equal to or larger than 12".
H. All steel embedded in or adjacent to masonry construction shall have adjustable masonry anchors spaced not greater that 16" vertically and 24" horizontally, unless otherwise noted, whether or not such ties are explicitly indicated on the drawings.
I. Typical beam connections shall be standard AISC framed beam connections, unless otherwise shown. All field connections, except where shown welded, shall be bolted with ¾" diameter, high strength bolts, unless otherwise noted. Where reactions are not indicated, connections shall be designed for 60% of the total allowable uniform load (in kips) derived from AISC Manual table of "Allowable Loads on Beams" for non-composite beams.
J. All coped beams to be designed in accordance with Section J4 of AISC's "Specification For Structural Steel Buildings"-ASD. Provide reinforcing as required. All re-entrant corners to be shaped, notch-free, to a radius of at least ½ inch.
K. All beam splices, not indicated on the contract documents, shall be full penetration welded to restore full capacities of the original beam; bolted connections shall be used for erection purposes only, unless approved in writing by Structural Engineer of Record. If splices are required for construction purposes, contractor shall coordinate all splice locations with General Contractor or Construction Manager to avoid any interference/conflicts with other trades.
L. Unless otherwise noted, the structural steel supplier shall furnish L5 x 3 1/2 x 5/16 shop welded angle frames at all roof and floor openings. Contractor shall verify in field all sizes and locations.

2.3 FINISH

A. Prepare structural component surfaces in accordance with SSPC SP-2, Hand Tool Cleaning or better.
B. Shop prime structural steel members unless otherwise noted. Do not prime surfaces that will be fireproofed, field welded, in contact with concrete, or high strength bolted.
C. Galvanize any structural steel members indicated to be galvanized to comply with ASTM A123/A 123M. Provide minimum 1.3 oz/sq. ft. galvanized coating.

2.4 SOURCE QUALITY CONTROL AND TESTS

A. High-Strength Bolts: Provide testing and verification of shop-bolted connections in accordance with AISC S329 testing at least 20 percent of bolts at each slip critical or Direct Tension connection. Bolts in Non-Slip Critical Connections Need Not Be Tested.
B. Radiographic testing performed in accordance with ASTM E 94 and ASTM E142.
    1. Radiographic testing performed in accordance with ASTM E 94 and ASTM E 142.
    2. Ultrasonic testing performed in accordance with ASTM E 164.
    3. Liquid penetrant inspection performed in accordance with ASTM E 165.
    4. Magnetic particle inspection performed in accordance with ASTM E 709.

C. In Addition to Visual Inspection, Shop Welded Shear Connectors Shall Be Inspected and Tested In Accordance With AWS D1.1 For Stud Welding and the Following:
   1. Bend Test will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs.
   2. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that conditions are appropriate for erection of structural steel including elevations of bearing surfaces and locations of anchorages and that the work may properly proceed.
B. Verify that materials are clean, free of all debris and prepared for erection. Clean all dirt, mud or other foreign materials from structural steel and related items. Steel materials shall be clean from all debris and ready to receive finishes prior to erection.

3.2 ERECTION

A. Erect structural steel in compliance with AISC "Code of Standard Practice for Steel Buildings and Bridges".
B. Tighten anchor bolts after supported members have been positioned and plumbed.
C. Allow for erection loads, and provide sufficient temporary bracing to maintain structure in safe condition, plumb, and in true alignment until completion of erection and installation of permanent bracing.
D. Field weld components and shear studs indicated on shop drawings.
E. Use carbon steel bolts only for temporary bracing during construction, unless otherwise specifically permitted on drawings. Install high-strength bolts in accordance with AISC "Specification for Structural Joints Using ASTM A325 or A490 Bolts".
F. Do not field cut or alter structural members without approval of Architect.
G. After erection, prime welds, abrasions, and surfaces not shop primed, except surfaces to be in contact with concrete.
H. Grout solidly between column plates and bearing surfaces, complying with manufacturer's instructions for non shrink grout. Trowel grouted surfaces smooth, splaying neatly to 45 degrees.
I. Install shop welded angle frames at all roof and floor openings in preparation for decking.

3.3 ERECTION TOLERANCES

A. Erect structural steel within tolerances of AISC S303, Section 7, except as noted.
B. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
C. Maximum Offset From True Alignment: 1/4 inch.

END OF SECTION

SECTION 07840

FIRESTOPPING

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Firestopping materials.
B. Firestopping of all penetrations and interruptions to fire rated assemblies, whether indicated on drawings or not, and other openings indicated.

1.2 REFERENCES
A. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

1.3 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on product characteristics and fire rating.
C. Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.4 QUALITY ASSURANCE
A. Fire Testing: Provide firestopping assemblies of designs which provide the specified fire ratings when tested in accordance with methods indicated.
B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Approved by Factory Mutual Research under FM Standard 4991, Approval of Firestop Contractors, or meeting any two of the following requirements:
      a. With minimum 3 years documented experience installing work of this type.
      b. Able to show at least 5 satisfactorily completed projects of comparable size and type.
      c. Licensed by authority having jurisdiction.
      d. Approved by firestopping manufacturer.

1.5 ENVIRONMENTAL REQUIREMENTS
A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation. Maintain minimum temperature before, during, and for 3 days after installation of materials.
B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 – PRODUCTS

2.1 FIRESTOPPING ASSEMBLIES
A. Firestopping at Control and Expansion Joints (without Penetrations), of widths 2 inches or less: Any material meeting requirements.
   1. Floor-to-Floor:
      a. UL Design No. FF-DD-0002, FF-D-0005, F Rating 1 & 2 hour.
      b. UL Design No. FF-D-0011, FF-D-0001, F Rating 3 hour.
   2. Floor-to-Wall:
      a. UL Design No. FW-D-0004, FW-D-0005, FW-D-0002, F Rating 1 & 2 hour.
      b. UL Design No. FFW-D-0007, FW-D-0002, F Rating 3 hour.
   3. Wall-to-Wall:
      a. UL Design No. WW-D-0013, WW-D-0004, WW-D-0017, F Rating 1 & 2 hour.
      b. UL Design No. WW-D-0013, WW-D-0001, F Rating 3 hour.
   4. Head-of-Wall:
      a. UL Design No. HW-D-0020, HW-D-0043, HW-D-0034, F Rating 1 & 2 hour.
      b. UL Design No. HW-D-0060, HW-D-0061, F Rating 3 hour.

B. Firestopping at Metallic Pipe, Conduit, or Tubing Penetrations, of diameter 4 inches or less; for single penetrations: Any material meeting requirements.
   1. Concrete Floors 5 inches in thickness or less:
      a. UL Design No. C-AJ-1014, C-AJ-1240, C-AJ-1149, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-1058, C-AJ-1198, C-AJ-1155, F Rating 3 hour.
   2. Concrete Floors 5 inches in thickness or greater:
      a. UL Design No. C-AJ-1004, C-AJ-1005, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-1004, C-AJ-1005, F Rating 3 & 4 hour.
   3. Roof Slabs 5 inches in thickness or less:
      a. UL Design No. C-AJ-1014, C-AJ-1240, C-AJ-1149, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-1058, C-AJ-1198, C-AJ-1155, F Rating 3 hour.
   4. Roof Slabs 5 inches in thickness or greater:
      a. UL Design No. C-AJ-1004, C-AJ-1005, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-1004, C-AJ-1005, F Rating 3 & 4 hour.
   5. Concrete/Masonry Walls 8 inches in thickness or less:
      a. UL Design No. C-AJ-1014, C-AJ-1240, C-AJ-1149, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-1058, C-AJ-1198, C-AJ-1155, F Rating 3 hour.
   6. Concrete/Masonry Walls 8 inches in thickness or greater:
      a. UL Design No. C-AJ-1004, C-AJ-1005, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-1004, C-AJ-1005, F Rating 3 & 4 hour.
   7. Framed Floors:
      a. UL Design No. F-C-1002, F-C-1010, F-C-1059, F Rating 1 & 2 hour.
   8. Framed Walls:
      a. UL Design No. W-L-1001, W-L-1049, W-L-1054, F Rating 1 & 2 hour.
      b. UL Design No. W-L-1001, W-L-1172, F Rating 3 hour.

C. Firestopping at Metallic Pipe, Conduit, or Tubing Penetrations, of diameter 4 inches or less; for multiple penetrations: Any material meeting requirements.
   1. Concrete Floors 5 inches in thickness or less:
      a. UL Design No. C-AJ-1092, C-AJ-1047, C-AJ-1140, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-1234, F Rating 3 hour.
   2. Concrete Floors 5 inches in thickness or greater:
      a. UL Design No. C-AJ-1003, F Rating 1 & 2 hour.
   3. Roof Slabs 5 inches in thickness or less:
      a. UL Design No. C-AJ-1092, C-AJ-1047, C-AJ-1140, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-1234, F Rating 3 hour.
   4. Roof Slabs 5 inches in thickness or greater:
      a. UL Design No. C-AJ-1003, F Rating 1 & 2 hour.
   5. Concrete/Masonry Walls 8 inches in thickness or less:
      a. UL Design No. C-AJ-1092, C-AJ-1047, C-AJ-1140, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-1234, F Rating 3 hour.
   6. Concrete/Masonry Walls 8 inches in thickness or greater:
      a. UL Design No. C-AJ-1003, F Rating 1 & 2 hour.
   7. Framed Floors:
      a. UL Design No. F-C-1065, F-C-1066, F Rating 1 & 2 hour.
   8. Framed Walls:
      a. UL Design No. W-L-1001, W-L-1049, W-L-54, F Rating 1 & 2 hour.
      b. UL Design No. W-L-1001, W-L-1172, F Rating 3 & 4 hour.

D. Firestopping at Non-Metallic Pipe, Conduit, or Tubing Penetrations, of diameter 4 inches or less; for single penetrations: Any material meeting requirements.
   1. Concrete Floors 5 inches in thickness or less:
      a. UL Design No. C-AJ-2143, C-AJ-2063, C-AJ-2271, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-2117, C-AJ-2038, C-AJ-2271, F Rating 3 hour.
   2. Concrete Floors 5 inches in thickness or greater:
      a. UL Design No. C-AJ-2001, C-AJ-2002, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-2001, C-AJ-2002, F Rating 3 & 4 hour.

3. Roof Slabs 5 inches in thickness or less:
   a. UL Design No. C-AJ-2143, C-AJ-2063, C-AJ-2271, F Rating 1 & 2 hour.
   b. UL Design No. C-AJ-2117, C-AJ-2038, C-AJ-2271, F Rating 3 hour.
4. Roof Slabs 5 inches in thickness or greater:
   a. UL Design No. C-AJ-2001, C-AJ-2002, F Rating 1 & 2 hour.
   b. UL Design No. C-AJ-2001, C-AJ-2002, F Rating 3 & 4 hour.
5. Concrete/Masonry Walls 8 inches in thickness or less:
   a. UL Design No. C-AJ-2143, C-AJ-2063, C-AJ-2271, F Rating 1 & 2 hour.
   b. UL Design No. C-AJ-2117, C-AJ-2038, C-AJ-2271, F Rating 3 hour.
6. Concrete/Masonry Walls 8 inches in thickness or greater:
   a. UL Design No. C-AJ-2001, C-AJ-2002, F Rating 1 & 2 hour.
   b. UL Design No. C-AJ-2001, C-AJ-2002, F Rating 3 & 4 hour.
7. Framed Floors:
   a. UL Design No. F-C-2024, F-C-2020, F-C-2025, F Rating 1 & 2 hour.
8. Framed Walls:
   a. UL Design No. W-L-2162, W-L-2047, W-L-2075, F Rating 1 & 2 hour.
   b. UL Design No. W-L-2162, W-L-2195, F Rating 3 hour.

E. Firestopping at Non-Metallic Pipe, Conduit, or Tubing Penetrations, of diameter 4 inches or less; for multiple penetrations: Any material meeting requirements.
   1. Concrete Floors 5 inches in thickness or less:
      a. UL Design No. C-AJ-2093, C-AL-2140, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-2092, F Rating 3 hour.
   2. Roof Slabs 5 inches in thickness or less:
      a. UL Design No. C-AJ-2093, C-AL-2140, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-2092, F Rating 3 hour.
   3. Concrete/Masonry Walls 8 inches in thickness or less:
      a. UL Design No. C-AJ-2093, C-AL-2140, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-2092, F Rating 3 hour.
   4. Framed Floors:
      a. UL Design No. F-C-2115, F-C-2129, F-C-2158, F Rating 1 & 2 hour.
   5. Framed Walls:
      a. UL Design No. C-AJ-2021, W-L-2032, F Rating 1 & 2 hour.

F. Firestopping at Cable Tray Penetrations: Any material meeting requirements.
   1. Concrete Floors 5 inches in thickness or less:
      a. UL Design No. C-AJ-4003, C-AJ-4020, C-AJ-4017, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-4003, C-AJ-4020, C-AJ-4017, F Rating 3 hour.
   2. Roof Slabs 5 inches in thickness or less:
      a. UL Design No. C-AJ-4003, C-AJ-4020, C-AJ-4017, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-4003, C-AJ-4020, C-AJ-4017, F Rating 3 hour.
   3. Concrete/Masonry Walls 8 inches in thickness or less:
      a. UL Design No. C-AJ-4003, C-AJ-4020, C-AJ-4017, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-4003, C-AJ-4020, C-AJ-4017, F Rating 3 hour.
   4. Framed Walls:
      a. UL Design No. W-L-4004, W-L-4005, W-L-4011, F Rating 1 & 2 hour.

G. Firestopping at Cable Penetrations, not in Conduit or Cable Tray: Any material meeting requirements.
   1. Concrete Floors 5 inches in thickness or less:
      a. UL Design No. C-AJ-3030, C-AJ-3133, C-AJ-3072, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-3030, C-AJ-3023, C-AJ-3072, F Rating 3 hour.
   2. Concrete Floors 5 inches in thickness or greater:
      a. UL Design No. C-BK-3001, C-BK-3002, F Rating 1 & 2 hour.
      b. UL Design No. C-BK-3001, C-BK-3002, F Rating 3 hour.
   3. Roof Slabs 5 inches in thickness or less:
      a. UL Design No. C-AJ-3030, C-AJ-3133, C-AJ-3072, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-3030, C-AJ-3023, C-AJ-3072, F Rating 3 hour.

4. Roof Slabs 5 inches in thickness or greater:
   a. UL Design No. C-BK-3001, C-BK-3002, F Rating 1 & 2 hour.
   b. UL Design No. C-BK-3001, C-BK-3002, F Rating 3 hour.
5. Concrete/Masonry Walls 8 inches in thickness or less:
   a. UL Design No. C-AJ-3030, C-AJ-3133, C-AJ-3072, F Rating 1 & 2 hour.
   b. UL Design No. C-AJ-3030, C-AJ-3023, C-AJ-3072, F Rating 3 hour.
6. Concrete/Masonry Walls 8 inches in thickness or greater:
   a. UL Design No. C-BK-3001, C-BK-3002, F Rating 1 & 2 hour.
   b. UL Design No. C-BK-3001, C-BK-3002, F Rating 3 hour.
7. Framed Floors:
   a. UL Design No. F-C-3002, F-C-3045, F-C-3012, F Rating 1 & 2 hour.
8. Framed Walls:
   a. UL Design No. W-L-3110, W-L-3076, W-L-3065, F Rating 1 & 2 hour.
   b. UL Design No. W-L-3139, F Rating 3 hour.

H. Firestopping at Insulated Piping: Any material meeting requirements.
1. Concrete Floors 5 inches in thickness or less:
   a. UL Design No. C-AJ-5001, C-AJ-5058, C-AJ-5045, F Rating 1 & 2 hour.
   b. UL Design No. C-AJ-5001, C-AJ-5058, C-AJ-5061, F Rating 3 hour.
2. Concrete Floors 5 inches in thickness or greater:
   a. UL Design No. C-BK-5001, C-BK-5002, F Rating 1 & 2 hour.
   b. UL Design No. C-BK-5001, C-BK-5002, F Rating 3 hour.
3. Roof Slabs 5 inches in thickness or less:
   a. UL Design No. C-AJ-5001, C-AJ-5058, C-AJ-5045, F Rating 1 & 2 hour.
   b. UL Design No. C-AJ-5001, C-AJ-5058, C-AJ-5061, F Rating 3 hour.
4. Roof Slabs 5 inches in thickness or greater:
   a. UL Design No. C-BK-5001, C-BK-5002, F Rating 1 & 2 hour.
   b. UL Design No. C-BK-5001, C-BK-5002, F Rating 3 hour.
5. Concrete/Masonry Walls 8 inches in thickness or less:
   a. UL Design No. C-AJ-5001, C-AJ-5058, C-AJ-5045, F Rating 1 & 2 hour.
   b. UL Design No. C-AJ-5001, C-AJ-5058, C-AJ-5061, F Rating 3 hour.
6. Concrete/Masonry Walls 8 inches in thickness or greater:
   a. UL Design No. C-AJ-5001, C-AJ-5058, C-AJ-5045, F Rating 1 & 2 hour.
   b. UL Design No. C-AJ-5001, C-AJ-5058, C-AJ-5061, F Rating 3 hour.
7. Framed Floors:
   a. UL Design No. F-C-5038, F-C-5055, F-C-5029, F Rating 1 & 2 hour.
8. Framed Walls:
   a. UL Design No. W-L-5011, W-L-5014, W-L-5029, F Rating 1 & 2 hour.
   b. UL Design No. W-L-5101, W-L-5023, W-L-5085, F Rating 3 hour.

I. Firestopping at Miscellaneous Electrical Penetrants such as Busducts: Any material meeting requirements.
1. Concrete Floors 5 inches in thickness or less:
   a. UL Design No. C-AJ-6002, C-AJ-6003, C-AJ-6006, F Rating 1 & 2 hour.
   b. UL Design No. C-AJ-6002, C-AJ-6003, C-AJ-6006, F Rating 3 hour.
2. Roof Slabs 5 inches in thickness or less:
   a. UL Design No. C-AJ-6002, C-AJ-6003, C-AJ-6006, F Rating 1 & 2 hour.
   b. UL Design No. C-AJ-6002, C-AJ-6003, C-AJ-6006, F Rating 3 hour.
3. Concrete/Masonry Walls 8 inches in thickness or less:
   a. UL Design No. C-AJ-6002, C-AJ-6003, C-AJ-6006, F Rating 1 & 2 hour.
   b. UL Design No. C-AJ-6002, C-AJ-6003, C-AJ-6006, F Rating 3 hour.
4. Framed Walls:
   a. UL Design No. W-L-6002, W-L-6001, W-L-6004, F Rating 1 & 2 hour.

J. Firestopping at Miscellaneous Mechanical Penetrants such as Air Ducts: Any material meeting requirements.
   1. Concrete Floors 5 inches in thickness or less:
      a. UL Design No. C-AJ-7013, C-AJ-7047, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-7003, C-AJ-7046, F Rating 3 hour.
   2. Roof Slabs 5 inches in thickness or less:
      a. UL Design No. C-AJ-7013, C-AJ-7047, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-7003, C-AJ-7046, F Rating 3 hour.
   3. Concrete/Masonry Walls 8 inches in thickness or less:
      a. UL Design No. C-AJ-7013, C-AJ-7047, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-7003, C-AJ-7046, F Rating 3 hour.
   4. Framed Floors:
      a. UL Design No. F-C-7001, F-C-7002, F-C-7013, F Rating 1 & 2 hour.
   5. Framed Walls:
      a. UL Design No. W-L-7041, W-L-7025, W-L-7040, F Rating 1 & 2 hour.

K. Firestopping at Groupings of penetrations including any combination of items above: Any material meeting requirements.
   1. Concrete Floors 5 inches in thickness or less:
      a. UL Design No. C-AJ-8001, C-AJ-8016, C-AJ-8041, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-8001, C-AJ-8016, C-AJ-8041, F Rating 3 hour.
   2. Roof Slabs 5 inches in thickness or less:
      a. UL Design No. C-AJ-8001, C-AJ-8016, C-AJ-8041, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-8001, C-AJ-8016, C-AJ-8041, F Rating 3 hour.
   3. Concrete/Masonry Walls 8 inches in thickness or less:
      a. UL Design No. C-AJ-8001, C-AJ-8016, C-AJ-8041, F Rating 1 & 2 hour.
      b. UL Design No. C-AJ-8001, C-AJ-8016, C-AJ-8041, F Rating 3 hour.
   4. Framed Walls:
      a. UL Design No. W-L-8013, W-L-8016, F Rating 1 & 2 hour.
      b. UL Design No. W-L-8014, W-L-8015, F Rating 3 hour.

L. Firestopping between Edge of Floor Slab and Curtain Wall (without Penetrations): Glass fiber or mineral fiber safing insulation; UL Design No. F-C-7001, F Rating 1 hour.

M. Temporary Firestopping: Intumescent pillows; UL Design No. C-AJ-2020, F Rating 1-1/2 hour; provide at locations indicated on drawings.

2.2 MATERIALS

A. Manufacturers:
   1. 3M Fire Protection Products.
   2. Firestop Systems, Inc.
   3. Hilti Construction Chemicals, Inc.
   4. Isolatek International.
   5. Johns Mansville International, Inc.
   6. Specified Technologies, Inc.
   7. Tremco.
   8. Substitutions: See Section 01600 - Product Requirements.

B. Elastomeric Silicone Firestopping: Single component silicone elastomeric compound and compatible silicone sealant. Type required for tested assembly design.
   1. Color: Dark grey.

C. Fibered Compound Firestopping: Formulated compound mixed with incombustible non-asbestos fibers. Type required for tested assembly design.
   1. Color: Dark grey.

D. Fiber Packing Material: Mineral fiber packing insulation. Type required for tested assembly design.

E. Foil Tape: Nominal 3 mil. thick pressure sensitive aluminum foil tape. Type required for tested assembly design.

F. Firestop Devices: Mechanical device with incombustible filler and galvanized steel jacket, collar, and flanged stops. Type required for tested assembly design.
G. Intumescent Composite Sheet: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet. Type required for tested assembly design.
H. Hangers: Minimum 1 inch wide strips of minimum 0.034 inch (20 gauge) galvanized steel sheet. Type required for tested assembly design.
I. Fire Spray: Sprayable, flexible, water-based coating that is water-resistant. Type required for tested assembly design.
J. Caulks: Single component, water-based, non-flammable, paintable coating with non-sag and low shrinkage characteristics. Type required for tested assembly design.
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. Type required for tested assembly design.
L. Primers, Sleeves, Forms, and Accessories: Type required for tested assembly design.

PART 3 – EXECUTION

3.1 EXAMINATION
A. Verify openings are ready to receive the work of this section.

3.2 PREPARATION
A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.
B. Remove incompatible materials which may affect bond.
C. Priming: Prime substrates where recommended in writing by through-penetration firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.

3.3 INSTALLATION
A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

3.4 CLEANING AND PROTECTION
A. Clean adjacent surfaces of firestopping materials.
B. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 07900

JOINT SEALERS

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Sealants and joint backing.

1.2 RELATED SECTIONS
A. Section 09260 – Gypsum Board Assemblies: Acoustic Sealant.

1.3 REFERENCES
A. ASTM C 834 - Standard Specification for Latex Sealants; 2000.
B. ASTM C 919 - Standard Practice for Use of Sealants in Acoustical Applications; 2002.
C. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2002.
D. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2000.
E. ASTM D 1667 - Standard Specification for Flexible Cellular Materials--Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam); 1997.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.

1.5 QUALITY ASSURANCE
A. Applicator Qualifications: Company specializing in performing the work of this section with minimum 3 years experience and approved by manufacturer.

1.6 ENVIRONMENTAL REQUIREMENTS
A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.7 WARRANTY
A. See section 01780 – Closeout Submittals, for additional warranty requirements.
B. Correct defective work within a five year period after the Date of Substantial Completion.
C. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

PART 2 – PRODUCTS

2.1 MANUFACTUERS
A. Silicone Sealants:
   1. Bostik Findley; www.bostikfindley-us.com.
   2. GE Plastics: www.geplastics.com.
   3. Pecora Corporation: www.pecora.com.
   4. Sonneborn, ChemRex, Inc; www.chemrex.com.
   5. Dow Corning: www.dowcorning.com
   6. Tremco, Inc: www.tremcosealants.com.
   7. Substitutions: See Section 01600 - Product Requirements.
B. Polyurethane Sealants:
   1. Bostik Findley; www.bostikfindley-us.com.
   2. Pecora Corporation: www.pecora.com.
   3. Sonneborn, ChemRex, Inc; www.chemrex.com.
   4. Tremco, Inc: www.tremcosealants.com.
   5. Substitutions: See Section 01600 - Product Requirements.

C. Butyl Sealants:
   1. Bostik Findley; www.bostikfindley-us.com.
   2. Pecora Corporation: www.pecora.com.
   3. TEC Specialty Products Inc.
   4. Tremco, Inc: www.tremcosealants.com.
   5. Substitutions: See Section 01600 - Product Requirements.
D. Preformed Compressible Foam Sealers:
   1. Emseal Joint Systems, Ltd: www.emseal.com.
   2. Sandell Manufacturing Company, Inc: www.sandellmfg.com.
   3. Polytite Manufacturing Corporation: www.polytite.com.
   4. Substitutions: See Section 01600 - Product Requirements.

2.2 SEALANTS

A. Type S1 - General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; single component.
   1. Color: As selected by Architect from Manufacturer's full line of colors.
   2. Applications:
      a. Control, expansion and soft joints in masonry.
      b. Joints between concrete and other materials.
      c. Joints between metal frames and other materials.
      d. Other exterior joints for which no other sealant is indicated.
B. Type S2 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.
   1. Color: As selected by Architect from Manufacturer's full line of colors.
   2. Applications:
      a. Interior wall and ceiling control joints.
      b. Joints between door and window frames and wall surfaces.
      c. Other interior joints for which no other sealant is indicated.
C. Type S3 - Acoustical Sealant: Butyl or acrylic sealant; ASTM C 920, Grade NS, Class 12-1/2, Uses M and A; single component, solvent release curing, non-skinning.
   1. Color: N/A.
   2. Applications:
      a. For concealed locations only.
      b. Sealant bead between top stud runner and structure; and between bottom stud track and floor.
D. Type S4 - Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Grade P, Class 25, Uses T, M and A; single component.
   1. Color: As selected by Architect from Manufacturer's full line of colors.
   2. Applications:
      a. Approved by manufacturer for wide joints up to 1-1/2 inches.
      b. Expansion joints in floors.

2.3 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
C. Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.
D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 – EXECUTION

3.1 EXAMINATION
A. Verify that substrate surfaces are ready to receive work.
B. Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION
A. Remove loose materials and foreign matter which might impair adhesion of sealant.
B. Clean and prime joints in accordance with manufacturer's instructions.
C. Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.
D. Protect elements surrounding the work of this section from damage or disfigurement.

3.3 INSTALLATION
A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
B. Perform installation in accordance with ASTM C 1193.
C. Perform acoustical sealant application work in accordance with ASTM C 919.
D. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
E. Install bond breaker where joint backing is not used.
F. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
G. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
H. Tool joints concave.

3.4 CLEANING
A. Clean adjacent soiled surfaces.

3.5 PROTECTION OF FINISHED WORK
A. Protect sealants until cured.

3.6 SCHEDULE
A. Exterior Joints for Which No Other Sealant Type is Indicated: Type S1; colors as selected.
B. Control and Expansion Joints in Paving: Type S5.
C. Exterior Wall Expansion Joints: Type S1.
D. Joints Between Exterior Metal Frames and Adjacent Work (except masonry): Type S1.
E. Interior Joints for Which No Other Sealant is Indicated: Type S2.
F. Control and Expansion Joints in Interior Concrete Slabs and Floors: Type S4.
G. In STC-Rated Walls, Between Metal Stud Track/Runner and Adjacent Construction: Type S3.
H. Joints Between Plumbing Fixtures and Walls and Floors, and Between Countertops and Walls: Type S2.

END OF SECTION

SECTION 08110

STEEL DOORS AND FRAMES

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Steel frames for wood doors.
B. Steel glazing frames.

1.2 RELATED SECTIONS
A. Section 08211 - Flush Wood Doors.
B. Section 08710 - Door Hardware.
C. Section 08800 - Glazing: Glass for doors and borrowed lites.
D. Section 09900 - Paints and Coatings: Field painting.

1.3 REFERENCES
A. ANSI/ICC A117.1 - American National Standard for Accessible and Usable Buildings and Facilities; International Code Council; 1998.
B. ANSI A250.8 - SDI-100 Recommended Specifications for Standard Steel Doors and Frames; 1998.
C. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 1998.
D. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2002a.
E. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus; 1997.
F. NAAMM HMMA 840 - Installation and Storage of Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 1999.
G. NAAMM HMMA 860 - Guide Specifications for Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 1992.
H. NAAMM HMMA 861 - Guide Specifications for Commercial Hollow Metal Doors and Frames; The National Association of Architectural Metal Manufacturers; 2000.
I. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association; 1999.
J. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; National Fire Protection Association; 1999.
K. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements for submittal procedures.
B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes; and one copy of referenced grade standard.
C. Shop Drawings: Details of each opening, showing elevations, glazing, frame profiles, and identifying location of different finishes, if any.
D. Manufacturer's Certificate: Certification that products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE
A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum Five years documented experience.
B. Maintain at the project site a copy of all reference standards dealing with installation.

1.6 DELIVERY, STORAGE, AND PROTECTION
A. Store in accordance with NAAMM HMMA 840.
B. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 – PRODUCTS

2.1 MANUFACTUERS

A. Steel Doors and Frames:
   1. Ceco Door Products; www.cecodoor.com.
   2. Curries; www.curries.com.
   3. Kewanee Corp., Kewanee, IL.
   4. LaForce Inc.; www.laforceinc.com.
   5. Republic Builders Products; www.republicdoor.com.
   6. Steelcraft Manufacturing Co; www.steelcraft.com.
   7. Trussbilt; www.trussbilt.com.
   8. Substitutions: See Section 01600 - Product Requirements.

2.2 DOORS AND FRAMES

A. Requirements for All Doors and Frames:
   1. Door Top Closures: Flush with top of faces and edges.
   2. Door Edge Profile: Beveled on both edges.
   3. Door Texture: Smooth faces.
   4. Glazed Lights: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
   5. Hardware Preparation: In accordance with DHI A115 Series, with reinforcement welded in place, in addition to other requirements specified in door grade standard.
   6. Galvanizing for Units in Wet Areas: All components hot-dipped zinc-iron alloy-coated (galvannealed), Manufacturer's standard coating thickness.
   7. Finish: Factory primed, for field finishing.

B. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with all the specified requirements for each type; for instance, an exterior door that is also indicated as being sound-rated must comply with the requirements specified for exterior doors and for sound-rated doors; where two requirements conflict, comply with the most stringent.

2.3 STEEL FRAMES

A. General: Provide fully welded frames.
   1. Comply with the requirements of grade specified for corresponding door, except:
      a. Provide 16 gage frames, except provide #14 gauge galvanized for exterior doors.
   2. Hardware Reinforcing:
      a. Butts and Pivots: 1/4-inch thick.
      b. Locks: # 12 gauge.
      c. Surface Applied Hardware: #12 gauge.
      d. Dust Covers: #20 gauge.
   3. Frame Anchors: #14 gauge, corrugated "T" anchors.
      a. Frames for Wood Doors: Comply with frame requirements specified in ANSI A250.8 for Level 1, 16 gage
   4. Minimum Reinforcing Size:
      a. Butts and Pivots: Full width of frame by 10-inches long.
      b. Closers: Full width of frame by 18-inches long.
      c. Locks: As required by template.
      d. Other Surface Applied Hardware: As required by template.
   5. Finish: Factory primed, for field finishing.
      a. Frame installer shall coat the interior portion of all exterior frames with a bituminous coating after factory priming and prior to installation (both jambs).
   6. Provide mortar guard boxes for hardware cut-outs in frames to be installed in masonry or to be grouted.
   7. Frames in Masonry Walls: Size to suit masonry coursing with head member 4 inches high to fill opening without cutting masonry units.

8. Frames Wider than 48 Inches: Reinforce with steel channel fitted tightly into frame head, flush with top.
9. Interior Door Frames, Non-Fire-Rated: Fully welded type.
10. Interior Door Frames, Fire-Rated: Fully welded type.
    a. Fire Rating: Same as door, labeled.

B. Mullions for Pairs of Doors: Removable, of profile similar to jambs.
C. Frames for Interior Glazing or Borrowed Lights: Construction and face dimensions to match door frames, and as indicated on drawings.
D. Transom Bars: Fixed, of profile same as jamb and head.

2.4 ACCESSORY MATERIALS

A. Louvers: Roll formed steel with overlapping frame; factory-painted finish, color as selected; factory-installed.
   1. In Fire-Rated Doors: UL-listed fusible link louver, same rating as door.
   2. Style: Standard straight slat blade.
B. Glazing: As specified in Section 08800.
C. Removable Stops: Formed sheet steel, shape as indicated on drawings, mitered or butted corners; prepared for countersink style tamper proof screws.
D. Grout for Frames: Portland cement grout of maximum 4-inch slump for hand troweling; thinner pumpable grout is prohibited unless approved in writing by Architect for areas only inaccessible to troweling during installation.
E. Silencers: Resilient rubber, fitted into drilled hole; 3 on strike side of single door, 3 on center mullion of pairs, and 2 on head of pairs without center mullions.
F. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.5 FINISH MATERIALS

A. Primer: Rust-inhibiting, complying with ANSI A250.10, door manufacturer's standard.
B. Bituminous Coating: Asphalt emulsion or other high-build, water-resistant, resilient coating.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify that opening sizes and tolerances are acceptable.

3.2 PREPARATION

A. Frame installing contractor shall coat inside of frames to be installed in masonry or to be grouted, with bituminous coating prior to installation as noted. Apply wet to 18.0 mils (450 microns) in one or two coats. Total dry film thickness of not less than 12 mils (300 microns) or in excess of 30 mils.

3.3 INSTALLATION

A. Install in accordance with the requirements of the specified door grade standard and NAAMM HMMA 840.
B. In addition, install fire rated units in accordance with NFPA 80.
C. Coordinate frame anchor placement with wall construction.
D. Grout frames in solid masonry construction; brace frames so that pressure of grout before setting will not deform frames.
E. Coordinate installation of hardware.
F. Coordinate installation of glazing.
G. Whenever possible, leave frame spreaders intact until frames and masonry are set perfectly square and plumb and all anchors are securely attached. Grout all frames solid.
H. Coordinate installation of electrical connections to electrical hardware or security devices.

I. Grind, bondo, sand, prime and paint over grout holes, anchor heads and any imperfections in frame.
J. Touch up damaged factory finishes.

3.4 ERECTION TOLERANCES

A. Clearances between Door and Frame: As specified in ANSI A250.8.
B. Maximum Diagonal Distortion: 1/16 in measured with straight edge, corner to corner.
C. Do not erect members which are observed to be warped, bowed, deformed, or otherwise damaged or defaced to such an extent as to impair strength or appearance. Remove and replace members which have been damaged in the process of erection.

3.5 ADJUSTING

A. Adjust for smooth and balanced door movement.

3.6 SCHEDULE

A. Refer to Door and Frame Schedule on the drawings.

END OF SECTION

SECTION 08211

FLUSH WOOD DOORS

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Flush wood doors; flush configuration; fire rated and non-rated.

1.2 RELATED SECTIONS
A. Section 08110 - Steel Doors and Frames.
C. Section 08710 - Door Hardware.
D. Section 08800 - Glazing.
E. Section 09900 - Paints and Coatings: Site finishing of doors.

1.3 REFERENCES
A. AWI (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute; 1997, Seventh Edition, Version 1.0.
B. NFPA 80 - Standard for Fire Doors and Fire Windows; National Fire Protection Association; 1999.
C. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.
D. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; 1998.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements for submittal procedures.
B. Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
C. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing.

1.5 QUALITY ASSURANCE – NOT USED

1.6 REGULATORY REQUIREMENTS
A. Installed Fire Rated Door and Transom Panel Assembly: Conform to NFPA 80 for fire rated class as indicated.

1.7 DELIVERY, STORAGE, AND PROTECTION
A. Package, deliver and store doors in accordance with specified quality standard.
B. Accept doors on site in manufacturer's packaging. Inspect for damage.
C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

1.8 PROJECT CONDITIONS
A. Coordinate the work with door opening construction, door frame and door hardware installation.

1.9 WARRANTY
A. See Section 01780 - Closeout Submittals for additional warranty requirements.
B. Provide warranty for the following term:
C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, telegraphing core construction.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Veneer Doors:
   1. Algoma Hardwoods, Algoma, WI.
   2. Eggers Industries, Two Rivers, WI.www.eggersindustries.com.
   3. Marshfield DoorSystems, Inc: www.marshfielddoors.com.
   4. Oshkosh Architectural Door Company, Oskosh, WI
   5. V.T. Industries, Holstein, IA
   6. Substitutions: See Section 01600 - Product Requirements.

2.2 DOORS AND PANELS

A. All Doors: See drawings for locations and additional requirements.
B. Interior Doors: 1-3/4 inches thick unless otherwise indicated; flush construction.
   1. Provide solid core doors at all locations unless otherwise noted.
   2. Fire Rated Doors: Tested to ratings indicated on drawings in accordance with UL 10C or UBC Standard 7-2-97 ("positive pressure"); UL labeled.

2.3 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: AWI Architectural Woodwork Quality Standards Illustrated, Section 1300, Type PC - Particleboard; Grade 1-LD-1.
B. Fire Rated Doors: Mineral core, Type FD, plies and faces as indicated above.

2.4 DOOR FACINGS

A. Wood Veneer Facing for Transparent Finish: Species as specified above, veneer grade as specified by quality standard, plain sliced, book veneer match, running assembly match; unless otherwise indicated.
   1. Vertical Edges: Same species as face veneer.
B. Interior Doors - Veneer: red oak species, veneer grade as specified by door quality standard, plain sliced, with slip matched grain, for transparent finish.
C. Facing Adhesive: Type I - waterproof.

2.5 ACCESSORIES

A. Glazing Stops: Wood, of same species as door facing, butted corners; prepared for countersink style tamper proof screws.

2.6 DOOR CONSTRUCTION

A. Fabricate doors in accordance with door quality standard specified.
B. Fabricate fire rated doors in accordance with UL requirements. Attach fire rating label to door.
C. Meeting Options for (Non-Rated) Double Doors: No Bevel
D. Provide solid blocks at lock edge for hardware reinforcement.
   1. Provide solid blocking for other through bolted hardware.
E. Vertical Exposed Edge of Stiles - Veneer Faces: Of same species as veneer facing.
F. Fit door edge trim to edge of stiles after applying veneer facing.
G. Bond edge banding to cores.
H. Transom Meeting Edge Options: Non-Rabbeted
I. Provide edge clearances in accordance with AWI Quality Standards Illustrated Section 1700.

2.7 FACTORY FINISHING

A. Factory finish doors in accordance with AWI Quality Standards Illustrated, Section 1500 to the following finish designations:
   1. Transparent Finish: TR-6, transparent catalyzed polyurethane, Custom quality, Semi-Gloss sheen.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify that opening sizes and tolerances are acceptable.
C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
   1. Install fire-rated doors in accordance with NFPA 80, Warnock Hersey, and UL requirements.
B. Trim non-rated door width by cutting equally on both jamb edges.
C. Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm).
D. Use machine tools to cut or drill for hardware.
E. Pilot drill screw and bolt holes.
F. Coordinate installation of doors with installation of frames and hardware.
G. Coordinate installation of glazing.

3.3 INSTALLATION TOLERANCES

A. Conform to specified quality standard for fit and clearance tolerances.
B. Conform to specified quality standard for maximum diagonal distortion.

3.4 ADJUSTING

A. Adjust doors for smooth and balanced door movement.
B. Adjust closers for full closure.

3.5 SCHEDULE - See Drawings

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Lock cylinders for doors for which hardware is specified in other sections.
B. Hardware for all doors.

1.2 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.3 SUMMARY
A. Section includes:
   1. Mechanical and electrified door hardware for:
      a. Swinging doors.
   2. Electronic access control system components, including:
      a. Electronic access control devices.
   3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
   4. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the contractor's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:
   1. Windows
   2. Cabinets (casework), including locks in cabinets
   3. Signage
   4. Toilet accessories
   5. Overhead doors
   6. Shower doors
   7. Access doors and panels
   8. Conduit, junction boxes & wiring

C. Related Sections:
   1. Division 01 Section "Alternates" for alternates affecting this section.
   2. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
   3. Division 08 Section "Openings" for doors and frames
   4. Division 08 Section "Entrances and Storefront" for hardware requirements applicable to installation of hardware to entrance doors
   5. Division 08 Section "Fire Rated Glass and Framing Systems" for requirements for aluminum opening fire rated hardware
   6. Division 09 sections for touchup, finishing or refinishing of existing openings modified by this section.

1.4 REFERENCES
A. UL - Underwriters Laboratories
   1. UL 10B - Fire Test of Door Assemblies
   2. UL 10C - Positive Pressure Test of Fire Door Assemblies
   3. UL 1784 - Air Leakage Tests of Door Assemblies
   4. UL 294 - Standard for Access Control System Units
   5. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute
   1. Sequence and Format for the Hardware Schedule
   2. Recommended Locations for Builders Hardware
   3. Key Systems and Nomenclature

C. ANSI - American National Standards Institute
   1. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
   2. ICC/ANSI A117.1 - 2017 – Specifications for making buildings and facilities usable by physically handicapped people
   3. ANSI/BHMA A156.28 “Recommended Practices for Keying Systems”
D. NFPA – National Fire Protection Association
   1. NFPA 70 – National Electrical Code
   2. NFPA 80 – Fire Doors and Windows
   3. NFPA 105 – Smoke and Draft Control Door Assemblies
   4. NFPA 252 – Fire Test of Door Assemblies
E. WHI – Warnock Hersey Incorporated
F. SDI – Steel Door Institute
G. WI – Woodwork Institute
H. AWI – Architectural Woodwork Institute
I. NAAMM – National Association of Architectural Metal Manufacturers
J. Local applicable codes

1.5 SUBMITTALS

A. General:
   1. Submit in accordance with Conditions of Contract and Division 01 requirements.
   2. Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
   3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.
B. Action Submittals:
   1. Product Data: Technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
   2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
      a. Wiring Diagrams: For power, signal, and control wiring and including:
         1) Details of interface of electrified door hardware and building safety and security systems.
         2) Schematic diagram of systems that interface with electrified door hardware.
         3) Point-to-point wiring.
         4) Risers.
   3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
      a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
   4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format. Indicate complete designations of each item required for each door or opening, include:
      a. Door Index; include door number, heading number, and Architects hardware set number.
      b. Quantity, type, function, style, size, and finish of each hardware item.
      c. Name and manufacturer of each item.
      d. Fastenings and other pertinent information.
      e. Location of each hardware set cross-referenced to indications on Drawings.
      f. Explanation of all abbreviations, symbols, and codes contained in schedule.
      g. Mounting locations for hardware.
      h. Door and frame sizes and materials.

i. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components). Operational description should include operational descriptions for: egress, ingress (access), and fire/smoke alarm connections.
   1) Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.

5. Key Schedule:
   a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
   b. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   c. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   d. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
      1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
   e. Prepare key schedule by or under supervision of supplier, detailing Owner’s final keying instructions for locks.
6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified for door hardware installation.

C. Informational Submittals:
1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
2. Certificates of Compliance:
   a. UL listings for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
   b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in “QUALITY ASSURANCE” article, herein.
   c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in “QUALITY ASSURANCE” article, herein.
3. Warranty: Special warranty specified in this Section.

D. Closeout Submittals:
1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
   a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Factory order acknowledgement numbers (for warranty and service)
   d. Parts list for each product.
   e. Final approved hardware schedule, edited to reflect conditions as-installed.
   f. Final keying schedule
   g. Copies of floor plans with keying nomenclature
   h. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
   i. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

1.6 QUALITY ASSURANCE

A. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.

B. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
   1. Warehousing Facilities: In Project's vicinity.
   2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
   3. Coordination Responsibility: Assist in coordinating installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.

C. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
   1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
   2. Can provide installation and technical data to Architect and other related subcontractors.
   3. Can inspect and verify components are in working order upon completion of installation.
   4. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.

D. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
   1. Bid and submit manufacturer’s updated/improved item if scheduled item is discontinued.

E. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of fire-rated door and door frame labels.

F. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

G. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in “REFERENCES” article, herein.

H. Keying Conference
   1. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
      a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
      b. Preliminary key system schematic diagram.
      c. Requirements for key control system.
      d. Requirements for access control.
      e. Address for delivery of keys.

I. Pre-installation Conference
   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. Inspect and discuss preparatory work performed by other trades.
   3. Inspect and discuss electrical roughing-in for electrified door hardware.
   4. Review sequence of operation for each type of electrified door hardware.
   5. Review required testing, inspecting, and certifying procedures.

J. Coordination Conferences:
   1. Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.

2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
   1. Deliver each article of hardware in manufacturer's original packaging.
C. Project Conditions:
   1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
   2. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
D. Protection and Damage:
   1. Promptly replace products damaged during shipping.
   2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
   3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
E. Deliver keys and permanent cores to Owner.

1.8 COORDINATION

A. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation. If conflict between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.
B. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
C. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
D. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
E. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
F. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.9 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
   1. Closers:
      a. Mechanical: 30 years
   2. Exit Devices:
      a. Mechanical: 3 years.
   3. Locksets:
      a. Mechanical: 3 years.
      b. Electrified: 1 year.
   4. Continuous Hinges: Lifetime warranty.
   5. Key Blanks: Lifetime

6. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

B. See Section 01780 - Closeout Submittals, for additional warranty requirements.

1.10 MAINTENANCE

A. Maintenance Tools: Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. The Owner requires use of certain products for their unique characteristics and project suitability to ensure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: “No Substitute.”
   1. Where “No Substitute” is noted, substitution requests for other products will not be considered.
1. Approval of manufacturers and/or products other than those listed as “Scheduled Manufacturer” or “Basis of Design” shall be in accordance per spec section 01600 - Product Requirements.

B. In the individual article for the product category items, shall be in accordance with the QUALITY ASSURANCE article, herein.

C. Approval of products is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer’s product.

D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval in accordance with substitution procedure in spec section

2.2 MATERIALS

A. Fasteners
   1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
   2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
   3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
   4. Install hardware with fasteners provided by hardware manufacturer.

B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.
   1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
   2. Use materials which match materials of adjacent modified areas.
   3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.

C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
   1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

D. Cable and Connectors: Hardwired Electronic Access Control Lockset and Exit Device Trim:
   1. Data: 24AWG, 4 conductor shielded, Belden 9843, 9841 or comparable.
   2. DC Power: 18 AWG, 2 conductor, Belden 8760 or comparable.
   3. Provide type of data and DC power cabling required by access control device manufacturer for this installation.
   4. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with sufficient number and wire gauge with standardized Molex plug connectors to accommodate electric function of specified hardware. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.3 HINGES

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product: Ives 5BB series. Basis of Design.
B. Requirements:
   1. Provide hinges conforming to ANSI/BHMA A156.1.
   2. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
      a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high
      b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
      c. Interior: Heavy weight steel, all doors with closers or overhead stops
   3. 1-3/4 inch (44 mm) thick doors 36 inches (914 mm) wide and over:
      a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
      b. Interior: Heavy weight, steel, 5 inches (127 mm) high
   4. 2 inches or thicker doors:
      a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
      b. Interior: Heavy weight, steel, 5 inches (127 mm) high
   5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
   6. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
   7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
      a. Steel Hinges: Steel pins
      b. Non-Ferrous Hinges: Stainless steel pins
      c. Out-Swinging Exterior Doors: Non-removable pins
      d. Out-Swinging Interior Lockable Doors: Non-removable pins
      e. Interior Non-lockable Doors: Non-rising pins
   8. Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, trim and wall conditions to allow proper degree of opening.

2.4 ELECTRIC POWER TRANSFER

A. Manufacturers:
   1. Scheduled Manufacturer: Von Duprin EPT-10. Basis of Design.
B. Requirements:
   1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires sufficient to accommodate electric function of specified hardware.
   2. Locate electric power transfer per manufacturer’s template and UL requirements, unless interference with operation of door or other hardware items.

2.5 FLUSH BOLTS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives. Basis of Design.

B. Requirements:
   1. Provide automatic, constant latching, and manual flush bolts with forged bronze or stainless-steel face plates, extruded brass levers, and with wrought brass guides and strikes. Provide 12 inch (305 mm) steel or brass rods at doors up to 90 inches (2286 mm) in height. For doors over 90 inches (2286 mm) in height increase top rods by 6 inches (152 mm) for each additional 6 inches (152 mm) of door height. Provide dust-proof strikes at each bottom flush bolt.

2.6 MORTISE LOCKS

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product: Schlage L9000 series. No substitute.

B. Requirements:
   1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3 hour fire doors.
   2. Indicators: Where specified, provide indicator window measuring a minimum 2 inch x 1/2 inch with 180 degree visibility. Provide messages color-coded with full text and/or symbols, as scheduled, for easy visibility.
      a. Inside Security Indicator: Provide indicator above cylinder or thumbturn for visibility during lockdown that identifies the outside trim as locked/unlocked status of the door.
      b. Outside Occupancy Indicator: Provide indicator above cylinder or emergency release for visibility while operating the lock that identifies an occupied/unoccupied status of the lock or latch.
   3. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
   4. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to “KEYING” article, herein.
   5. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1 inch (25 mm) throw, constructed of stainless steel.
   6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
   7. Provide electrified options as scheduled in the hardware sets. Where scheduled, provide switches and sensors integrated into the locks and latches.
   8. Provide motor based electrified locksets with electrified options as scheduled in the hardware sets and comply with the following requirements:
      a. Universal input voltage – single chassis accepts 12 or 24V DC to allow for changes in the field without changing lock chassis.
      b. Fail Safe/Fail Secure – changing mode between electrically locked (fail safe) and electrically unlocked (fail secure) is field selectable without opening the lock case
      c. Low maximum current draw – maximum 0.4 amps to allow for multiple locks on a single power supply.
      d. Low holding current – maximum 0.01 amps to produce minimal heat, eliminate “hot levers” in electrically locked applications, and to provide reliable operation in wood doors that provide minimal ventilation and air flow.
      e. Request to Exit Switch (RX) –
         1) Modular Design – provide electrified locks capable of using, adding, or changing a modular RX switch without opening the lock case.
         2) Monitoring – where scheduled, provide a request to exit (RX) switch that detects rotation of the inside lever.
      f. Connections – provide quick-connect Molex system standard.
   9. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.

a. Lever Design: Schlage 06N.
b. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.7 EXIT DEVICES

A. Manufacturers and Products:
1. Scheduled Manufacturer and Product: Von Duprin 99/33A series. No substitute.

B. Requirements:
1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to “KEYING” article, herein.
3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide flush end caps for exit devices.
7. Provide exit devices with manufacturer’s approved strikes.
8. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
9. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
10. Provide cylindrical or hex-key dogging as specified at non fire-rated openings.
11. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
12. Provide factory drilled weep holes for exit devices used in full exterior application, highly corrosive areas, and where noted in hardware sets.
13. Provide electrified options as scheduled.
14. Concealed Vertical Cable Exit Devices: provide cable-actuated concealed vertical latch system in two-point for non-rated or fire rated wood doors up to a 90 minute rating and less bottom latch (LBL) configuration for non-rated or fire rated wood doors up to 20 minute rating. Vertical rods not permitted.
    a. Cable: Stainless steel with abrasive resistant coating. Conduit and core wire ends snap into latch and center slides without use of tools.
    b. Wood Door Prep: Maximum 1 inch x 1.1875 inch x 3.875 inches top latch pocket and 1 inch x 1.1875 inch x 5 inches bottom latch pocket which does not require the use of a metal wrap or edge for non-rated or fire rated wood doors up to a 45 minute rating.
    c. Latchbolts and Blocking Cams: Manufactured from sintered metal low carbon copper-infiltrated steel, with molybdenum disulfide low friction coating.
    d. Top Latchbolt: Minimum 0.38 inch (10 mm) and greater than 90 degree engagement with strike to prevent door and frame separation under high static load.
    e. Bottom Latchbolt: Minimum of 0.44 inch (11 mm) engagement with strike.
    f. Product Cycle Life: 1,000,000 cycles.
    g. Latch Operation: Top and bottom latch operate independently of each other. Top latch fully engages top strike even when bottom latch is compromised. Separate trigger mechanisms not permitted.
    h. Latch release does not require separate trigger mechanism.
    i. Cable and latching system characteristics:
        1) Installed independently of exit device installation, and capable of functioning on door prior to device and trim installation.
        2) Connected to exit device at single point in steel and aluminum doors, and two points for top and bottom latches in wood doors.

3) Bottom latch height adjusted, from single point for steel and aluminum doors and two points for wood doors, after system is installed and connected to exit device, while door is hanging
4) Bottom latch position altered up and down minimum of 2 inches (51 mm) in steel and aluminum doors without additional adjustment. Bottom latch deadlocks in every adjustment position in wood doors.
5) Top and bottom latches in steel and aluminum doors and top latch in wood doors may be removed while door is hanging.

15. Top latch mounting: double or single tab mount for steel doors, face mount for aluminum doors eliminating requirement of tabs, and double tab mount for wood doors.
16. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
17. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

2.8 CYLINDERS

A. Manufacturers:
   1. Scheduled Manufacturer: Schlage. No substitute.
B. Requirements:
   1. Provide interchangeable cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
   2. Provide the following keyway: Schlage E – verify with owner.
C. Construction Keying:
   1. Replaceable Construction Cores
      a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
         1) 3 construction control keys
         2) 12 construction change (day) keys.
      b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2.9 KEYING

A. Provide a factory registered keying system, complying with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
B. Provide cylinders/cores keyed into Owner's existing factory registered keying system.
C. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
D. Requirements:
   1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
      a. Master Keying system as directed by the Owner.
   2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
   3. Provide keys with the following features:
      a. Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
      b. Patent Protection: Keys and blanks protected by one or more utility patent(s).
   4. Identification:
      a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Do not provide blind code marks with actual key cuts.
      b. Identification stamping provisions must be approved by the Architect and Owner.

c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
d. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.

5. Quantity: Furnish in the following quantities.
   a. Change (Day) Keys: 3 per cylinder/core.
   b. Permanent Control Keys: 3.
   c. Master Keys: 6.

2.10 KEY CONTROL SYSTEM

A. Manufacturers:
   1. Scheduled Manufacturer: Telkee.
   2. Acceptable Manufacturers: HPC, Lund.

B. Requirements:
   1. Provide key control system, including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of number of locks required for Project.
      a. Provide complete cross index system set up by hardware supplier, and place keys on markers and hooks in cabinet as determined by final key schedule.
      b. Provide hinged-panel type cabinet for wall mounting.

2.11 DOOR CLOSERS

A. Manufacturers and Products:
   1. Scheduled Manufacturer and Product: LCN 4040XP series. No substitute.

B. Requirements:
   1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
   2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
   3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 3/4 inch (19 mm) diameter double heat-treated pinion journal.
   4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
   5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
   6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
   7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
   8. Pressure Relief Valve (PRV) Technology: Not permitted.
   9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
   10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

2.12 DOOR TRIM

A. Manufacturers:
   1. Scheduled Manufacturer: Ives. Basis of Design.
B. Requirements:
   1. Provide push plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick and beveled 4 edges. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
   2. Provide push bars of solid bar stock, diameter and length as scheduled. Provide push bars of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
   3. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
   4. Provide flush pulls as scheduled. Where required, provide back-to-back mounted model.
   5. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
   6. Provide pull plates 4 inches (102 mm) wide by 16 inches (406 mm) high by 0.050 inch (1 mm) thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches (102 mm) wide plate, adjust width to fit.
   7. Provide wire pulls of solid bar stock, diameter and length as scheduled.
   8. Provide decorative pulls as scheduled. Where required, mount back to back with pull.

2.13 PROTECTION PLATES

A. Manufacturers:
   1. Scheduled Manufacturer: Ives. Basis of Design.
B. Requirements:
   1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
   2. Sizes of plates:
      a. Kick Plates: 10 inches (254 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
      b. Mop Plates: 4 inches (102 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
      c. Armor Plates: 36 inches (914 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

2.14 DOOR STOPS AND HOLDERS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives. Basis of Design.
B. Provide door stops at each door leaf:
   1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
   2. Where a wall stop cannot be used, provide universal floor stops for low or high rise options.
   3. Where wall or floor stop cannot be used, provide medium duty surface mounted overhead stop.

2.15 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:
   1. Scheduled Manufacturer: Zero International. Basis of Design.
B. Requirements:
   1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.

2. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
3. Size of thresholds:
   a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
   b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width
4. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

2.16 SILENCERS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives. Basis of Design.
B. Requirements:
   1. Provide "push-in" type silencers for hollow metal or wood frames.
   2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
   3. Omit where gasketing is specified.

2.17 LATCH PROTECTORS

A. Manufacturers:
   1. Scheduled Manufacturer: Ives. Basis of Design.
B. Provide stainless steel latch protectors of type required to function with specified lock.

2.18 FINISHES

A. Finish: exterior and aluminum storefront doors - BHMA 626/652 (US26D); except:
   1. Hinges at Exterior Doors: BHMA 630 (US32D)
   2. Push Plates, Pulls, and Push Bars: BHMA 630 (US32D)
   3. Protection Plates: BHMA 630 (US32D)
   4. Overhead Stops and Holders: BHMA 630 (US32D)
   5. Door Closers: Powder Coat to Match
   6. Wall Stops: BHMA 630 (US32D)
   7. Latch Protectors: BHMA 630 (US32D)
   8. Weatherstripping: Clear Anodized Aluminum
   9. Thresholds: Mill Finish Aluminum
B. Finish: all interior doors match existing
   1. Chesterton Middle School
      a. BHMA 613 or 643e/716 (US10B)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Field verify existing conditions, existing doors and frames receiving new hardware. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
B. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Where on-site modification of doors and frames is required:
   1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
   2. Field modify and prepare existing door and frame for new hardware being installed.
   3. When modifications are exposed to view, use concealed fasteners, when possible.
   4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
      a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
      b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
      c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.3 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
   1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
   2. Custom Steel Doors and Frames: HMMA 831.
   3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
B. Install each hardware item in compliance with manufacturer’s instructions and recommendations, using only fasteners provided by manufacturer.
C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
   1. Replace construction cores with permanent cores as indicated in keying section.
   2. Furnish permanent cores to Owner for installation.
I. Wiring: Coordinate with Division 26, ELECTRICAL sections for:
   1. Conduit, junction boxes and wire pulls.
   2. Connections to and from power supplies to electrified hardware.
   3. Connections to fire/smoke alarm system and smoke evacuation system.
   4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
   5. Testing and labeling wires with Architect’s opening number.
J. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
K. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
L. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

M. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
N. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
O. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
P. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
Q. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
R. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Engage qualified manufacturer trained representative to perform inspections and to prepare inspection reports.
   1. Representative will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
   1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, Installer's Architectural Hardware Consultant must examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure proper function of doors and door hardware.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.
B. Clean operating items as necessary to restore proper function and finish.
C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DOOR HARDWARE SCHEDULE

A. Hardware items are referenced in the following hardware. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.
B. Hardware Sets:

Hardware Sets

Hardware Group No. 01
Provide each SGL door(s) with the following:

3	EA	HINGE	5BB1 4.5 X 4.5	F643E/716	IVE
1	EA	CLASSROOM SECURITY WITH INDICATOR	L9071T 06N L283-711	626	SCH
2	EA	FISC PERMANENT CORE	23-030 VKC	626	SCH
1	EA	DOOR STOP - AS REQUIRED	FS436/WS401 CCV	626	IVE

1	EA	GASKETING SET/SILENCERS - AS REQUIRED	188SBK PSA/SILENCERS - AT NON-RATED DOORS	BK	ZER
		NOTE:	FURNISH 5BB1HW 5" X 4.5" HINGES @ DOORS OVER 3'0" WIDE		

Hardware Group No. 02
Provide each PR door(s) with the following:

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	HM REMOVABLE MULLION	BY DOOR/ FRAME MANUF.		
1	EA	PANIC HARDWARE	99-EO W/CYL HOLE-L/TRIM-SNB (ACTIVE LEAF)	626	VON
1	EA	PANIC HARDWARE	99-EO-SNB	626	VON
1	EA	FSIC RIM CYLINDER	20-057 ICX W/CONST. CORE	626	SCH
1	EA	FISC PERMANENT CORE	23-030 VKC	626	SCH
2	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH SRI TBSRT	689	LCN
2	EA	PA MOUNTING PLATE - AS REQUIRED	4040XP-18PA SRI	689	LCN
2	EA	CUSH SHOE SUPPORT - AS REQUIRED	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER - AS REQUIRED	4040XP-61	689	LCN
1	EA	SEALS	BY DOOR/ FRAME MANUF.		B/O
1	EA	WIRE HARNESS CONNECTOR IN DOOR - LENGTH AS REQUIRED	CON -		SCH
1	EA	WIRE HARNESS CONNECTOR - IN FRAME TO POWER SUPPLY	CON-6W		SCH
1	EA	CREDENTIAL READER	BY SECTION 28 13 00		B/O
2	EA	DOOR CONTACT	679-05 TYPE AS REQ	WHT	SCE
1	EA	POWER SUPPLY	BY SECTION 28 13 00		B/O
		NOTE:	FURNISH 5BB1HW 5" X 4.5" HINGES @ DOORS OVER 3'0" WIDE		

OPERATIONAL DESCRIPTION: ENTRANCE BY CREDENTIAL READER OR MANUAL KEY OVER-RIDE. ALWAYS FREE EGRESS. FAIL SECURE.

Hardware Group No. 03
Provide each PR door(s) with the following:

6	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	652	IVE
1	EA	HM REMOVABLE MULLION	BY DOOR/ FRAME MANUF.		
2	EA	PANIC HARDWARE	99-EO-SNB	626	VON
2	EA	90 DEG OFFSET PULL	8190HD 10" O	630	IVE
2	EA	SURFACE CLOSER	4040XP SCUSH TBSRT	689	LCN
2	EA	PA MOUNTING PLATE - AS REQUIRED	4040XP-18PA	689	LCN

2	EA	CUSH SHOE SUPPORT - AS REQUIRED	4040XP-30	689	LCN
2	EA	BLADE STOP SPACER - AS REQUIRED	4040XP-61	689	LCN
		NOTE:	FURNISH 5BB1HW 5" X 4.5" HINGES @ DOORS OVER 3'0" WIDE		

Hardware Group No. 04
Provide each SGL door(s) with the following:

3	EA	HINGE	5BB1 4.5 X 4.5	F643E/716	IVE
1	EA	OFFICE/ENTRY LOCK	L9050T 06N 09-544	643e	SCH
1	EA	FISC PERMANENT CORE	23-030 VKC	606	SCH
1	EA	DOOR STOP - AS REQUIRED	FS436/WS401 CCV	643E/716	IVE
1	EA	GASKETING SET/SILENCERS - AS REQUIRED	188SBK PSA/SILENCERS - AT NON-RATED DOORS	BK	ZER
		NOTE:	FURNISH 5BB1HW 5" X 4.5" HINGES @ DOORS OVER 3'0" WIDE		

Hardware Group No. 05
Provide each SGL door(s) with the following:

3	EA	HINGE	5BB1 4.5 X 4.5	F643E/716	IVE
1	EA	STOREROOM LOCK	L9080T 06N	643e	SCH
1	EA	FISC PERMANENT CORE	23-030 VKC	606	SCH
1	EA	DOOR STOP - AS REQUIRED	FS436/WS401 CCV	643E/716	IVE
1	EA	GASKETING SET/SILENCERS - AS REQUIRED	188SBK PSA/SILENCERS - AT NON-RATED DOORS	BK	ZER
		NOTE:	FURNISH 5BB1HW 5" X 4.5" HINGES @ DOORS OVER 3'0" WIDE		

END OF SECTION

SECTION 08800

GLAZING

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Glass and plastic glazing.
B. Glazing compounds and accessories.

1.2 RELATED SECTIONS
A. Section 07900 - Joint Sealers: Sealant and back-up material.
B. Section 08110 - Steel Doors and Frames

1.3 REFERENCES
A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 1984 (R1994).
B. ASTM C 864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 1999.
C. ASTM C 920 - Standard Specification for Elastomeric Joint Sealants; 2002.
D. ASTM C 1036 - Standard Specification for Flat Glass; 2001.
E. ASTM C 1048 - Standard Specification for Heat-Treated Flat Glass--Kind HS, Kind FT Coated and Uncoated Glass; 1997b.
F. ASTM C 1193 - Standard Guide for Use of Joint Sealants; 2000.
G. GANA (GM) - GANA Glazing Manual; Glass Association of North America; 1997.
H. GANA (SM) - FGMA Sealant Manual; Glass Association of North America; 1990.

1.4 PERFORMANCE REQUIREMENTS
A. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier:
   1. In conjunction with materials described in Section 07260 and 07900.
   2. To utilize the inner pane of multiple pane sealed units for the continuity of the air barrier and vapor retarder seal.
   3. To maintain a continuous air barrier and vapor retarder throughout the glazed assembly from glass pane to heel bead of glazing sealant.

1.5 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.
C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.
D. Samples: Submit two samples 12 x 12 inch in size of glass units.
E. Certificates: Certify that products meet or exceed specified requirements.
F. Manufacturer's Certificate: Certify that sealed insulated glass meets or exceeds specified requirements.

1.6 QUALITY ASSURANCE
A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods. Maintain one copy on site.
B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience.

1.7 PRE-INSTALLATION MEETING
A. Convene one week before starting work of this section.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Do not install glazing when ambient temperature is less than 50 degrees F.
B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.9 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
B. Provide a five year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

PART 2 – PRODUCTS

2.1 FLAT GLASS MATERIALS

A. Manufacturers:
   1. Guardian Industries Corporation: www.guardian.com.
   2. Pilkington Building Products North America: www.pilkington.com.
   3. Visteon Glass Systems: www.visteon.com
   4. Substitutions: Refer to Section 01600 - Product Requirements.
B. Vision Glass (Type I-1): Clear; fully tempered with horizontal tempering.
   1. Comply with ASTM C 1036, Type I, transparent flat, Class 1 clear, Quality Q3 (glazing select) and ASTM C 1048.
   2. Comply with ANSI Z97.1.
C. Fire-Rated Vision Glass (Type I-2): Clear; Safety-rated Glass Ceramic with Surface-Applied Film.
   1. Thickness: 3/16” Min.
   2. Grade: Premium Grade Clear Viewing
   3. Rating: Provide rating as required for associated door or frame construction, unless otherwise noted – refer to drawings.
   4. Manufactured by:
   a. Technical Glass Products
      b. Vetrotech Saint-Gobain North America.
      c. Safti First Fire Rated Glazing Solutions.
      d. Approved Equal.

2.2 GLAZING COMPOUNDS

A. Manufacturers:
   1. Dow Corning Corp: www.dowcorning.com
   2. GE Plastics: www.geplastics.com
   3. Pecora Corporation: www.Pecora.com
   4. Substitutions: Refer to Section 01600 - Product Requirements.
B. Silicone Sealant: Single component; chemical curing; capable of water immersion without loss of properties; non-bleeding, non-staining; ASTM C 920, Type S, Grade NS, Class 25, Uses M, A, and G; cured Shore A hardness of 15 to 25; color as selected.

2.3 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness, ASTM C 864 Option I. Length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness, ASTM C 864 Option I. Minimum 6 inch long x one half the height of the glazing stop x thickness to suit application, self adhesive on one face.
C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; 3/8 inch size; black color.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.
B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.2 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.
B. Install sealants in accordance with ASTM C 1193 and FGMA Sealant Manual.

3.3 INSTALLATION - INTERIOR DRY METHOD (TAPE AND TAPE)

A. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch (1.6 mm) above sight line.
B. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
C. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
D. Place glazing tape on free perimeter of glazing in same manner described above.
E. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
F. Knife trim protruding tape.

3.4 CLEANING

A. Remove glazing materials from finish surfaces.
B. Remove labels after Work is complete.
C. Clean glass and adjacent surfaces.

3.5 PROTECTION OF FINISHED WORK

A. After installation, mark pane with an 'X' by using removable plastic tape or paste.

END OF SECTION

SECTION 09260

GYPSUM BOARD ASSEMBLIES

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Metal stud wall framing.
B. Metal channel ceiling framing.
C. Acoustic insulation.
D. Gypsum wallboard.
E. Joint treatment and accessories.

1.2 REFERENCES
A. Unless noted otherwise, the most current issue of the reference shall be used.
B. ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members.
C. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
D. ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
E. Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
F. GA-600 - Fire Resistance Design Manual; Gypsum Association.

1.3 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on metal framing, gypsum board, accessories, and joint finishing system.
C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.4 QUALITY ASSURANCE
A. Perform in accordance with ASTM C 840. Comply with requirements of GA-600 for fire-rated assemblies.
B. Applicator Qualifications: Company specializing in performing gypsum board application and finishing, with minimum five years of documented experience.

1.5 REGULATORY REQUIREMENTS
A. Conform to applicable code for fire rated assemblies as indicated on drawings.

PART 2 – PRODUCTS

2.1 METAL FRAMING MATERIALS
A. Metal Framing Manufacturers:
   1. Clark Dietrich Building Systems; www.clarkdietrich.com
   2. Marino-Ware; www.marinoware.com.
   3. Telling Industries; www.buildstrong.com
   4. Substitutions: See Section 01600 - Product Requirements.
B. Metal Framing Connectors and Accessories:
   1. Same manufacturer as framing.
C. Non-Load bearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated unless exceeded herein, with maximum deflection of wall framing of L/240 at 5 psf. All interior framing shall be a minimum of 20 gauge.
   1. Studs: C shaped with knurled faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C shaped.
   4. Furring: Hat-shaped sections, minimum depth of 7/8 inch.

D. Shaft Wall Studs and Accessories: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 and specified performance requirements.
E. Ceiling Hangers: Type and size as specified in ASTM C 754 for spacing required.
F. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection using slotted holes, screws and anti-friction bushings, preventing rotation of studs while maintaining structural performance of partition.
    1. Material: ASTM A 653/A 653M steel sheet, SS Grade 50, with G60/Z180 hot dipped galvanized coating.

2.2 GYPSUM BOARD MATERIALS

A. Manufacturers:
    1. Georgia Pacific Gypsum Corporation; www.gp.com.
    2. National Gypsum Company; www.nationalgypsum.com.
    3. USG Corporation; www.usg.com.
    4. Lafarge North America Inc.; www.lafargenorthamerica.com
    5. Substitutions: See Section 01600 - Product Requirements.
B. Gypsum Wallboard: ASTM C 36/C 36M and ASTM C 1396/C 1396M. Sizes to minimize joints in place; ends square cut.
    1. Thickness: 5/8 inch.
    2. Edges: Tapered.
C. Type X: Fire resistant, UL or WH rated.
    1. Application: Vertical surfaces, unless otherwise indicated.
        a. Thickness: 5/8 inch.

2.3 ACCESSORIES

A. Acoustic Insulation: ASTM C 665; preformed glass fiber, friction fit type, unfaced. Thickness of 3-1/2 inches unless indicated otherwise.
B. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
C. Finishing Accessories: ASTM C 1047, galvanized steel or rolled zinc, unless otherwise indicated.
D. Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.
    1. Tape: 2 inch wide, creased paper tape for joints and corners, except as otherwise indicated.
E. Screws: ASTM C 1002; self-piercing tapping type; cadmium-plated for exterior locations.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

A. Metal Framing: Comply with ASTM C 754 and manufacturer's instructions.
B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
    1. Level ceiling system to a tolerance of 1/1200.
    2. Laterally brace entire suspension system.
C. Studs: Space studs as permitted by standard.
    1. Extend partition framing to structure where indicated and to ceiling in other locations.
    2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
    3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.

D. T intersections: Construct T intersections by using minimum of three studs with top, bottom and intermediate blocking or four full studs. Lock all walls together by fastening framing members together at 16 inches on center vertically. Walls secured through Gypsum materials only shall not be permitted.
E. Corners: Construct corners using minimum of three studs with top, bottom and intermediate blocking or four full studs. Lock all walls together by fastening framing members together at 16 inches on center vertically. Walls secured through Gypsum materials only shall not be permitted.
F. Openings: Install minimum double studs at wall openings, sides, top and bottom at door and window jambs and all other openings.
G. Standard Wall Furring: Install at concrete and masonry walls scheduled to receive gypsum board, not more than 4 inches from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches on center.
    1. Orientation: Vertical.
    2. Spacing: As indicated.
H. Acoustic Furring: Install resilient channels at maximum 24 inches on center. Locate joints over framing members.
I. Furring for Fire Ratings: Install as required for fire resistance ratings indicated and to GA-600 requirements.

3.3 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
B. Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.4 GYPSUM BOARD INSTALLATION

A. Comply with ASTM C 840. Install to minimize butt end joints, especially in highly visible locations.
B. Single Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
C. Single Layer Fire-Rated: Install gypsum board vertically, with ends and edges occurring over firm bearing.
D. Installation on Metal Framing: Use screws for attachment of all gypsum board.

3.5 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
    1. Not more than 30 feet apart on walls and ceilings over 50 feet long.
B. Corner Beads: Install at external corners, using longest practical length.
C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated on drawings.

3.6 JOINT TREATMENT

A. Finish gypsum board in scheduled areas in accordance with levels defined in ASTM C 840 and as scheduled below.
B. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.7 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet in any direction.

3.8 FINISH LEVEL SCHEDULE

A. Level 1: Above finished ceilings concealed from view.
B. Level 2: Utility areas and areas behind cabinetry.
C. Level 3: Walls scheduled to receive textured wall finish.
D. Level 4: Walls and ceilings scheduled to receive flat or eggshell paint finish.
E. Level 5: Walls and ceilings scheduled to receive semi-gloss or gloss paint finish.

SECTION 09260

GYPSUM BOARD ASSEMBLIES

END OF SECTION

SECTION 09511

SUSPENDED ACOUSTICAL CEILINGS

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Acoustical ceiling panels.
B. Suspension system.
C. Wire hangers, fasteners, main runners, cross tees, and wall angle moldings.

1.2 RELATED SECTIONS
A. Section 09260 – Gypsum Board Assemblies.
B. Section 15940 – Air Outlets and Inlets.
C. Section 16510 – Lighting, Lighting Systems, and Controls.

1.3 REFERENCES
A. Unless noted otherwise, the most current issue of the reference shall be used.
B. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
C. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
D. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
E. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
F. ASTM C 635 - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
G. ASTM C 636 - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
H. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
I. ASTM E 580 – Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
J. ASTM E 1414 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
K. ASTM E 1111 Standard Test Method for Measuring the Interzone Attenuation of Ceilings Systems.
L. ASTM E 1264 - Standard Classification for Acoustical Ceiling Products.
M. ASTM E 1477 Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.
N. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
O. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate grid layout and related dimensioning.
C. Product Data: Provide data on suspension system components.
D. Certifications: Manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material must carry an approved independent laboratory classification of NRC, CAC, and AC.
E. Samples: Submit two samples of each panel type; 12 x 12 inch in size illustrating material and finish of acoustical units.
F. Samples: Submit two samples of each suspension system type; 12 inches long, of main runner, cross runner, and perimeter molding.
G. Manufacturer’s Installation Instructions: Indicate special procedures.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide acoustical panel units and grid components by a single manufacturer.
B. Fire-Resistive Assemblies: Complete assembly listed and classified by UL for the fire resistance indicated.
C. Fire Performance Characteristics: Identify acoustical ceiling components with appropriate markings of applicable testing and inspecting organization.
   1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class A products.
      a. Flame Spread: 25 or less
      b. Smoke Developed: 50 or less
D. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
E. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.6 ENVIRONMENTAL REQUIREMENTS

A. Maintain uniform temperature of minimum 60 degrees F and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver acoustical ceiling units to project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
B. Before installing acoustical ceiling units, permit them to reach room temperature and a stabilized moisture content.
C. Handle acoustical ceiling units carefully to avoid chipping edges or damaged units in any way.

1.8 PROJECT CONDITIONS

A. All ceiling products and suspension systems must be installed and maintained in accordance with manufacturer’s written installation instructions for that product in effect at the time of installation and best industry practice.
B. Prior to installation, the ceiling product must be kept clean and dry, in an environment that is between 32°F and 120°F and not subject to Abnormal Conditions. Abnormal conditions include exposure to chemical fumes, vibrations, moisture from conditions such as building leaks or condensation, excessive humidity, or excessive dirt or dust buildup.
C. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
D. Install acoustical units after interior wet work is dry.

1.9 WARRANTY

A. Acoustical Panel: Submit a written warranty executed by the manufacturer, agreeing to repair or replace acoustical panels that fail within the warranty period. Failures include, but are not limited to:
   1. Acoustical Panels: Sagging and warping as a result of defects in materials or factory workmanship.
   2. Grid System: Rusting and manufacturer's defects
   3. Acoustical Panels designated as inherently resistive to the growth of micro-organisms: Visible sag and will resist the growth of mold/mildew and gram positive and gram negative odor and stain causing bacteria.
B. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.10 EXTRA MATERIALS

A. See Section 01600 - Product Requirements, for additional provisions.
B. Provide 10 percent of total acoustical unit area of each type of acoustical unit for Owner's use in maintenance of project.

PART 2 – PRODUCTS

2.1 ACOUSTICAL UNITS

A. Manufacturers:
   1. Armstrong World Industries, Inc.: www.armstrong.com
   2. CertainTeed Ceilings: www.certainteed.com
   3. USG Interiors, Inc.: www.usg.com
   4. Substitutions: See Section 01600 - Product Requirements.
B. Acoustical Units - General: ASTM E 1264, Class A.
   1. Units for Installation in Fire-Rated Suspension System: Listed and classified for the fire-resistive assembly the suspension system is a part of.
C. Acoustical Panels – Type I: Painted mineral fiber, ASTM E 1264 Type III, with the following characteristics:
   1. Size: 24 x 48 inches.
   2. Thickness: 5/8 inches.
   3. Composition: Wet felted.
   4. Density: 1.05 lb/cu ft.
   5. Light Reflectance: 84 percent, determined as specified in ASTM E 1264.
   6. NRC Range: .55 to .65, determined as specified in ASTM E 1264.
   7. Edge: Square.
   8. Surface Color: White.
   9. Surface Pattern: Non-directional fissured.
   10. Products:
      a. Armstrong: “Fine Fissured Medium Texture #1729”.
      b. CertainTeed: “Performa Fine Fissured”.
      c. USG Interiors: “Radar ClimaPlus #2410”.
   11. Suspension System: Exposed grid.

2.2 SUSPENSION SYSTEMS

A. Manufacturers:
   1. Armstrong World Industries, Inc.: www.armstrong.com
   2. USG Interiors, Inc.: www.usg.com
   3. Chicago Metallic Corp.; www.chicagometallic.com
   4. Substitutions: See Section 01600 - Product Requirements.
B. Suspension Systems - General: ASTM C 635; die cut and interlocking components, with stabilizer bars, clips, splices, and perimeter moldings as required.
C. Exposed Steel Suspension System: Formed galvanized steel, commercial quality cold rolled; intermediate-duty.
   1. Profile: Tee
   2. Finish: White painted.
D. Exposed Aluminum Suspension System: Narrow-Face, Single-Web, Extruded-Aluminum Suspension System: Main and cross runners formed from extruded aluminum to produce structural members; intermediate-duty.
   1. Profile: Tee
   2. Face Finish: Painted white.

2.3 ACCESSORIES

A. Support Channels and Hangers: Match material and finish of suspension system; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
B. Perimeter Moldings: Same material and finish as suspension system.
   1. At Exposed Grid: Provide L-shaped molding for mounting at same elevation as face of grid.
C. Gasket for Perimeter Moldings: Closed cell rubber sponge tape.
D. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify that layout of hangers will not interfere with other work.
C. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out, unless expressly permitted by manufacturer's printed recommendations.

3.2 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636, ASTM E 580, and manufacturer's instructions and as supplemented in this section.
B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.
C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.
D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.
E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
H. Support fixture loads using supplementary hangers located within 6 inches of each corner, or support components independently.
I. Do not eccentrically load system or induce rotation of runners.
J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Install with continuous gasket.
   2. Use longest practical lengths.
   3. Overlap and rivet corners.
K. Coordinate all existing pipe, conduit, and power pole penetrations through ceiling system. Provide trim plates at all penetrations to match finish of ceiling grid.

3.3 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.
B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
C. Fit border trim neatly against abutting surfaces.
D. Install units after above-ceiling work is complete.
E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
F. Cutting Acoustical Units:
   1. Make field cut edges of same profile and finish as factory edges.

G. Coordinate all existing pipe, conduit, and power pole penetrations through ceiling system. Provide trim plates at all penetrations to match finish of ceiling grid.

3.4 ERECTION TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.5 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.
B. Clean exposed surfaces of acoustical ceilings, including trim, edge moldings, and suspension members. Comply with manufacturer's instructions for cleaning and touch up of minor finish damage.
C. Remove and replace work that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION

SECTION 09650

RESILIENT FLOORING

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Resilient tile flooring.
B. Rubber wall base.
C. Installation accessories.
D. Subfloor preparation.

1.2 RELATED SECTIONS
A. Section 03300 - Cast-In-Place Concrete
B. Section 03505 - Self-Leveling Underlayment.

1.3 REFERENCES
A. Unless noted otherwise, the most current issue of the reference shall be used.
B. ASTM F 1066 - Standard Specification for Vinyl Composition Floor Tile.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
C. Selection Samples: Submit manufacturer's complete set of color samples for Architect's initial selection.
D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.5 DELIVERY, STORAGE, AND PROTECTION
A. Deliver materials in labeled packages. Store and handle in strict compliance with manufacturer's recommendations. Protect from damage due to weather, excessive temperatures, and construction operations.
B. Deliver materials sufficiently in advance of installation to condition materials to room temperature prior to installation.
C. Protect roll materials from damage by storing on end.

1.6 QUALITY ASSURANCE
A. Manufacturer: Provide resilient flooring manufactured by a firm with a minimum of 10 years' experience in the fabrication of resilient flooring of types equivalent to those specified. Manufacturers proposed for use, which are not named in this Section, shall submit evidence of ability to meet performance requirements specified not less than 10 days prior to bid date.
B. Color Matching: Provide resilient flooring products, including wall base and accessories, from one manufacturer to ensure color matching.
C. Manufacturer capable of providing field service representation.
D. Installer's Qualifications: Installer experienced (minimum of 2 years) to perform work of this section who has specialized in the installation of work similar to that required for this project and who is acceptable to the product manufacturer.
E. Materials: For each type of material required for the work of this Section, provide primary materials which are the products of one manufacturer. Provide secondary materials which are acceptable to the manufacturer of the primary materials. Comply with applicable regulations regarding VOC (volatile organic compound) content of adhesives.

1.7 ENVIRONMENTAL REQUIREMENTS

A. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
B. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F to achieve temperature stability. Maintain a temperature of 68 degrees F plus or minus 5 degrees F in spaces to receive resilient flooring. Specified temperature shall be maintained at least 48 hours before, during, and 48 hours after installation.

1.8 WARRANTY

A. Provide manufacturer's standard one-year warranty against defects in manufacturing and workmanship of resilient flooring products. Provide manufacturer's standard limited wear warranty/conductivity warranty as specified under each product as applicable.

1.9 EXTRA MATERIALS

A. See Section 01600 - Product Requirements, for additional provisions.
B. Provide one (1) box of tile, 50 lineal feet of base of each type and color specified.

PART 2 – PRODUCTS

2.1 MATERIALS – LUXURY VINYL TILE

A. Manufacturers:
   1. Basis of Design: Interface
   2. Shaw
   3. Tarkett
   2. Substitutions: See Section 01600 - Product Requirements.
B. Luxury Vinyl Tile:
   1. Size: 25cm x 1m
   2. Thickness: 4.5 mm
C. Basis of Design Colors and Patterns:
   1. LVT: Interface, Studio Set #A007, Color A00702 Pewter (Owner selected)
D. Installation Method: Ashlar (In direction and pattern as shown on finish drawings).

2.2 MATERIALS – BASE

A. Manufacturer:
   1. Johnsonite, Inc: www.johnsonite.com.
   2. Armstrong World Industries: www.armstrong.com
   3. Burke Industries: www.burkeflooring.com
   4. Marley Flexco: www.flexcofloors.com
   5. Roppe Corporation: www.roppe.com
   6. Nora: www.norarubber.com
   7. Substitutions: See Section 01600 - Product Requirements.
B. Resilient Base: Manufactured from a homogeneous composition polyvinyl chloride (PVC)
   1. Height:
      a. 4 inch base.
   2. Profile: Coved at areas of resilient flooring; straight at carpeted areas.
   3. Thickness: 0.125 inch thick.
   4. Finish: Satin
   5. Length: Roll
   6. Color: Black, to be selected from manufacturer’s full range.
   7. Accessories: Premolded external corners, internal corners, and end stops.

2.3 ACCESSORIES

A. Subfloor Filler: White premix latex; type recommended by adhesive material manufacturer.
B. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.

C. Moldings and Edge Strips:
   1. At transitions between dissimilar floor finishes: Johnsonsite T-Molding or Equal. Color to be selected by Architect from manufacturers full color range.
D. Filler for Coved Base: Plastic.
E. Sealer and Wax: Types recommended by flooring manufacturer

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified in Section 03300 and are ready to receive resilient flooring.
B. Verify that concrete sub-floor surfaces are ready for resilient flooring installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within the following limits:
   1. Moisture emission rate: Not greater than 3 lb per 1000 sq ft per 24 hours when tested using calcium chloride moisture test kit for 72 hours.
   2. Alkalinity: pH range of 5-9.
C. Verify that required floor-mounted utilities are in correct location.
D. Perform adhesive bond test in each major area, minimum 1 per 2,000 square feet, prior to installation. Examine after 72 hours to determine whether bond is solid and no moisture is present. Do not proceed with work until results of bond test are acceptable.

3.2 PREPARATION

A. Where tile is shown or scheduled to be installed over existing tile, remove existing tile completely. Sand and level substrate with a latex underlayment acceptable to, or provided by, the tile flooring manufacturer. In addition, comply with the tile flooring manufacturer’s procedures for installation over existing tile.
B. Where only tile patching is required, remove existing tile back to full tile units and match coursing. Clean substrate and comply with tile manufacturer’s instructions for installation over existing substrate.
C. Comply with ASTM F 710-92 and manufacturer's recommendations for surface preparation. Remove substances incompatible with resilient flooring adhesive by method acceptable to manufacturer.
D. Concrete floors with steel troweled (slick) finish shall be properly roughened up (sanded) to ensure suitable adhesion.
E. Concrete floors with curing, hardening, and breaking compounds shall be abraded with mechanical methods only to remove compounds. Use blastrac or similar equipment.
F. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
G. Fill voids, cracks, and depressions with trowel-applied leveling compounds acceptable to manufacturer. Remove projections and repair other defects to tolerances acceptable to manufacturer.
H. Prohibit traffic until filler is cured.
I. Clean substrate by vacuuming subfloors immediately prior to installation to remove loose particles.
J. Apply primer as required to prevent "bleed-through" or interference with adhesion by substances that cannot be removed.

3.3 INSTALLATION - GENERAL

A. Install resilient flooring in accordance with manufacturer's printed installation instructions.
B. Comply with the following:
   1. Layout resilient flooring to provide equal size at perimeter. Adjust layout as necessary to eliminate resilient flooring which is cut to less than half full width.
   2. Lay resilient flooring with arrows in the same direction.

3. Install resilient flooring without cracks or voids at seams. Lay seams together without stress. Remove excess adhesive immediately.
4. Scribe resilient flooring neatly at perimeter and obstructions.
5. Extend resilient flooring into reveals, closets, and similar openings.
6. Install reducer strips at exposed edges.
7. Do not mix manufacturing batches of a color within the same area.
8. Do not install resilient flooring over building expansion joints.
9. Do not install defective or damaged resilient flooring.

3.4 INSTALLATION - TILE FLOORING

A. Install in accordance with manufacturer's instructions.
B. Mix tile from container to ensure shade variations are consistent when tile is placed.
C. Spread only enough adhesive to permit installation of materials before initial set.
D. Set flooring in place; press with heavy roller to attain full adhesion.
E. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
F. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated. Secure metal strips (or type as indicated on drawings) before installation of flooring with stainless steel screws.
G. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.

3.5 INSTALLATION - BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches between joints.
B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.6 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

3.7 PROTECTION OF FINISHED WORK

A. Prohibit traffic on resilient flooring for 48 hours after installation.

END OF SECTION

SECTION 09900

PAINTS AND COATINGS

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Surface preparation.
B. Field application of paints, stains, varnishes, and other coatings.
C. See Schedule - Surfaces to be Finished, at end of Section.

1.2 REFERENCES
A. Unless noted otherwise, the most current issue of the reference shall be used.
B. ASTM D 16 - Standard Terminology for Paint, Related Coatings, Materials, and Applications.

1.3 DEFINITIONS
A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Samples: Submit two paper chip samples, 4 x 4 inch in size illustrating range of colors and textures available for each surface finishing product scheduled.

1.5 QUALITY ASSURANCE
A. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years experience.

1.6 REGULATORY REQUIREMENTS
A. Comply with applicable code for flame and smoke rating requirements for products and finishes.

1.7 MOCK-UP
A. See Section 01400 - Quality Requirements, for general requirements for mock-up.
B. Provide 8’ x 8’ panel as directed by Architect, illustrating special coating color, texture and finish.
C. Provide door frame assembly illustrating paint color, texture and finish.
D. Approved mock-up may remain as part of the work. Rejected mock-up must be re-done.

1.8 DELIVERY, STORAGE, AND PROTECTION
A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
C. Paint Materials: Store at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

1.9 ENVIRONMENTAL REQUIREMENTS
A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
B. Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
C. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
D. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

1.10 EXTRA MATERIALS

A. See Section 01600 - Product Requirements, for additional provisions.
B. Supply 1 gallon of each color; store where directed.
C. Label each container with color in addition to the manufacturer's label.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Paints:
   1. Glidden Professional: www.gliddenprofessional.com
   2. Benjamin Moore & Co.: www.benjaminmoore.com
   3. PPG Pittsburgh Paints: www.ppg.com
   4. Sherwin-Williams Co: www.sherwin-williams.com
B. Transparent Finishes:
   1. Glidden Professional: www.gliddenprofessional.com
   2. Benjamin Moore & Co.: www.benjaminmoore.com
   3. PPG Pittsburgh Paints: www.ppg.com
   4. Sherwin-Williams Co: www.sherwin-williams.com
C. Stains:
   1. Glidden Professional: www.gliddenprofessional.com
   2. Benjamin Moore & Co.: www.benjaminmoore.com
   3. PPG Pittsburgh Paints: www.ppg.com
   4. Sherwin-Williams Co: www.sherwin-williams.com
D. Primer Sealers:
   1. Glidden Professional: www.gliddenprofessional.com
   2. Benjamin Moore & Co.: www.benjaminmoore.com
   3. PPG Pittsburgh Paints: www.ppg.com
   4. Sherwin-Williams Co: www.sherwin-williams.com
E. Block Fillers:
   1. Glidden Professional: www.gliddenprofessional.com
   2. Benjamin Moore & Co.: www.benjaminmoore.com
   3. PPG Pittsburgh Paints: www.ppg.com
   4. Sherwin-Williams Co: www.sherwin-williams.com
F. Substitutions: See Section 01600 - Product Requirements.

2.2 PAINTS AND COATINGS – GENERAL

A. Paints and Coatings: Ready mixed, except field-catalyzed coatings. Prepare pigments:
   1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
   2. For good flow and brushing properties.
   3. Capable of drying or curing free of streaks or sags.

2.3 PAINT SYSTEMS – INTERIOR

A. Paint WI-OP-3L - Wood, Opaque, Latex, 3 Coat:
   1. Latex primer sealer.
      a. Glidden Professional: GP3210 Gripper Interior/Exterior Primer.
      b. Benjamin Moore: Fresh Start All Purpose 100% Acrylic Primer #046
      c. Sherwin-Williams: Problock Latex Primer/Sealer, B51W20
   2. Gloss: Two coats of latex enamel.
      a. Glidden Professional: GP3028 Ultra-Hide 250 Interior Gloss Paint.
      b. Benjamin Moore: Super Spec HP Acrylic Gloss Enamel #P28
      c. Sherwin-Williams: All Surface Enamel Latex Gloss, A41 Series

3. Semi-gloss: Two coats of latex enamel.
    a. Glidden Professional: GP1416 Ultra-Hide 150 Interior Semi-Gloss Paint.
    b. Benjamin Moore: Super Spec Latex Semi-Gloss Enamel #276
    c. Sherwin-Williams: ProMar 400 Interior Latex Semi-Gloss, B31-4450 Series
4. Eggshell: Two coats of latex enamel.
    a. Glidden Professional: GP1412 Ultra-Hide 150 Interior Eggshell Paint.
    b. Benjamin Moore: Super Spec Latex Eggshell Enamel #274
    c. Sherwin-Williams: ProMar 400 Interior Latex EgShel, B20-4450 Series
5. Flat: Latex enamel.
    a. Glidden Professional: GP1210 Ultra-Hide 150 Interior Flat Paint.
    b. Benjamin Moore: Super Spec Latex Flat #275
    c. Sherwin-Williams: ProMar 400 Interior Latex Flat, B30-4450 Series

B. Paint WI-TR-VS - Wood, Transparent, Varnish, Stain:
1. Filler coat.
2. One coat of stain; All colors to be selected by Architect from manufacturer's full range-maximum 3 colors.
    a. Glidden Professional: GP1700V WoodPride Water-Based Interior Wood Stain.
    b. Benjamin Moore: Benwood® Interior Wood Finishes Waterborne Stain 205
    c. Sherwin-Williams: WoodClassics 250 Oil Stain, A49 Series
3. Gloss: Two coats of varnish.
    a. Glidden Professional: GP1808 Woodpride Interior Gloss Water-Based Varnish.
    b. Benjamin Moore & Co.: Benwood Finishes® Polyurethane Finish High Gloss 428
    c. Sherwin Williams WoodClassics WB Polyurethane Gloss, A68V91
4. Satin: Two coats of varnish.
    a. Glidden Professional: GP1802 Woodpride Interior Satin, Water-Based Varnish.
    b. Benjamin Moore & Co.: Benwood Finishes® Polyurethane Finish Low Lustre C435
    c. Sherwin Williams WoodClassics WB Polyurethane Satin, A68F90

C. Paint CI-OP-3L - Concrete/Masonry, Opaque, Latex, 3 Coat:
1. Primer.
    a. Glidden Professional: GP3210 Gripper Interior /Exterior Primer
    b. Benjamin Moore: Fresh Start All Purpose 100% Acrylic Primer #046
    c. Sherwin-Williams: Problock Latex Primer/Sealer, B51W20
2. Semi-gloss: Latex enamel.
    a. Glidden Professional: GP1416 Ultra-Hide 150 Interior Semi-Gloss Paint
    b. Benjamin Moore: Super Spec Latex Semi-Gloss Enamel #276
    c. Sherwin-Williams: ProMar 400 Interior Latex Semi-Gloss, B31-4450 Series
3. Flat: Latex enamel.
    a. Glidden Professional: GP1210 Ultra-Hide 150 Interior Flat Paint
    b. Benjamin Moore: Super Spec Latex Flat #275
    c. Sherwin-Williams: ProMar 400 Interior Latex Flat, B30-4450 Series

D. Paint MI-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
1. One coat of alkyd primer.
    a. Glidden Professional: Devoe Coatings 4360 Devguard Low VOC Multi-Purpose Tank & Structural Prime.
    b. Benjamin Moore: P06 Super Spec HP® Alkyd Metal Primer
    c. Sherwin-Williams: Kem Bond HS Metal Primer, B50WZ Series
2. Gloss: Two coats of alkyd enamel.
    a. Glidden Professional: Devoe Coatings 4309 Devguard Rust Preventative Gloss Enamel.
    b. Benjamin Moore: Super Spec HP D.T.M. Alkyd Gloss Enamel #P26
    c. Sherwin-Williams: ProIndustrial Industrial Urethane Alkyd Enamel, B54-150 Series

3. Semi-gloss: Two coats of alkyd enamel.
    a. Glidden Professional: Devoe Coatings 4306 Devguard Rust Preventative Semi-Gloss Enamel.
    b. Benjamin Moore: Super Spec HP D.T.M. Alkyd Semi-Gloss #P24
    c. Sherwin-Williams: Metalastic DTM Alkyd Enamel, B55 Series

E. Paint MI-OP-2A - Ferrous Metals, Primed, Alkyd, 2 Coat:
1. Touch-up with alkyd primer.
    a. Glidden Professional: Devoe Coatings 4360 Devguard Low VOC Multi-Purpose Tank & Structural Primer.
    b. Benjamin Moore: P06 Super Spec HP® Alkyd Metal Primer
    c. Sherwin-Williams: Kem Bond HS Metal Primer, B50WZ Series
2. Gloss: Two coats of alkyd enamel.
    a. Glidden Professional: Devoe Coatings 4309 Devguard Rust Preventative Gloss Enamel.
    b. Benjamin Moore: Super Spec HP D.T.M. Alkyd Gloss Enamel #26
    c. Sherwin-Williams: ProIndustrial Industrial Urethane Alkyd Enamel, B54-150 Series
3. Semi-gloss: Two coats of alkyd enamel.
    a. Glidden Professional: Devoe Coatings 4306 Devguard Rust Preventative Semi-Gloss Enamel.
    b. Benjamin Moore: Super Spec HP D.T.M. Alkyd Semi-Gloss #P24
    c. Sherwin-Williams: Metalastic DTM Alkyd Enamel, B55 Series

F. Paint GI-OP-3L - Gypsum Board/Plaster, Latex, 3 Coat:
1. One coat of fast-drying latex primer sealer.
    a. Glidden Professional: 1000 High-Hiding Interior Primer.
    b. Benjamin Moore: Moorcraft Super Spec Latex Enamel Undercoater & Primer Sealer #253
    c. Sherwin-Williams: ProMar 400 Interior Latex Primer, B28W8400
2. Semi-gloss: Latex enamel.
    a. Glidden Professional: GP1416 Ultra-Hide 150 Interior Semi-Gloss Paint.
    b. Benjamin Moore: Super Spec Latex Eggshell Enamel #274
    c. Sherwin-Williams: ProMar 400 Interior Latex Semi-Gloss, B31-4450 Series
3. Eggshell: Latex enamel.
    a. Glidden Professional: GP1412 Ultra-Hide 150 Interior Eggshell Paint.
    b. Benjamin Moore: Super Spec Latex Eggshell Enamel #274
    c. Sherwin-Williams: ProMar 400 Interior Latex EgShel, B20-4450 Series
4. Flat: Latex enamel.
    a. Glidden Professional: GP1210 Ultra-Hide 150 Interior Flat Paint.
    b. Benjamin Moore: Super Spec Latex Flat #275
    c. Sherwin-Williams: ProMar 400 Interior Latex Flat, B30-4450 Series

2.4 ACCESSORY MATERIALS

A. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.
B. Patching Material: Latex filler.
C. Fastener Head Cover Material: Latex filler.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive Work as instructed by the product manufacturer.
B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
C. Test shop-applied primer for compatibility with subsequent cover materials.

D. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
   1. Plaster and Gypsum Board: 12 Percent
   2. Masonry, Concrete and Concrete Masonry Unit: 12 Percent
   3. Interior Wood: 15 Percent, measured in accordance with ASTM D 4442.
   4. Concrete Floors: 8 Percent.

3.2 PREPARATION

A. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
B. Surfaces: Correct defects and clean surfaces which affect work of this section. Remove or repair existing coatings that exhibit surface defects.
C. Marks: Seal with shellac those which may bleed through surface finishes.
D. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
E. Concrete and Unit Masonry Surfaces to be Painted: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
F. Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
G. Galvanized Surfaces to be Painted: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
H. Uncoated Steel and Iron Surfaces to be Painted: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by hand wire brushing or sandblasting; clean by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Prime paint entire surface; spot prime after repairs.
I. Shop-Primed Steel Surfaces to be Finish Painted: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Re-prime entire shop-primed item.
J. Interior Wood Items to Receive Opaque Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats. Back prime concealed surfaces before installation.
K. Interior Wood Items to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
L. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with clear sealer.
M. Metal Doors to be painted: Prime metal door top and bottom edge surfaces.

3.3 APPLICATION

A. Apply products in accordance with manufacturer's instructions.
B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
C. Apply each coat to uniform appearance. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
D. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.

3.4 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Section 15075 and Section 16075 for schedule of color coding of equipment, duct work, piping, and conduit.
B. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
C. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.5 CLEANING

A. Collect waste material, which may constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.6 SCHEDULE - SURFACES TO BE FINISHED

A. Do Not Paint or Finish the Following Items:
   1. Items fully factory-finished unless specifically noted.
   2. Fire rating labels, equipment serial number and capacity labels.
B. Paint the surfaces described below under Schedule - Paint Systems.
C. Mechanical and Electrical: Use paint systems defined for the substrates to be finished.
   1. Paint all insulated and exposed pipes occurring in finished areas to match background surfaces, unless otherwise indicated.
   2. Paint shop-primed items occurring in finished areas.
   3. Paint interior surfaces of air ducts and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint to visible surfaces.
   4. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.

3.7 SCHEDULE - PAINT SYSTEMS

A. Concrete, Concrete Block, Brick Masonry: Finish all surfaces exposed to view.
   1. Exterior: CE-OP-3A, flat.
   2. Interior: CI-OP-3L, semi-gloss.
B. Gypsum Board: Finish all surfaces exposed to view.
   1. Interior Ceilings and Bulkheads: GI-OP-3L, flat.
   2. Interior Walls: GI-OP-3A, semi-gloss.
C. Wood Doors: WI-TR-VS.
D. Steel Doors and Frames: Finish all surfaces exposed to view; MI-OP-3A, gloss.
E. Steel Fabrications: Finish all surfaces exposed to view.
   1. Exterior: ME-OP-3A, gloss; finish all surfaces, including concealed surfaces, before installation.
   2. Interior: MI-OP-3L, gloss.
F. Shop-Primed Metal Items: Finish all surfaces exposed to view.
   1. Finish the following items:
      a. Exposed surfaces of lintels.
      b. Elevator pit ladders.
      c. Exposed surfaces of steel stairs and railings.
      d. Mechanical equipment.
      e. Electrical equipment.

END OF SECTION

SECTION 15010

BASIC MECHANICAL REQUIREMENTS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this and the other sections of Division 15 and Division 17.

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 Division 1:
   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 15 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. Indiana Administrative Code, including, but not limited to:
      a. Indiana State Plumbing Code
      b. Indiana 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)

1.5 SUBMITTALS

A. General: Follow the procedures specified in Division 1 Sections, and additional defined below.
B. Increase by one copy the number of mechanical related shop drawings, product data, and samples submitted, as required and defined in Division 2, to allow for required distribution. 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 Division 1 Sections, other Division 15, 16 and 17 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. Electronic backgrounds (plan sheets only) are available from the office of the Consulting Engineer for a flat fee of $250.00 per trade (i.e.: mechanical, plumbing, electrical, fire protection). Contractor will be required to sign a waiver of release of the documents prior to electronic transmittal.
D. See front end documents for additional coordination requirements.

1.7 RECORD DOCUMENTS

A. Prepare record documents in accordance with the requirements in Division 1 Sections and other Division 15 Sections. In addition to the requirements specified in Division 1, 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 these sections. 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 Division 1 Sections. In addition to the requirements specified in Division 1, 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 Division 1 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 visqueen. 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 MANUFACTURERS

(Not Applicable)

PART 3 – EXAMINATION

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.
B. Refer to equipment specifications in Divisions 2 through 17 for additional rough-in requirements.

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 15 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, 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 Division 1 Sections. In addition to the requirements specified in Division 1, 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

SECTION 15020

MECHANICAL DEMOLITION

PART 1 – GENERAL

1.1 REQUIREMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, 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 Indiana.
   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 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, 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 16 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.
   9. Coordinate with Owner any existing equipment/devices that the Owner wants to salvage.

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.

SECTION 15020

MECHANICAL DEMOLITION

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, ductwork 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

SECTION 15121

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 15140 - Supports and Anchors.
B. Section 15510 - Hydronic Piping.
C. Section 15535 – Refrigerant Piping and Specialties.

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. Safety Factor: 30 percent.

1.5 SUBMITTALS
A. Submit under provisions of Division 1 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 Division 1 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 Division 1 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 Division 1 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.

SECTION 15121

PIPING EXPANSION COMPENSATION

1.10 WARRANTY

A. Contractor shall provide a one (1) year manufacturer's warranty on parts on furnished equipment. Equipment parts warranty shall start at time of substantial completion. Contractor will provide a one (1) year warranty on all labor associated with the equipment and its' installation. Warranty shall start at date of final payment. See General Requirements for additional 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.
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.

PART 3 – EXECUTION

3.1 EXAMINATION

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. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets or expansion joints where required.
F. 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.
G. Rigidly anchor pipe to building structure where necessary.

END OF SECTION

SECTION 15135

GAGES AND METERS

PART 1 – GENERAL

1.1 WORK INCLUDED
A. Pressure gages and Pressure gage taps.
B. Thermometers and thermometer wells.
C. Filter gages.

1.2 RELATED SECTIONS
A. Section 15510 - Hydronic Piping: Installation of Thermometer wells, pressure gage tappings.
B. Section 15545 - Chemical Water Treatment.
C. Division 17 - Building Automation System.

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 Division 1 General Requirements.

1.5 SUBMITTALS AT PROJECT CLOSEOUT
A. Project Record Documents: Record actual locations of components and instrumentation.
B. Submit under provision of Division 1 General Requirements.

1.6 INSTALLATION OF DIVISION 17 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. No Substitutions.
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: 4½-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, ¼-inch NPT for minimum 150 psig.
C. Pulsation Damper: Pressure snubber, brass with ¼-inch connections.
D. Syphon: Steel, Schedule 40, ¼-inch angle or straight pattern.

2.3 STEM TYPE THERMOMETERS

A. Manufacturers:
   1. Miljoco.
   2. Weiss.
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: ¾ 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: ¼-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 2½-inch diameter pressure gages, one gage adapters with 1/8-inch probes, two one-inch dial thermometers.

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 in Division 17.
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
   Pressure reducing valves
   Pressure Tanks
B. Pressure Gage Tapping Schedule
   LOCATION
   Major coils - inlets and outlets
   Control pressure-sensing locations
C. Stem Type Thermometer Schedule
   LOCATION
   Headers to central equipment
   After major coils
   Water zone supply and return
D. Thermometer Socket Schedule
   LOCATION
   Control temperature-sensing locations
   Heating and cooling coils – inlet and outlet

END OF SECTION

SECTION 15140

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 15242 - Vibration Isolation.
B. Section 15260 - Piping Insulation.
C. Section 15410 - Plumbing Piping.
D. Section 15505 - Fuel Piping.
E. Section 15510 - Hydronic Piping.
F. Section 15870 - Power Ventilators.

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 Division 1 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 2015 International Mechanical Code for support of plumbing or hydronic piping.

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 1½-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 1½-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. Vertical Support: Steel riser clamp.
   11. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   12. 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.
   13. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

C. Hydronic Piping:
   1. Conform to ASME B31.9, ASTM F708.
   2. Hangers for Pipe Sizes ½ to 1½-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. Fuel Gas Piping:
   1. Conform to ASME B31.2, ASTM F708.
   2. Hangers for Pipe Sizes 2 to 1½-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. Vertical Support: Steel riser clamp.
   10. 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.
   11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

E. Refrigerant Piping:
   1. Conform to ASME B31.5, ASTM F708.
   2. Hangers for Pipe Sizes to 1½-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-gauge stainless steel.
B. Metal Counterflashing: 22-gauge stainless 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: Stainless steel, 22-gauge minimum; 16-gauge at fire resistant elements.

2.5 EQUIPMENT CURBS

A. Manufacturers:
   1. Thycurb.
   2. Pate.
   3. Approved Equal.
B. Fabrication: Welded 18-gauge stainless steel or aluminum shell and base, mitered 3-inch cant, 1½-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-gauge galvanized steel.
B. Sleeves for Pipes through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18-gauge 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 1½-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 1½-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 6 -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 counter flash, 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 counter flash 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 wall.
B. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
C. 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.
D. 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

SECTION 15170

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 Division 1 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 Division 1 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 Division 1 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 Division 1 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. No substitutions.

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 ½-horsepower and Smaller: 208 or 120-volts, single-phase, 60 Hz.
   2. Motors Larger than ¾-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, pre-lubricated sleeve or ball bearings.
E. Enclosed Motors: Class A insulation, 1.0 Service Factor, pre-lubricated 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, pre-lubricated 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, pre-lubricated sleeve bearings.
G. Enclosed Motors: Class A insulation, 1.0 Service Factor, pre-lubricated ball bearings.

2.6 THREE-PHASE POWER - SQUIRREL CAGE MOTORS

A. Starting Torque: Between 1 and 1½ 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

SECTION 15190

MECHANICAL IDENTIFICATION

PART 1 – GENERAL

1.1 WORK INCLUDED
A. Nameplates.
B. Tags.
C. Stencils.
D. Pipe Markers.

1.2 RELATED SECTIONS
A. Section 15260 - Piping Insulation.
B. Section 15290 – Ductwork Insulation.
C. Section 15410 - Plumbing Piping.
D. Section 15505 - Fuel Piping.
E. Section 15510 - Hydronic Piping.
F. Section 15515 - Hydronic Specialties.
G. Section 15535 – Refrigerant Piping and Specialties.
H. Section 15890 - Ductwork.

1.3 REFERENCES
A. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS
A. Submit under provisions of Division 1 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 Division 1 General Requirements.
B. Record actual locations of tagged valves.

PART 2 – PRODUCTS

2.1 NAMEPLATES
A. Manufacturers:
   1. Laco.
   2. Seton.
   3. Brady.
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
B. Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1½-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. Install underground plastic pipe markers 6 to 8 inches below finished grade, directly above buried pipe.
E. 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. Do not identify cabinet/suspended unit heaters, unit ventilators, etc.
F. Identify control panels and major control components outside panels with plastic nameplates.
G. Identify valves in main and branch piping with tags (i.e.: HWS, HWR, BWS, BWR, HW, CW, etc.).
H. Identify air terminal units with numbered tags.
I. Tag automatic controls, instruments, and relays. Key to control schematic.
J. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping ¾-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.
K. Identify ductwork with plastic tape markers. Identify type of service i.e. 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.
L. 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

SECTION 15195

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 15505 - Fuel Piping.
B. Section 15535 – Refrigerant Piping and Specialties.

1.3 REFERENCES
A. NFPA.
B. ARI.
C. International Mechanical Code 2015.

1.4 REGULATORY REQUIREMENTS
A. Conform to International Mechanical Code 2015.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

(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 15410.
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

SECTION 15242

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 15535 – Refrigerant Piping and Specialties.
B. Section 15671 – Air-Cooled Condensing Units.
C. Section 15880 – Heat Pump Heat Recovery System – Owner Purchased.

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 15 work from the product line of a single manufacturer, unless otherwise accepted by the Acoustics Consultant.
C. Provide all vibration isolators and equipment bases for Division 16 work from the product line of a single manufacturer, unless otherwise accepted by the Acoustics Consultant.
D. 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.
E. Provide engineering, isolator selection, site supervision, and inspection by manufacturer's personnel who shall perform these services directly. Alert the Engineer 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.
F. 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.
G. 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 Division 1.

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 2015 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.

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
   2. Neoprene/Steel composite pads:
      a. Mason WSW
      b. Amber-Booth SP-NR Style E

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

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. (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

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

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

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, SFDCR, and SFU
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
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
   2. Bushings:
      a. Mason HLB
   3. Washers:
      a. Mason HLW

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 be 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.

3.3 PIPING AND CONDUIT

A. Isolate all piping 1½ inches and larger in diameter that is connected to rotating or reciprocating equipment. Waste, vent, rainwater, and fire protection piping do not require isolation unless noted otherwise.
B. Select and install isolators in a manner that does not induce stresses in piping connections and does not result in misalignment of shafts and bearings. Maintain equipment and piping in rigid condition during installation. Do not transfer loads to the isolators until the installation is complete and under full operational load.

C. Isolator Types:
   1. For equipment isolated with supports and mounts containing springs, provide Type G or H spring/elastomer-in-series isolators for the first 4 horizontal piping hangers and associated vertical piping. Size these hangers to provide the same static deflection as the isolators for the equipment. For floor-supported piping, use Type D open spring base mount isolators and Type B neoprene-in-shear base mount isolators.
   2. Beyond the 4 hangers nearest the equipment, within the rooms housing the equipment and for a distance of not less than 50 feet from the equipment, provide Type F elastomeric hangers, and provide Type F hangers for all piping of 2-inch and smaller diameter and flow rates of greater than 4 feet per second.
   3. For pipes larger than 2-inch and not greater than 6-inch diameter throughout the building, support entire length on Type F elastomeric hangers, Type B neoprene-in-shear base supports, or Type A elastomeric pads between the piping and all points of contact between piping and non-isolated construction.
   4. For pipes larger than 6-inch diameter, support entire length throughout the building on Type H restrained spring/elastomer-in-series hangers, or Type D restrained spring/elastomer-in-series base mounts if supported from the floor.

D. Position isolators as high as possible in the hanger rod or strap assembly but not in direct contact with the building structure without manufacturer's written authorization. Provide 1-inch minimum clearance between isolator housing and structure above. Provide side clearance for hangers to allow full 360-degree rotation about the rod axis without contacting any object.

E. Parallel pipes can be hung together on a trapeze that is isolated from the structure. Isolator deflections must be equal to or greater than the greatest deflection required for the pipes if isolated individually. Do not mix isolated and non-isolated piping on the same trapeze.

F. Mount flexible connections for piping to equipment on the equipment side of shut-off valves.

G. Provide isolation of expansion tanks, air separators, and other devices similar to that provided for the attached piping.

3.4 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.

3.5 EQUIPMENT SCHEDULE

A. Equipment to be installed on isolators:
    1. VRF cassettes.
    2. Air cooled condensing units.

3.6 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

SECTION 15260

PIPE INSULATION

PART 1 – GENERAL

1.1 WORK INCLUDED
A. All hydronic piping jackets and accessories.
B. All piping saddles.

1.2 RELATED SECTIONS
A. Section 15140 - Supports and Anchors: Pipe covering protection shields.
B. Section 15190 - Mechanical Identification.
C. Section 15510 - Hydronic Piping.
D. Section 15515 - Hydronic Specialties.
E. Section 15535 – Refrigerant Piping and Specialties.

1.3 REFERENCES
A. ASTM C335 - Steady-State Heat Transfer Properties of Horizontal Pipe Insulation.
B. ASTM C449 - Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
C. ASTM C518 - Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
D. ASTM C534 - Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
E. ANSI/ASTM C547 - Mineral Fiber Preformed Pipe Insulation.
F. ASTM C585 - Inner and Outer Diameters and Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
G. ASTM C921 - Properties of Jacketing Materials for Thermal Insulation.
H. ASTM D1667 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Closed Cell Foam).
I. ASTM D2842 - Water Absorption of Rigid Cellular Plastics.
J. ASTM E84 - Surface Burning Characteristics of Building Materials.
K. ASTM E96 - Water Vapor Transmission of Materials.

1.4 REGULATORY REQUIREMENTS
A. Conform to 2015 International Mechanical Code and 2015 International Energy Code.

1.5 SUBMITTALS
A. Submit under provisions of Division 1 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 Division 1 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 Division 1 General Requirements.
B. Store, protect and handling products under provisions of Division 1 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.
B. Steel and Wood Insulation Protection Saddles:
   1. Acceptable Manufacturers:
      a. Grinnell.
      b. B-Line.
      c. Unistrut.

2.2 FIBER GLASS INSULATION MATERIALS (TYPE A):

A. Glass Fiber Insulation
   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.
      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.

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: ASTMA 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.
   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 piping serving air-cooled chiller).
   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.

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. Hydronic Piping:
      1) 2-Inch to 2½-Inch: High density pre-molded type with insulation shields.
      2) 3-Inch and Larger: Manufactured steel saddles welded to the pipe.
5. Run insulation continuous through walls, floors, sleeves, pipe hangers and other pipe penetrations.
6. Insulate all piping located behind chases.
7. Insulate all piping installed inside cabinet unit heaters and fan coils.
8. **Insulate entire system including fittings, valves, unions, flanges, strainers, expansion joints, pump bodies, chemical feeders, rolairtrols, chemical feed piping from pot feeders and separators, including heating piping.**
9. Finish all insulation at supports, protrusions and interruptions.
10. Seal all aluminum jackets outdoors air and water tight.
11. 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 ½" To 1"	1¼" To 2"	2½" To 4"	5" & Larger
A. Mechanical Systems					
Heating Water (HWS&R)	A	1½"	1½"	2"	2"
Chilled Water (CWS&R)	A	1"	1"	2"	3"
Refrigerant Suction and Hot Gas	B	1"	1"	1½"	--- (Exterior Piping Shall Include Aluminum Jacket)
Condensate Dew Drain Pipes (if installed in copper or steel pipe)	A	½"	½"	1"	1"

Note: ALL exposed interior piping shall have a PVC jacket as specified.

END OF SECTION

SECTION 15290

DUCTWORK INSULATION

PART 1 – GENERAL

1.1 WORK INCLUDED
A. Ductwork insulation.
B. Duct liner.
C. Insulation jackets.

1.2 RELATED WORK
A. Section 15190 - Mechanical Identification.
B. Section 15890 - 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 Division 1 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 2015 International Mechanical Code and 2015 International Energy Code with all amendments.

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 Division 1 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 visqueen. 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.

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: 1½-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.

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.

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

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

TYPE DUCTWORK	THICKNESS INCHES	TYPE
All rectangular supply and return ductwork	1”	C
Relief and transfer ducts	1”	C
Outdoor air intake ductwork/plenums	2”	B
All concealed round supply ducts	1-1/2”	A

END OF SECTION

SECTION 15505

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 15140 - Supports and Anchors.
B. Section 15195 – Testing of HVAC & Gas Piping.
C. Section 15410 - Plumbing Piping.
D. Section 15450 - Plumbing Equipment.
E. Section 15860 – Dedicated Outdoor Air Units (Packaged).
F. Section 15865 – Gas-Fired Unit Heater.

1.3 REGULATORY REQUIREMENTS
A. Illinois State Plumbing Code, ISPC.
B. Building Officials and Code Administrators International, Inc., 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.
E. International Fire Code.

1.4 PROJECT RECORD DOCUMENTS
A. Submit under provisions of Division 1 General Requirements.

1.5 DELIVERY, STORAGE AND HANDLING
A. Store and protect products under provisions of Division 1 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 visqueen. 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, BURIED OUTSIDE THE BUILDING (UNLESS PROVIDED BY NICOR GAS)
A. Steel Pipe: ASTM A53 or A120, Schedule 40 black. Fittings: ASTM A234, forged steel welding type, with ANSI/AWWA C105 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape. Joints: ANSI/AWS D1.1, welded.

2.2 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).

2.3 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.

2.4 ACCEPTABLE MANUFACTURERS - GAS COCKS

A. Stockham.
B. Eclipse, Inc.
C. Ladish Co.

2.5 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.

2.6 PRESSURE REDUCING REGULATORS

A. Fisher Type S202
   1. Cast iron body, NPT screwed ends, aluminum spring case, lower diaphragm casing, union ring, seat ring, and disk holders, Nitrile disk, diaphragm, and O-ring, Neoprene closing cap gasket, Nylon stabilizer vent flappers, and internal relief.
   2. Maximum inlet pressure 125 psig, maximum outlet pressure 15 psig; outlet pressure setting 2 to 30-inches W.C.; temperature capabilities –20 deg F to 180 deg F.
B. Fisher Type 299H
   1. Cast iron body, NPT screwed ends, aluminum actuator casing and pilot spring case, Nitrile diaphragms, disks, and O-rings, aluminum orifice, valve stem, and disk holder, copper tubing with brass fittings, and external pressure registration.
   2. Maximum inlet pressure 150 psig, maximum outlet pressure 45 psig; outlet pressure setting 3.5 to 40-inches W.C.; temperature capabilities –20 deg F to 180 deg F.
C. Fisher Type S302
   1. Direct-operated, spring loaded regulators, cast iron body, NPT screwed ends, aluminum casing and spring case, Nitrile diaphragms, disks, and composition closing cap gasket, and internal relief.
   2. Maximum inlet pressure 150 psig, maximum outlet pressure 15 psig; outlet pressure setting 5 to 28-inches W.C.; temperature capabilities –20 deg F to 160 deg F.
D. Fisher Type S402
   1. Direct-operated, spring loaded regulators, cast iron body, NPT screwed ends, aluminum casing and spring case, Dacron-fabric reinforced Nitrile diaphragms, Delrin/nylon/nitrile orifice assembly, Nitrile O-ring, and internal relief.
   2. Maximum inlet pressure 125 psig, maximum outlet pressure 5 psig; outlet pressure setting 4.5 to 13-inches W.C.; temperature capabilities –20 deg F to 160 deg F.

2.7 BELOW GRADE PIPING PROTECTION

A. Factory applied, ANSI/AWWA C105 polyethylene jacket, bonded to pipe surface with hot-applied thermo-plastic adhesive.

2.8 CONCRETE EQUIPMENT PADS

A. Refer to Division 3 Specifications.
B. Provide 6-inch concrete pad for mounting new gas meter and service. Verify overall pad dimensions with NIGAS.

2.9 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.
      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. Natural gas utility company shall provide new gas service as indicated on contract documents. Utility shall provide a new gas meter and/or regulators on inlet side of meter as required to meet the buildings new pressure and capacity requirements. Contractor to provide all gas regulators on the discharge side of the meter.
   1. Owner will pay all utility connection and installation charges required for new service connection.

B. 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.

C. Support all piping as called for in Section 15140, Supports and Anchors.

D. 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.

E. Install exterior gas piping on a minimum 4” sand bed approximately 30” below grade.

F. 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.

G. 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.

H. Gas piping mounted on roof or ground shall be mounted on pipe stands. Mount on a max. center line of 4’-0”.
I. All exposed exterior gas piping to be primed and painted with Outdoor Yellow Paint.

END OF SECTION

SECTION 15510

HYDRONIC PIPING

PART 1 – GENERAL

1.1 WORK INCLUDED

A. Pipe and pipe fittings for:
   1. Heating water system.
   2. Equipment drains and overflows.
B. Valves:
   1. Ball valves.
   2. Butterfly valves.
   3. Check valves.
   4. Gate or globe valves are not acceptable for isolation service on this project.

1.2 RELATED SECTIONS

A. Section 15140 - Supports and Anchors.
B. Section 15190 - Mechanical Identification.
C. Section 15195 - Testing of HVAC Piping.
D. Section 15260 - Piping Insulation.
E. Section 15515 - Hydronic Specialties.
F. Section 15835 – Terminal heat transfer units
G. Section 15880 – Heat pump heat recovery system – Owner Purchased.
H. Division 17 - Building Automation System.

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.
E. Use flanged ball, lug end bubble tight positive shut-off butterfly valves for shut off and to isolate equipment, part of systems, or vertical risers.
F. Use ball or butterfly valves for throttling, bypass, or manual flow control services.
G. Use ¾-inch ball valves with cap for drains at main shut off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest floor drain.

1.5 INSTALLATION OF DIVISION 17 PRODUCTS

A. Install control valves, wells for temperature sensors and threaded sockets for pressure sensors in the locations directed by the BAS contractor.
B. Install BAS valves and sensors in the locations shown on the plans and as required to achieve the Division 17 Sequence of Operation.
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.

1.6 SUBMITTALS

A. Submit under provisions of Division 1 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 REGULATORY REQUIREMENTS

A. Conform to ANSI/ASME B31.9 code for installation of piping system.
B. Conform to 2015 International Mechanical Code.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, protect and handle products to site under provisions of Division 1 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 HOT WATER PIPING, ABOVE GROUND

A. Steel Pipe: ASTM A53 or A120, Schedule 40, black.
   1. Fittings: ANSI/ASTM B16.3, malleable iron or ASTM A234, forged steel welding type fittings.
   2. Joints: Welded for 2½” and larger.
B. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ANSI/ASME B16.18, cast brass, or ASME B16.22, brazed wrought copper.
   2. Joints: ASTM B32 - Solder Grade 95TA.
C. All piping 2½-inches and above to be steel pipe as stated in paragraph A. above. All piping 2-inches and under to copper tubing as stated in paragraph B. above.

2.2 CONDENSATE DRAINS OVERFLOWS AND EQUIPMENT DRAIN PIPING

A. Copper Tubing: ASTM B88, Type L, hard drawn.
   1. Fittings: ANSI/ASME B16.18, cast brass, or ASME B16.22, brazed wrought copper.
   2. Joints: ASTM B32 - Solder Grade 95TA.

2.3 UNIONS, FLANGES, AND COUPLINGS

A. Unions for Pipe 2 Inches and Under:
   1. Copper Pipe: Bronze, soldered joints.
B. Flanges for Pipe Over 2 Inches:
   1. Ferrous Piping: 150 psig forged steel, slip on.
   2. Copper Piping: Bronze.
   3. Gaskets: 1/16-inch thick preformed neoprene.

2.4 BALL VALVES

A. Up to and Including 2-1/2 inches:
   1. Manufacturers:
      a. Milwaukee - Model BA1005.
      b. Nibco - Model T585-70.
      c. Stockham - Model S-216.
   2. Bronze one-piece body, stainless-steel ball, Teflon seats and stuffing box ring, lever handle with balancing stops, solder ends.

2.5 BUTTERFLY VALVES

A. Manufacturers:
   1. Milwaukee - Model C Series.
   2. Nibco - Model LD2000.
   3. Stockham - Model LD712.
B. Body: Ductile iron with resilient replaceable EPDM seat, wafer or lug ends, extended neck.
C. Disc: Aluminum bronze.
D. Operator: 10-position lever handle.

2.6 SWING CHECK VALVES

A. Up to and Including 2-Inches:
   1. Manufacturers:
      a. Milwaukee.
      b. Nibco.
      c. Stockham.
   2. Bronze body, bronze trim, bronze rotating swing disc, with composition disc, threaded ends.
B. Over 2-Inches:
   1. Manufacturers:
      a. Milwaukee.
      b. Nibco.
      c. Stockham.
   2. Iron body, bronze trim, swing disc, renewable disc and seat, flanged ends.

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.
E. After completion, fill, clean, and treat systems.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install heating water to ASME B31.9.
C. Route piping in orderly manner, parallel to building structure, and maintain gradient.
D. Install piping to conserve building space, and not interfere with use of space and other work.
E. Group piping whenever practical at common elevations.
F. Sleeve pipe passing through partitions, walls and floors. Pack fire seal between sleeve and pipe.
G. Slope piping and arrange to drain at low points.
H. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

I. Inserts: Refer to Section 15140.
J. Pipe Hangers and Supports: Refer to Section 15140.
K. Furnish and install ¾" ball valve, with hose connection and cap, at all high and low points in the piping system for vents and drains respectively.
L. Install and pipe, coupon racks, pot feeder and side stream filter per manufacturer's recommendations.
M. Pipe equipment and condensate drains to nearest floor/roof drain. Run pipe close to equipment bases to avoid tripping hazards.

END OF SECTION

SECTION 15515

HYDRONIC SPECIALTIES

PART 1 – GENERAL

1.1 WORK INCLUDED
A. Air vents.
B. Strainers.
C. Balancing fittings.
D. This contractor shall install all control valves, furnished by BAS contractor, in piping system.
E. This contractor shall furnish all pipe wells in piping system

1.2 RELATED SECTIONS
A. Section 15510 - Hydronic Piping.
B. Section 15545 - Chemical Water Treatment.
C. Division 17 – Building Automation System.

1.3 REFERENCES
A. ANSI/ASME - Boilers and Pressure Vessel Codes, SEC 8 D Rules for Construction of Pressure Vessels.

1.4 SUBMITTALS
A. Submit under provisions of Division 1 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.

1.5 OPERATION AND MAINTENANCE DATA
A. Submit under provisions of Division 1 General Requirements.
B. Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.6 DELIVERY, STORAGE, AND HANDLING
A. Deliver, store, protect and handle products to site under provisions of Division 1 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 AIR VENTS
A. Manual Type: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8-inch brass needle valve at top of chamber.
B. Float Type:
   1. Brass or semi steel body, copper, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
C. Washer Type.
   1. Brass with hydroscopic fiber discs, vent ports, adjustable cap for manual shut off, and integral spring-loaded ball check valve.

2.2 STRAINERS

A. Size 2-inch and Under:
   1. Manufacturers:
      a. O.C. Keckley Co.
      b. Armstrong Machine Works.
      c. MetraFlex Co.
   2. Screwed brass or iron body for 175 psig working pressure, Y pattern with 1/32-inch stainless steel perforated screen.

B. Size 2½-inch thru 4-inch:
   1. Manufacturers:
      a. O.C. Keckley Co.
      b. Armstrong Machine Works.
      c. MetraFlex Co.
   2. Flanged iron body for 175 psig working pressure, Y pattern with 3/64-inch stainless steel perforated screen.

C. Size 5-inch and Larger:
   1. Manufacturers:
      a. O.C. Keckley Co.
      b. Armstrong Machine Works.
      c. MetraFlex Co.
   2. Flanged iron body for 175 psig working pressure, basket pattern with 1/8-inch stainless steel perforated screen.

2.3 COIL HOOK-UP KITS

A. Manufacturers:
   1. Belimo
   2. Bell & Gossett, ITT.
   3. Nexus

B. Fabrication:
   1. Combination wye strainer and shut-off valve with one pressure/temperature port, drain valve, tailpiece and union end (equal to B & G model UBY).
      a. Design and Construction:
         1) The Valve shall have integral ball shutoff valve capable of 600 PSI service at 60°F, integral “Y” pattern strainer at 20 mesh, and union ended connection with configurable tail piece of female sweat, female NPT or male NPT.
         2) The valve shall have four plugged ¼” NPT Female threaded accessory ports.
         3) The valve shall have one ¼” NPT Female threaded accessory port with installed Pressure/Temperature measurement port utilizing double core elastomeric isolation for hypodermic insertion of temperature or pressure measuring instrument. The port shall have a cap.
         4) The valve shall have one ¼” female threaded NPT port in the end of the threaded strainer cap for the blow down of the strainer or the emptying of the coil. A drain valve shall be installed in the fitting and shall have a ball isolation valve and garden hose capped drain fitting.
         5) The valve shall have one ½” female threaded NPT port suitable for use in bypass piping considerations. The port shall be plugged.
         6) The valve shall have an EPDM O-ring installed in the mating area of the tail piece flange and the body.

2. Union accessory with one pressure/temperature port, manual air vent, tailpiece and union end (equal to B & G model UA).
   a. Design and Construction:
      1) Manual Air Vent: bronze body and nonferrous internal parts; 150 psig working pressure, 225-degrees F operating temperature; manually operated with screwdriver or thumbscrew; and having 1/8-inch discharge connection and ½-inch inlet connection.
      2) The Union shall have union ended connection with configurable tail piece of female sweat, female NPT or male NPT
      3) The union shall have one ¼" NPT Female threaded accessory port with installed Pressure/Temperature measurement port utilizing double core elastomeric isolation for hypodermic insertion of temperature or pressure measuring instrument. The port shall have a cap.
      4) The union shall have one ¼" female threaded NPT port in the end of the threaded strainer cap for the air venting of the coil. An air venting valve shall be installed in the fitting.
      5) The valve shall have an EPDM O-ring installed in the mating area of the tail piece flange and the body.
3. Circuit setter calibrated balance, commissioning and shut-off valve with input side pressure/temperature port, output side pressure/temperature port, tailpiece and union end (equal to B & G model MC).
   a. Design and Construction:
      1) The Hydronic System Balancing flow control valve shall be constructed by the product manufacturer to provide the functions called for in this section. The valve shall not be field constructed to provide key functionality.
      2) For 1/2"-2", the valve shall be bronze construction; incorporate integral ball shutoff valve; rated at 400 psi at 250ºF service for water; Have union nut & separate tail piece exit from body with O-ring seal between body and flange; Shall have round handle with memory stop and integral calibrated position indicator and nameplate.
      3) Shall have two NPT female threaded accessory port with installed pressure/temperature measurement port; Shall have one plugged ¼" female threaded NPT port.
      4) All flow control devices shall be supplied by a single source and certified flow tests, witnessed by a professional engineer, shall be available.
      5) Pump head requirement: The required differential pressure for the pump head shall be as required to allow for the flow of the controlled circuit to be maintained with the required differential pressure for manual proportional balance at a position not closed more than 30% of the rated travel of the valve.
4. Shut-off valve.
5. Control valve to be by the BAS contractor.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions to permit intended performance.
B. Where large air quantities can accumulate, provide enlarged air collection standpipes.
C. Provide manual air vents at system high points and as indicated.
D. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
E. Provide valved drain and hose connection on strainer blow down connection.
F. Provide balancing fitting valves on water outlet from terminal heating units such as radiation, radiant panels, unit heaters, and fan coil units.
G. Provide coil hook-up kit for each terminal unit.

3.2 OPERATING AND MAINTENANCE DATA BY INSTALLING CONTRACTOR

A. Contractor shall furnish two (2) hard copies and two (2) electronic copies of equipment manuals, maintenance manuals and repair parts list for all equipment and systems reviewed. See General Requirements for additional requirements.

END OF SECTION

SECTION 15535

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 15260 – Piping Insulation.
B. Section 15880 – Heat Pump Heat Recovery System – Owner Purchased.
C. Division 17 – Building Automation System.

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 15140.
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 Division 1 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 Division 1 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 Division 1 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 REFRIGERANT

A. Refrigerant: ASHRAE 34;
1. 134a

2.3 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.

2.4 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.

2.5 FILTER DRIERS

A. Replaceable Cartridge Angle Type:
1. Shell: ARI 710, UL listed, brass, removable cap, for maximum working pressure of 350 psig.

2.6 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 15140.
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 15260.
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

SECTION 15545

CHEMICAL WATER TREATMENT

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Cleaning of piping systems.

1.2 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION
A. Section 15510 – Hydronic Piping.
B. Section 15515 – Hydronic Specialties.

1.3 REFERENCES
A. NFPA 70 - National Electrical Code.
B. International Building Code.

1.4 SUBMITTALS
A. Submit under provisions of Division 1 General Requirements.
B. Product Data: Provide chemical treatment materials, chemicals, and equipment including electrical characteristics and connection requirements.
C. Manufacturer's Installation Instructions: Indicate placement of equipment in systems, piping configuration, and connection requirements.
D. Manufacturer's Field Reports: Indicate startup of treatment systems when completed and operating properly. Indicate analysis of system water after cleaning and after treatment.

1.5 PROJECT RECORD DOCUMENTS
A. Submit under provisions of Division 1 General Requirements.
B. Record actual locations of equipment and piping.

1.6 OPERATION AND MAINTENANCE DATA
A. Submit under provisions of Division 1 General Requirements.
B. Operation and Maintenance Data: Include data on chemical feed pumps, agitators, and other equipment including spare parts lists, procedures, and treatment programs. Include step by step instructions on test procedures including target concentrations.

1.7 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing the products specified in this Section with minimum ten years documented experience. Company shall have local representatives with water analysis laboratories and full-time service personnel.

1.8 REGULATORY REQUIREMENTS
A. Conform to applicable code for addition of non-potable chemicals to building mechanical systems, and to public sewage systems.
B. 2015 International Mechanical Code.

1.9 WASTEWATER STANDARDS
A. Discharge from any chemically treated system shall be directed to sanitary sewers and shall not result in containment levels which are in excess of standards as set forth by the appropriate water pollution control authorities.

PART 2 – PRODUCTS

2.1 MATERIALS
A. System Cleaner:
   1. Liquid alkaline compound with emulsifying agents and detergents to remove grease and petroleum products.
   2. Biocide.

B. Closed System Treatment (Water):
   1. Sequestering agent to reduce deposits and adjust pH.
   2. Corrosion inhibitors.
   3. Conductivity enhancers.

2.2 CHEMICALS

A. Water Treatment Contractor shall provide chemical treatment products as specified for cleaning and for the control of scale formation, corrosion, and microbiological growth in all water using systems. The quantity of chemicals furnished shall be sufficient to develop desired treatment levels in all systems from time of start-up through the warranty period, or for a maximum of one year, whichever comes first. Water Treatment Contractor shall have the ability to recycle shipping containers, per DOT guidelines.

PART 3 – EXECUTION

3.1 PREPARATION

A. Systems shall be operational, filled, started, and vented prior to cleaning. Use water meter to record capacity in each system.
B. Place terminal control valves in open position during cleaning.
C. Verify that electric power is available and of the correct characteristics.

3.2 CLEANING

A. General - Prior to acceptance by the Owner, all grease, dirt and metallic oxides shall be removed from each closed recirculating system. Equipment shall be provided to meter the water, filter system water, mix and inject the cleaning solution into the system. Mechanical Contractor shall inform Water Treatment Contractor of all system materials of construction, to insure chemical cleaner compatibility. A cleaning agent shall be circulated, wetting all metal surfaces and flushed from the system at completion. Supervision shall be as provided by Water Treatment Contractor.
B. Procedure - The Following Cleaning Procedure shall apply:
   1. The system shall be filled through a suitable water meter to determine total water capacity, taking care to bleed all air.
   2. Liquid Cleaner shall be added to the system at a dosage rate of twenty (20) gallons per one thousand (1000) gallons of system capacity. The Chemical Water Treatment Contractor shall verify cleaner strength.
   3. Hot Water Systems shall be heated to 160-180 degrees F and circulated for 24 hours.
   4. During the cleaning period, system water shall be circulated through the entire system. Mechanical Contractor shall insure that all small orifices (control valves, strainers, etc.) remain free of debris. A side stream filter shall be used for solids removal during the cleaning period. Filter media shall be changed as specified in the filter cartridge specifications.
   5. When cleaning is complete, the system shall be drained and flushed with fresh water to remove the cleaning solution. Flushing shall continue until the total (M) alkalinity of the system water is within fifty (5) PPM of the total alkalinity of the make-up water.
   6. Immediately following completion and verification of flushing, certification records covering the cleaning operation shall be submitted to the Mechanical Contractor. Records shall include: System volume, cleaner concentration, circulation time, volume of flush water and final alkalinity reading. Each system shall then be chemically treated as provided elsewhere in the specifications.
C. Chemicals - Grease, dirt, oil and metallic oxides shall be removed from each closed recirculating water system using a non-foaming, liquid cleaning agent formulated to lift a disperse organic soil and to chelate alkaline earth metals and metallic oxides.
D. Use neutralizer agents on recommendation of system cleaner supplier and approval of Architect/Engineer.

E. Remove, clean and replace strainer screens.
F. Inspect, remove sludge and flush low points with clean water after cleaning process is completed. Include disassembly of components as required.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 PREPARATION FOR FINAL FILL

A. The piping system shall be hydrostatically tested to the required test conditions to assure no leaks.
B. Piping system shall be cleaned prior to system final fill of clean water. Dirt, weld slag, filings, oil, etc. shall be removed and flushed from the system prior to final fill.
C. All heat transfer equipment (chiller, boilers, etc.) shall be isolated while the field piping is being flushed.
D. For the initial flush Contractor shall meter and fill system with high quality water and Trisodium Phosphate (TSP). Water shall contain less than 100ppm $CaCO_3$ hardness and less than 50ppm chloride plus sulfate ions. Blended solution shall have a concentration of 5 pounds TSP per 50 gallons water. Circulate this blended solution for 8-12 hours.
E. Drain the system of TSP solution. Open the isolation valves to all heat transfer equipment. Using a meter refill, fill the system with high quality water.
F. Final flush shall be drained and metered. Contractor shall flush all excess water out of the system. Drain all low "pockets".

3.5 FILLING THE SYSTEM

A. Fill the systems with the specified solution concentration complete with all inhibitors, buffers, and anti-foam agent as specified. Provide a minimum level of 850 Nitrite (NO_2) within the building system.
B. Contractor shall vent system during fill. The air has to come out of the system to let the fluid in. Before the fill, check to make sure ALL control valves are in the OPEN position. During the fill, periodically check the valves. To ensure no loss of fluid, close them off as the system fills up.
C. After the system is filled and the air is properly purged, allow the fluid to circulate for 24 hours. Then, pull a sample using the sample kit provided by the manufacturer.
D. Contractor shall pull a second sample six-months after the initial fill, and on the anniversary of the fill. It is recommended these samples are to be sent to the manufacturer for analysis.
E. The analysis from the manufacturer should list the following for water system:
    1. pH, Color, Clarity
    2. Reserve Alkalinity, ml
    3. Inhibitors: Ferrous, Copper & Brass Corrosion Products
    4. Degradation Products
    5. Corrosives
    6. Scale Promoters
    7. Contaminants
F. Manufacturer report shall be submitted to the Engineer for the inclusion in the building submittal records for distribution to the Owner.

3.6 OPERATING AND MAINTENANCE DATA BY INSTALLING CONTRACTOR

A. Contractor shall furnish two (2) hard copies and two (2) electronic copies of equipment manuals, maintenance manuals and repair parts list for all equipment and systems reviewed. See General Requirements for additional requirements.

END OF SECTION

SECTION 15671

AIR COOLED CONDENSING UNITS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Condensing unit package.
B. Charge of refrigerant and oil.
C. Controls and control connections.
D. Refrigerant piping connections.
E. Motor starters.
F. Electrical power connections.
G. Platform roof curb or concrete base.

1.2 RELATED SECTIONS

A. Section 15245 - Vibration Isolation.
B. Section 15535 - Refrigerant Piping and Specialties.
C. Section 15880 – Heat pump heat recovery system – Owner Purchased.
D. Division 17 - Building Automation System.

1.3 REFERENCES

A. ARI 370 - Sound Rating of Large Refrigeration and Air-Conditioning Equipment.
B. ARI 360 - Unitary Air Conditioning Equipment.
C. ASHRAE 14 - Methods of Testing for Rating Positive Displacement Condensing Units.
D. ASHRAE 15 - Safety Code for Mechanical Refrigeration.
E. ASHRAE 90A - Energy Conservation in new Building Design.
F. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
G. NEMA MG 1 - Motors and Generators.
H. UL 207 - Refrigerant Containing Components and Accessories, Non-Electrical.
I. UL 303 - Refrigeration and Air Conditioning Condensing, and Air Source Heat Pump Equipment.

1.4 SUBMITTALS

A. Submit under provisions of Division 1 General Requirements.
B. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.
C. Product Data: Provide rated capacities, weights, specialties and accessories, electrical nameplate data, and wiring diagrams.
D. Design Data: Indicate refrigeration pipe and equipment sizing.
E. Submit manufacturer's installation instructions.
F. Operation and Maintenance Data: Submit under provisions of Division 1 General Requirements.
G. Operation and Maintenance Data: Include manufacturer’s descriptive literature, startup instructions, maintenance instructions, parts lists, controls, and accessories.

1.5 REGULATORY REQUIREMENTS

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.
B. Unit shall conform to UL 1995/CSA 22.2 #236 for construction of condensing units and shall have UL/CSA label affixed to unit.

1.6 DELIVERY, STORAGE, AND PROTECTION

A. Transport, handle, store, and protect products under provisions of Division 1 General Requirements.
B. Comply with manufacturer's installation instructions for rigging, unloading, and transporting units.

C. Protect units on site from physical damage. Protect coils.
D. 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 visqueen. 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 ACOUSTICS

A. Manufacturer of condensing unit shall provide outdoor sound power level data across all major octave band center frequencies for cataloged operating range of unit at gross cooling capacity range. Data shall be obtained in conformance with ANSI S1.32-1980, American National Standard Methods for the Determination of Sound Power Levels of Discrete Frequency and Narrow Band Noise Sources in Reverberation Rooms and per AMCA Standard 300-85 test code "Sound Rating Air Moving Devices".

1.8 WARRANTY

A. Provide one (1) year parts and labor warranty for the entire package.
B. Provide a five (5) year parts and labor warranty to include coverage for refrigerant compressors.

PART 2 – PRODUCTS

2.1 MANUFACTURED UNITS

A. Units: Self-contained, packaged, factory assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, sub cooling circuits, controls, and liquid receiver.
B. Construction and Ratings: In accordance with ARI 360 and UL 1995. Testing shall be in accordance with ASHRAE 14.
C. Performance Ratings: Performance as scheduled on Drawings. Energy Efficiency Rating (EER) and Coefficient of Performance (COP) not less than prescribed by ASHRAE 90A. Operating range shall be between 115º F and 35º F.

2.2 CASING

A. Unit casing shall be constructed of 18-gauge zinc coated heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized and finished with a weather-resistant baked enamel finish. Unit’s surface shall be tested 500 hours in salt spray test. Units shall have removable end panels, which allow access to all major components and controls.

2.3 CONDENSER SECTION

A. Coils shall be internally finned or smooth bore 3/8" copper tubes mechanically bonded to configured aluminum plate fin as standard. Factory pressure and leak tested to 425 psig air pressure. Metal grilles with PVC coating for coil protection shall be provided.

2.4 REFRIGERATION SYSTEM – DUAL COMPRESSOR

A. Units shall have two separate and independent refrigeration circuits. Each refrigeration circuit shall have an integral sub-cooling circuit. A refrigeration filter drier shall be provided. Units shall have both a liquid line and suction gas line service valve with gauge port.

B. Units shall have two direct-drive hermetic reciprocating compressors with centrifugal oil pump and provide positive lubrication to all moving parts. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of nameplate voltage. Crankcase heater, internal temperature and current-sensitive motor overloads shall be included for maximum protection. Units shall have internal spring isolation and sound muffling to minimize vibration transmission and noise. External high and low-pressure cutout devices shall be provided. Evaporator defrost control provided in indoor blower coil shall prevent compressor slugging by temporarily interrupting compressor operation when low evaporator coil temperatures are encountered.

2.5 FANS AND MOTORS

A. Direct-drive, statically and dynamically balanced propeller fan(s) with aluminum blades and electro-coated steel hubs shall be used in draw-through vertical discharge position. Either permanently lubricated totally enclosed or open construction motors shall be provided and shall have built in current and thermal overload protection. Motor(s) shall have be either ball or sleeve bearing type.

2.6 CONTROLS

A. Condensing units shall be completely factory wired with necessary controls and contactor pressure lugs or terminal block for power wiring. Control wiring shall be 24-volt control circuit, which includes fusing and control transformer. Units shall provide external location for mounting a fused disconnect device. Time delay timers to prevent compressors in dual compressor units from simultaneous start-up and anti-recycle timers shall be provided.

2.7 MISCELLANEOUS FEATURES

A. Vibration Isolation Packages – Shall reduce transmission of noise and vibration to building structures, equipment and adjacent spaces. Packages shall be available in either neoprene-in-shear or spring-flex types.
B. Hot Gas Bypass Kit – Shall be available to provide capacity modulation.
C. Time Delay Relay – Shall prevent compressors in dual compressor unit from coming on line simultaneously. Timer shall be 24-volt, 60-cycle, with four-minute timing period.
D. Anti-Short Cycle Timer – Shall prevent rapid on-off compressor cycling in light load conditions by not allowing compressor to operate for 5-7 minutes upon shutdown. Shall consist of a solid-state timing device, 24-volt, 60-cycle with either 5 or 7 minute fixed-off timing period.
E. Condenser Coil Guard – Metal grille with PVC coating shall be provided to alleviate coil damage.
F. Platform Roof Curb – 18” high. See details.
G. Hail guard.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide for connection to electrical service.
C. Install units on vibration isolation.
D. Install units on roof 18” high platform curb as indicated on contract documents.
E. Provide connection to refrigeration piping system and evaporators.
F. See Section 15242 – Vibration Isolation for additional requirements.

3.2 MANUFACTURER'S FIELD SERVICES

A. Supply initial charge of refrigerant and oil for each refrigerant circuit.
B. Manufacturer shall furnish a factory trained service engineer without additional charge to start the units. Package rooftop unitary manufacturers shall maintain service capabilities no more than 100 miles from the job site.
C. The manufacturer shall furnish complete submittal wiring diagrams of the package unit as applicable for field maintenance and service.

3.3 REQUIREMENTS BY INSTALLING CONTRACTOR

A. Contractor shall furnish a minimum of two (2) equipment manuals, maintenance manuals and repair parts list for all equipment and systems reviewed.

END OF SECTION

SECTION 15835

TERMINAL HEAT TRANSFER UNITS

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Horizontal and vertical pipe enclosures.
B. Radiant ceiling panels.

1.2 RELATED SECTIONS
A. Section 15510 - Hydronic Piping.
B. Section 15515 - Hydronic Specialties.
C. Division 17 - Building automation system.

1.3 REFERENCES
A. NFPA 70 - National Electrical Code.
B. International Mechanical Code 2015.

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 manufacturer’s 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. Conform to 2015 International Mechanical Code.

1.7 WARRANTY
A. Contractor shall provide a one (1) year manufacturer’s warranty on parts on furnished equipment. Equipment parts warranty shall start at time of substantial completion. Contractor will provide a one (1) year warranty on all labor associated with the equipment and its’ installation. Warranty shall start at date of final payment. See General Requirements for additional requirements.

1.8 GENERAL PROVISIONS

A. The general provisions of the contract, including General Conditions and Supplementary General Conditions, apply to the work specified in this Section.

1.9 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 visqueen. 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.
D. Material and Equipment: Transport, handle, store, and protect products.
E. Protect units on site from physical damage. Store in protected are on palates and wood drainage as required to keep the equipment clean and level after delivery to the site. Covered and protect the equipment from weather, dirt and damage with tarps and framing as required.

1.10 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Division 1 General Requirements.

1.11 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.

PART 2 - PRODUCTS

2.1 HORIZONTAL AND VERTICAL PIPE ENCLOSURE

A. Provide 14 gauge, 2-sided sheet metal pipe chase for horizontal pipe enclosure. Enclosures shall be security installation type, and shall be one piece. Enclosures shall be field measured for actual enclosure lengths and shall include the following installation accessories.
   1. Provide 1" x 1" 18 ga. steel angles to mount chase vertically. Drill and secure in field with tamper proof screws, spaced as recommended by chase manufacturer.
   2. Pre punch ¼" diameter holes in enclosure 1'-0" on center. Drill and secure chase to angle as described above.
   3. End caps at non-wall terminations.
B. Prime and paint finished enclosure installation per Architect/Owner's color selection.
C. Sheet metal pipe enclosure chase shall be as manufactured by Vulcan, type "PE", or equal.

2.2 RADIANT CEILING PANELS

A. Acceptable Manufacturer:
   1. Aerotech.
   2. No Substitutions.
B. Ceiling Panels Construction:
   1. Extruded Aluminum Panels:
      a. Extrusion panel thickness to be approximately 0.100 inch.
      b. Panel Tube: 0.500-inch I.D. copper.
      c. Panels to have a U-shaped channel formed more than 2 of the way around the copper tube for increased thermal performance and to eliminate any separation of copper and aluminum. The use of adhesive or hold-down clips to attach copper tubing to the aluminum extrusion is not acceptable.

d. Ceiling panels are made up of multiples of 5-, 6- or 8-inch extrusions to match required depth as indicated on Drawings.
   1) Assembled in factory with return bends factory installed.
   2) Cross bar shall maintain flatness and provide another point for panel suspension.
   3) Factory apply two coats of baked enamel paint to the finished side of panels after assembly. Matte finish of off-white color to match ceiling grid.
   4) Maximum length of single panel shall be 16 feet.
e. Face Configuration: Fluted.
f. A heat conductive paste shall be applied between copper tube and aluminum saddle.

2. Tubing Interconnects:
   a. Type L copper, 3/8 inch (0.500 OD) or Type M soft, copper 2-inch nominal, 0.028-inch wall thickness.
3. Insulation:
   a. One-inch-thick fiberglass; 3/4 pound per cubic foot density.
4. Suspension Wire:
   a. Galvanized, soft annealed steel wire, 12-gauge, hanger spacing not to exceed four feet on center.

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 conditions.
D. Provide start-up and labor warranty.

3.2 INSTALLATION

A. Hydronic Radiant Ceiling Panels.
   1. Install in accordance with manufacturer’s instructions.
   2. Locate baseboard radiation, radiator or radiant panel on outside wall and run cover continuously unless otherwise indicated. Center elements under windows. Where multiple windows occur over units, divide element into equal segments centered under each window. Install end caps where units end.
   3. Mount all piping and elements from steel supports and slide cradles.
   4. Install the following minimum pipe trim on each section of controlled radiation. (Note: See typical finned tube radiation piping detail on the Drawings.)
      a. Inlet Side of Element: Ball valve, strainer, union, control valve and increaser.
      b. Outlet Side of the Last Piece of Element in a Controlled Section: Reducer, union, balancing valve and ball valve and key operating manual air vent.
   5. Pitch piping and finned element up to air vent.
   6. Install all valves in a location so they can be reached through the fin tube cover access door.
   7. Building Automation Contractor shall furnish control valve. This Contractor shall install control valve. This Contractor shall install valve in piping system.
   8. Protect finish 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 OPERATION AND MAINTENANCE DATA BY INSTALLING CONTRACTOR

A. At the completion of the project, the Installing Contractor shall provide furnish two (2) hard copies and two (2) electronic copies of equipment manuals, maintenance manuals and repair parts list for all equipment and systems reviewed. See General Requirements for additional requirements.

END OF SECTION

SECTION 15860

DEDICATED OUTDOOR MAKE-UP AIR UNITS (PACKAGE)

PART 1 - GENERAL

1.1 PRE-PURCHASED EQUIPMENT

A. Duneland School Corporation has elected to pre-bid and purchase the mechanical HVAC equipment called for in this section of the specifications.
B. Equipment will be shipped to Duneland District Office at 651 W. Morgan Avenue, Chesterton, IN 46304 within Duneland School Corporation and will be unloaded by the installing Mechanical Contractor.
C. The equipment manufacturer's representative shall be on site and present at the time of unloading at project site. The Owner's representative, Mechanical Contractor, and manufacturer's representative shall inspect the equipment for damage and/or missing components and identify such in writing.
    1. If there are damaged or missing components, the manufacturer's representative shall provide a written list to the Owner.
    2. A Mechanical Contractor shall inspect the equipment for damage and/or missing components and identify such in writing. If the contractor agrees the equipment is in proper condition, the manufacturer's representative shall obtain a written acceptance of the equipment from the contractor.
D. The equipment manufacturer's bid/proposal includes start-up services. The equipment manufacturer's bid/proposal includes operating manuals and warranty for parts and labor on equipment only. All other warranty services are by the installing contractor.
    1. Owner's schooling shall be provided under this section.
E. All bidding manufacturers must submit complete product data and shop drawings as outlined in sub-section 1.5 below with their bid/proposal, failure to complete submittals with bid/proposal will be grounds for disqualification.

1.2 SECTION INCLUDES

A. Delivery of equipment to the job site with a manufacturer's representative present.
B. Field start-up services and Owner training at the job site.
C. Parts and labor warranty.
D. Packaged unit with insulated cabinet, fan(s), evaporator coil, energy wheel, gas furnace, etc.
E. Controls and control connections.
F. Electrical power connections.

1.3 ASSIGNMENT

A. Equipment will be assigned to the successful mechanical contractor as directed by Owner/Architect/Engineer.

1.4 WORK INCLUDED

A. Delivery of equipment to the job site with a manufacturer's representative present.
B. Parts and labor warranty on Package from date of delivery per sub-section 1.9 below.
C. Start-up and Owner's Training on equipment being provided.

1.5 SUBMITTALS

A. Submit two (2) copies of unit performance data.
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.

1.6 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.7 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.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site.

1.9 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.
B. Provide seven-year warranty (parts) for compressor only.

1.10 VERIFICATION OF CAPACITY AND EFFICIENCY

A. All proposals for performance must be included and match scheduled corrected cooling and heating outputs.

1.11 COORDINATION

A. Coordinate size and location of all building penetrations required for installation of each unit and associated plumbing and electrical systems.
B. Coordinate sequencing of construction of associated plumbing, HVAC, electrical supply and sheet metal contractor.

1.12 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Filters: Two complete sets of disposable filters for each unit.
   2. Belts: Two sets for Energy Wheel.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Valent Air – Dan Walters – (630) 947-9166.

2.2 MANUFACTURED UNITS

A. Unit shall be fully assembled at the factory and consist of an insulated metal cabinet, downturn outdoor air intake hood exhaust air blower, evaporator coil, condensate drain pan, Energy wheel, hot gas reheat coil, indirect gas furnace, packaged DX system, dampers, sensors, filter assembly for intake air, supply/exhaust/relief blower assembly and an electrical control center. All specified components and internal accessories factory installed are tested and prepared for single-point high voltage connection except with electric post heat and exhaust fan only power if dual point power is selected.

2.3 CABINET

A. Materials: Formed, 2-inch double wall closed cell foam insulated metal panels and 2” double wall closed cell foam insulated metal door construction, fabricated to permit access to internal components for maintenance.
   1. Outside casing: 22-gauge, galvanized (G90) steel meeting ASTM A653 for components that do not receive a painted finish.
   2. Internal assemblies: 22- or 24-gauge, galvanized (G90) steel except for motor supports which shall be minimum14 gauge galvanized (G90) steel.

B. Cabinet Insulation: Comply with NFPA 90A and NFPA 90B and erosion requirements of UL 181.
   1. Materials: Rigid urethane foam
      a. Thickness: 2-inch
      b. Thermal Resistance: R13
      c. Meets UL94HF-1 flame requirements
      d. Location and application: Full coverage of entire exterior to include walls, roof of unit, unit base and doors
C. Access panels / doors: Unit shall be equipped with insulated, hinged doors or removable access panels to provide easy access to all major components. Doors and access panels shall be fabricated of 18-gauge galvanized G90 steel or painted galvannealed steel with 2-inch closed cell foam insulation.
D. Supply Air blower assemblies: Blower assembly shall consist of an electric motor as specified by A / E and direct-drive fan(s). Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125-inch-thick neoprene vibration isolators. Blower motor(s) shall be capable of continuous speed modulation and controlled by a VFD.
E. Exhaust Air blower assemblies: Blower assembly shall consist of an electric motor, with fan ODP enclosure and a direct-drive fan. Assembly shall be mounted on heavy gauge galvanized steel rails and further mounted on 1.125-inch-thick neoprene vibration isolators. Blower motor shall be capable of continuous speed modulation and controlled by a VFD.
F. Evaporator Coil: Evaporator coil shall be AHRI Certified and shall be (silver) soldered or brazed into the compressed refrigerant system. Coil shall be constructed of copper tubing, permanently bonded to aluminum fins and enclosed in a stainless-steel frame. If two compressors are used as components of the unit, then the evaporator coil shall be of “interlaced” configuration, permitting independent operation of either compressor without conflict with the other compressor.
G. Control panel / connections: Rooftop Ventilator units shall have an electrical control center where all high and low voltage connections are made. Control center shall be constructed to permit single-point high voltage power supply connections. RTU shall be equipped with a Unit Disconnect Switch.
H. Condensate drain pan: Drain Pan shall be an integral part of the unit whenever a cooling option is included. Pan shall be formed of welded austenitic stainless-steel sheet material and provided with a drain connection at the front (access side) for connection to a P trap. Drain pan shall be sloped in two directions to provide positive draining and drain connector shall be sealed at penetration through cabinet wall.
I. Energy wheel: Unit energy wheel shall handle the full volume of outdoor and exhaust air without an energy wheel bypass damper(s). Energy wheel shall be of total enthalpy, rotary air-to-air type and shall be an element of a removable energy wheel cassette. The cassette shall consist of a galvanized steel framework (designed to produce laminar air flow through the wheel), an energy wheel as specified and a motor and drive assembly. The cassette shall incorporate a pre-tensioned urethane drive belt or a link style belt with a five-year parts warranty. The wheel media shall be a polymer film matrix. Wheel shall be comprised of individual segments that are removable for servicing Silica gel desiccant shall be permanently bonded to the polymer film. The energy wheel is to have a five-year parts warranty. Performance criteria are to be as specified in AHRI Standard 1060, complying with the Combined Efficiency data in the submittal.
J. Reheat Coil with factory installed modulating hot gas reheat valve.
K. Indirect gas furnace:
   1. Shall be ETL Certified as a component of the unit.
   2. Shall have an integral combustion gas blower.
   3. Shall be ETL Certified for installation downstream of a cooling coil.
   4. Shall have fault sensors to provide fault conditions to optional digital controller or building controls.
   5. Shall have 4-pass tubular heat exchangers, constructed of type 409 stainless steel. Heat exchanger tubes shall be installed on the vest. Heat exchanger tubes shall be supported and also permit expansion and contraction of the tubes].

6. Heat exchanger shall have a 5-year extended warranty.
7. Furnace control shall be 12:1 Modulating.
8. Shall be encased in a weather-tight metal housing with intake air vents. Large, metal door shall provide easy access to the enclosed vest plate, control circuitry, gas train, burner assembly, and exhaust blower.

L. Packaged DX System: Unit shall have an integral compressor(s) and evaporator coil located within the weather-tight unit housing. Condenser coils and appurtenant condenser fan assemblies shall be factory installed as integral subassemblies of the unit and mounted on the exterior of the unit. Unit condenser fans shall feature swept owlet blade design resulting in reduced sound levels. Condenser fan motors shall be three phase, external rotor, type 56 frame, open air over and shaft up. Each condenser fan motor shall have a vented frame, rated for continuous duty and be equipped with an automatic reset thermal protector. Lead condenser fan will have an electronically commutated (EC) motor that will modulate to maintain a head pressure set point. Motors shall be UL Recognized and CSA Certified. The refrigerant compressor(s) shall be digital hermetic scroll-type and shall be equipped with liquid line filter drier, expansion valves, manual reset high pressure and low-pressure cutouts and all appurtenant sensors, service ports and safety devices. Compressed refrigerant system shall be fully charged with R-410A refrigerant.

M. Packaged DX Control and Diagnostics: The Packaged DX system shall be controlled by an onboard digital controller (DDC) that indicates both owner-supplied settings and fault conditions that may occur. The DDC shall be programmed to indicate the following faults:
   1. Global alarm condition (active when there is at least one alarm)
   2. Supply Air Proving alarm
   3. Dirty Filter alarm
   4. Compressor Trip alarm
   5. Compressor Locked Out alarm
   6. Supply Air Temperature Low Limit alarm
      a. Sensor #1 Out of Range (outside air temperature)
      b. Sensor #2 Out of Range (supply air temperature)
      c. Sensor #3 Out of Range (cold coil leaving air temperature)

N. Motorized dampers: Damper shall be of low leakage AMCA Class 1A certified construction. Leakage rate shall not exceed 3 CFM/ft2 @ 1 in. wg. and shall be factory installed].

O. Sensors are considered to be part of various optional operational modes or device controllers and are to be factory supplied and installed as specified by the A/E.

P. Service receptacle: 120 VAC GFCI service outlet shall be factory-provided and installed by this contractor in a location designated by the A/E.

Q. Hail guards: Protects the condensing unit from damage due to extreme weather conditions such as hail and flying debris.

2.4 BLOWER

A. Blower section construction Supply Air: direct drive motor(s) and blower(s) shall be assembled on a 14-gauge galvanized steel platform and shall be equipped with 1.125-inch-thick neoprene vibration isolation devices.

B. Blower assemblies: Shall be statically and dynamically balanced and designed for continuous operation at maximum rated fan speed and horsepower.

C. Fan: Direct drive, airfoil plenum fan with painted steel wheels statically and dynamically balanced and AMCA certified for air and sound performance.

D. Blower section motor source quality control: Blower performance shall be factory tested for flow rate, pressure, power, air density, rotation speed and efficiency. Ratings are to be established in accordance with AMCA 210, “Laboratory Methods of Testing Fans for Rating.”

2.5 MOTORS

A. General: Blower motors greater than ¾ horsepower shall be “NEMA Premium™” unless otherwise indicated. Compliance with EPAct minimum energy-efficiency standards for single speed ODP and TE enclosures is not acceptable. Motors shall be heavy-duty, permanently lubricated type to match the fan load and furnished at the specified voltage, phase and enclosure.

2.6 UNIT CONTROLS

A. The unit shall be constructed so that it can function as a stand-alone heating and cooling system controlled by factory-supplied controllers, thermostats and sensors, or it can be operated as a heating and cooling system controlled by a Building Management System (BMS). This unit shall be controlled by a factory-installed microprocessor programmable controller (DDC) that is connected to various optional sensors.

B. Unit shall incorporate a DDC controller with integral LCD screen that provides text readouts of status. DDC controller shall have a built-in keypad to permit operator to access read-out screens without the use of ancillary equipment, devices or software. DDC controllers that require the use of equipment or software that is not factory-installed in the unit are not acceptable. Alarm readouts consisting of flashing light codes are not acceptable. Owner-specified ventilating conditions can be input by means of pushbuttons

2.7 FILTERS

A. Unit shall have the filters as scheduled.

2.8 ACCESSORIES

A. Roof Curb
   1. Manufacturer provides 18” insulated curb. Curb to be 18-gauge perimeter, meeting ASTM A653/653M, with welded corners and with seams joined by continuous water and air tight welds. Curb shall be internally reinforced with bulkheads, 48” on center and factory installed wood nailer. Top of curb shall be level.
   2. Factory prefabricated and insulated
   3. Curb shall be manufactured in accordance with the National Roofing Contractors Association guidelines.
   4. Acceptable curb manufacturers:
      a. Thybar
      b. CDI
      c. KCC

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to start of installation, examine area and conditions to verify correct location for compliance with installation tolerances and other conditions affecting unit performance. See unit IOM.

B. Examine roughing-in of plumbing, electrical and HVAC services to verify actual location and compliance with unit requirements. See unit IOM.

C. Proceed with installation only after all unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Installation shall be accomplished in accordance with these written specifications, project drawings, manufacturer’s installation instructions as documented in manufacturer’s IOM, Best Practices and all applicable building codes.

3.3 CONNECTIONS

A. In all cases, industry Best Practices shall be incorporated. Connections are to be made subject to the installation requirements shown above.
   1. Piping installation requirements are specified in Division 15. Drawings indicate general arrangement of piping, fittings and specialties.
   2. Duct installation and connection requirements are specified in Division 15 of this document.
   3. Electrical installation requirements are specified in Division 16 of this document.
   4. Provide full-size condensate pipe with trap to nearest roof drain.

3.4 START-UP SERVICE

A. Engage a factory authorized service representative to perform startup supervision. Contractor shall clean entire unit, comb coil fins as necessary, and install clean filters. Measure and record electrical values for voltage and amperage. Refer to Division 17 “Testing, Adjusting and Balancing” and comply with provisions therein.

3.5 DEMONSTRATION AND TRAINING

A. Engage a factory authorized service representative to train owner’s maintenance personnel to adjust, operate and maintain the entire unit. Refer to Front End Specification Section Closeout Procedures and Demonstration and Training.

END OF SECTION

SECTION 15880

HEAT PUMP HEAT RECOVERY SYSTEM – OWNER PURCHASED

PART 1 - GENERAL

1.1 PRE-PURCHASED EQUIPMENT

A. Duneland School Corporation has elected to pre-bid and purchase the mechanical HVAC equipment called for in this section of the specifications.
B. Equipment will be shipped to Duneland District Office at 651 W. Morgan Avenue, Chesterton, IN 46304 within Duneland School Corporation and will be unloaded by the installing Mechanical Contractor.
C. The equipment manufacturer's representative shall be on site and present at the time of unloading at project site. The Owner's representative, Mechanical Contractor, and manufacturer's representative shall inspect the equipment for damage and/or missing components and identify such in writing.
    1. If there are damaged or missing components, the manufacturer's representative shall provide a written list to the Owner.
    2. A Mechanical Contractor shall inspect the equipment for damage and/or missing components and identify such in writing. If the contractor agrees the equipment is in proper condition, the manufacturer's representative shall obtain a written acceptance of the equipment from the contractor.
D. The equipment manufacturer's bid/proposal includes start-up services. The equipment manufacturer's bid/proposal includes operating manuals and warranty for parts and labor on equipment only. All other warranty services are by the installing contractor.
    1. Owner's schooling shall be provided under this section.
E. All bidding manufacturers must submit complete product data and shop drawings as outlined in sub-section 1.5 below with their bid/proposal, failure to complete submittals with bid/proposal will be grounds for disqualification.

1.2 SECTION INCLUDES

A. Delivery of equipment to the job site with a manufacturer's representative present.
B. Field start-up services and Owner training at the job site.
C. Parts and labor warranty.
D. VRF cassettes, thermostats, heat recovery units, condensing unit, etc. per schedule.
E. Controls and control connections.
F. Electrical power connections.

1.3 ASSIGNMENT

A. Equipment will be assigned to the successful mechanical contractor as directed by Owner/Architect/Engineer.

1.4 WORK INCLUDED

A. Delivery of equipment to the job site with a manufacturer's representative present.
B. Parts and labor warranty on Package from date of delivery per sub-section 1.9 below.
C. Start-up and Owner's Training on equipment being provided.

1.5 SUBMITTALS

A. Submit two (2) copies of unit performance data.
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.

1.6 QUALITY ASSURANCE

A. Manufacturers Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.7 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.

1.8 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect and handle products to site.

1.9 WARRANTY

A. Equipment manufacturer shall provide a one (1) year parts warranty. Installing Contractor will provide one (1) year warranty on all parts and labor associated with the equipment and installation of the equipment.
B. Provide five-year warranty (parts) for compressor only.

1.10 VERIFICATION OF CAPACITY AND EFFICIENCY

A. All proposals for performance must be included and match scheduled corrected cooling and heating outputs.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURERS

A. LG – Dan Walters – (630) 947-9166

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:
    1. Cooling: 14°F DB to 122°F DB
    2. Heating: -13°F WB to 61°F WB
G. Refrigerant Piping to be provided and installed by the Mechanical Contractor.

2.3 EQUIPMENT MANUFACTURER TO PROVIDE CERTIFIED DOCUMENTATION FOR APPROVAL BY ENGINEER OF UNIT TESTED HEATING CAPACITY AT -13F. (DESIGN CONDITION)

A. Refrigerant Lines (by Mechanical Contractor):
    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, (by Mechanical Contractor).
    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 (by Mechanical Contractor).
    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 3,280 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 drawing schedule.

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 sub-cooling.
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 67ºF WB, 80ºF DB for the indoor unit and 95 ºF DB, 75 ºF WB 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. Physical characteristics:
   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.
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.

2.8 SERVICE AND START-UP

A. Startup - Provide all labor and materials to perform startup. Startup shall be performed by a factory-trained technician from the original equipment manufacturer (OEM). Technician shall confirm that equipment has been correctly installed and passes specification checklist prior to equipment becoming operational and covered under OEM warranty. This shall be done in strict accordance with manufacturer's specifications and requirements. Third-party service agencies are not permitted.
B. A start-up log shall be furnished by the factory approved start-up technician to document the start-up date and shall be signed by the owner or his authorized representative prior to commissioning the system.
C. VRF manufacturer shall furnish a factory trained service engineer without additional charge to start the units. VRF manufacturer shall maintain service capabilities to more than 100 miles from the jobsite.
D. The manufacturer shall furnish complete submittal wiring diagrams of the system as applicable for field maintenance and service.

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.
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. See Section 15242 – Vibration Isolation for additional requirements.
   4. See Section 15242 – 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 equipment manufacturer shall provide training of Owner's staff. Training shall consist of on-site (hands-on) training which will show the location of all devices, operation of all controls, devices, motors, and maintenance and repair requirements. Prior to commencement of training, Equipment Manufacturer shall provide Architect with a schedule of dates, times and agenda for each training session. This Equipment Manufacturer shall provide a minimum of two (2) hours of training for equipment provided under this Section of the contract. Equipment Manufacturers shall furnish a minimum of two (2) equipment manuals, maintenance manuals and repair parts lists for all equipment and systems reviewed.

END OF SECTION

SECTION 15890

DUCTWORK

PART 1 – GENERAL

1.1 WORK INCLUDED
A. Insulated flexible ductwork.
B. Low pressure (rectangular) ductwork.
C. Low pressure (round) ductwork.
D. Installation of all dampers in ductwork.
E. Coordination of building automation system installation.
F. Installation of BAS components.

1.2 RELATED SECTIONS
A. Section 15140 - Supports and Anchors: Sleeves.
B. Section 15190 – Mechanical Identification
C. Section 15290 - Duct Insulation.
D. Section 15910 - Ductwork Accessories.
E. Section 15940 - Air Inlets and Outlets.
F. Division 17 - Building Automation System.

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. NFPA 90A - Installation of Air Conditioning and Ventilating Systems.
G. SMACNA - HVAC Air Duct Leakage Test Manual.
H. SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
I. 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 and Energy Code 2015.

1.6 SUBMITTALS
A. Submit under provisions of Division 1 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 Division 1 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 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. Fasteners: Rivets, bolts, duct mate (TM) or sheet metal screws.
E. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used alone or with tape or heavy mastic.
F. 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. No substitutions.
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 flame spread 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.

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. 2015 International Energy Conservation Code.
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. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
I. Connect diffusers to low pressure ducts with 3 feet maximum length of flexible duct held in place with strap or clamp.
J. Connect flexible ducts to metal ducts with adhesive plus draw bands. Flexible duct allowed for final connection to diffuser only (3’-0” max. length).
K. Seal all joints in ductwork with United duct sealer and per the International Energy Conservation Code.

L. Use UL-181A or 181B tapes and mastics on joints, seams and connections per SMACNA HVAC Duct Construction Standards and seal all ductwork per International Energy Conservation Code.
M. Connect ducts to fans and other air distribution equipment with mechanical fasteners, seals, mastics or gaskets.

3.2 INSTALLATION OF DIVISION 17 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

Air System	Material	Material Pressure
Low Pressure Supply (Heating and Cooling Systems)	Steel	4”
Return and Relief	Steel	4” (Negative)
General Exhaust	Steel	2” (Negative)
Outside Air	Steel	4”

END OF SECTION

SECTION 15910

DUCTWORK ACCESSORIES

PART 1 – GENERAL

1.1 WORK INCLUDED
A. Air turning devices/extractors.
B. Duct access doors.
C. Duct test holes.
D. Flexible duct connections.
E. Volume control dampers.

1.2 RELATED SECTIONS
A. Section 15242 - Vibration Isolation.
B. Section 15890 - Ductwork.
C. Division 17 - Building Automation System.

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.

1.4 SUBMITTALS
A. Submit under provisions of Division 1 General Requirements.

1.5 PROJECT RECORD DOCUMENTS
A. Submit under provisions of Division 1 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 Division 1 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 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. Leaded Vinyl Sheet: Minimum 0.55-inch-thick, 0.87 lbs. per sq. ft., 10 dB attenuation in 10 to 10,000 Hz range.

2.5 VOLUME CONTROL DAMPERS

A. Manufacturers:
   1. Ruskin.
   2. Air Balance.
   3. Vent Products.
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 standoff 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 15890 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. Demonstrate re setting of fire dampers to Owner's representative.
E. Provide flexible connections immediately adjacent to equipment in ducts associated with all fans and motorized equipment and supported by vibration isolators.
F. 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.
G. 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.

H. Install automatic control dampers provided by BAS contractor in the locations indicated on the floor plans.
I. 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 DIVISION 17 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

SECTION 15940

AIR OUTLETS AND INLETS

PART 1 – GENERAL

1.1 WORK INCLUDED
A. Registers/Grilles
B. Diffusers

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 Division 1 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. Nailor.

2.2 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.

2.3 SUPPLY REGISTERS/GRILLES

A. Type: Aluminum border and individually adjustable blades, ¾-inch blade spacing, single deflection.
B. Frame: 1¼-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.

2.4 RETURN GRILLES/REGISTERS

A. Return grilles shall be ½" 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 1¼" 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.

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.

END OF SECTION

SECTION 16010

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 16.
B. The 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. 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 16 Sections.
B. Shop Drawings: Refer to the General Requirements and 16 Sections.
C. Operation and Maintenance Data: Refer to the General Requirements and 16 Sections.
D. Coordination with Other Trades: Refer to the General Requirements, 15, and1 16 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. BOCA - Building Officials and Code Administrators.
    2. NEC - National Electrical Code.
    3. State of Indiana Building Code.
    4. NFPA 72 - National Fire Protection Association
    5. 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.

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. 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.

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 and payment 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 16 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 1 through 16 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 contractor's 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 visqueen. 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 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.

3.10 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.

3.11 ACCESS PANELS

A. Provide access panels as required. The access panels shall comply with Division 8.

3.12 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 megaohm 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 of 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 ensure that rated voltage is delivered and that the instrument is in calibration.
    4. Unless otherwise specified, the insulation resistance shall be approximately one megaohm for each 1000-volts of operating voltage with a minimum value of one megaohm.
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.

3.13 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	- 46" to C.L.
5.	Fire Alarm Pull Stations	- 46" to C.L.
6.	Security and Intercom Call Stations	- 46" to C.L.
7.	Clock and Paging Speaker Outlets	- 84" to C.L.
8.	Fire Alarm Audio/Visual Devices	- 82" to C.L.
9.	Corridor Wall Sconces (>4" deep)	- 66" to C.L.
10.	Exit Signs	- 90" to C.L.
11	Volume Controls	46" to C.L.
12.	T.V. Outlets	82" to C.L.
13.	Individual Disconnects and Starters	- 60" to C.L.
14.	Grouped Disconnects and Starters	> 12" to C.L. < 72" to C.L.
15.	Panelboard Overcurrent Devices	> 12" to C.L. < 72" to C.L.
16.	Grouped Utility Revenue Meters	> 30" to C.L. < 66" to C.L.

END OF SECTION

SECTION 16060

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 16 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 16010 – 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.
    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 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 re-laminating 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 re-supported 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

SECTION 16111

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 16 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 16130 - Boxes.
B. Section 16170 - Grounding and Bonding.
C. Section 16190 - Supporting Devices.
D. Section 16195 - 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 16010.
B. Product Data: Provide for metallic conduit, flexible metal conduit, liquid-tight 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.
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 V up thru 50V -	Above 50V up thru 250V -	Above 250V up thru 600V - -
Above an Accessible Ceiling	≤ 2 1/2"EMT ≥ 3" IMC	≤ 2 1/2" EMT ≥ 3" IMC	≤ 2 1/2" EMT ≥ 3" IMC
Concealed in Walls	≤ 2 1/2"EMT ≥ 3" IMC	≤ 2 1/2"EMT ≥ 3" IMC	≤ 2 1/2"EMT ≥ 3" IMC
Exposed Interior	≤ 2 1/2"EMT ≥ 3" IMC	≤ 2 1/2" EMT ≥ 3" IMC	≤ 2 1/2" EMT ≥ 3" 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
Corrosive Environments		HWG – PVC Coated	HWG – PVC Coated

* All voltages are line-to-line or line-to-neutral.

2.2 CONDUIT REQUIREMENTS

A. Minimum Size: ¾-inch. All remaining conduits shall be minimum of ¾-inch 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, ½-inch minimum size unless otherwise indicated.
E. Flexible connections, where required, shall be made with flexible metallic tubing ¾-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 16510 for flexible connections to lighting fixtures

2.3 METAL CONDUIT

A. Manufacturers:
   1. Allied.
   2. LTV/Republic.
   3. Steelduct.
   4. Wheatland.
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: ½-inch (13 mm), unless otherwise specified.
D. Flexible metal conduit shall only be used as a final connection to equipment and shall not exceed 72” in total length. Extending flexible runs beyond 72” by adding a junction box or small run of conduit is not allowed.

2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:
   1. Anaconda.
   2. American Brass.
   3. Electri-Flex Company.
B. Description: Interlocked galvanized steel construction with UL PVC jacket.
C. Fittings: ANSI/NEMA FB 1; steel or malleable iron.
D. Liquid tight flexible metal conduit shall be used for final connection to the following equipment;
   1. Pumps
   2. Boilers
   3. Chillers
   4. Air Supply Units
   5. Condensing Units
   6. Transformer
E. Liquid tight flexible metal conduit shall only be used as a final connection to equipment and shall not exceed 72” in total length. Extending flexible runs beyond 72” by adding a junction box or small run of conduit is not allowed.

2.6 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:
   1. Allied.
   2. LTV/Republic.
   3. Steelduct.
   4. Wheatland.

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. Raco.
   5. Steel City.
   6. T&B

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.

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 1¼-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. Installation of the PVC coated conduit system shall be performed in accordance with the manufacturer’s installation manual. To assure correct installation, the installer shall be certified by the PVC coated conduit manufacturer before the installation can begin.

D. Arrange conduit to maintain headroom and present neat appearance.

E. Route conduit parallel and perpendicular to walls.

F. Route conduit installed above accessible ceilings parallel and perpendicular to walls.

G. Route conduit in and under slab from point to point.

H. Do not cross conduits in slab.

I. Maintain adequate clearance, minimum of 12-inches, between conduit and piping.

J. Maintain 12-inch clearance between conduit and surfaces with temperatures exceeding 104 degrees F.

K. Cut conduit square using saw or pipecutter; de burr cut ends.
L. 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.
M. Provide suitable pull string in each empty conduit except sleeves and nipples.
N. Ground and bond conduit under provisions of Section 16170.
O. Identify conduit under provisions of Section 16195.
P. 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.
Q. 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.
R. 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.
S. In equipment spaces, such as fan rooms, plenums, etc., conduits and outlets may be exposed, but shall avoid interference with ventilating ducts, piping, etc.
T. 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.
U. Non-metallic conduit changes of direction shall be made by use of large radius bends, sweeps, or offsets.
V. Steel conduit bends of same size as the non-metallic conduit shall be used to terminate non-metallic conduit underground runs above ground.
W. 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.
X. 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 1¼-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 16190.
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 pipe portals. Coordinate location with roofing installation.

END OF SECTION

SECTION 16123

BUILDING WIRE AND CABLE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. The General Provisions of the Contract, including Conditions of the Contract and Division 1 Specification Sections, 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. Building wire and cable.
B. Wiring connectors and connections.

1.3 RELATED SECTIONS
A. Section 16195 - Electrical Identification.
B. Section 16170 - 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 16010.
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 16010.
B. Field Measurements: Verify that field measurements are as shown on Drawings.
C. Where wire and cable routing are 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 are 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.

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 Location	Line/Load terminations on OCP devices rated from 15A thru 600A -	Line/Load Terminations on 100% rated OCP devices
Interior Locations	THHN/THWN XHHW	<45°C ambient XHHW >45°C ambient
Exposed Exterior	THHN/THWN	XHHW - damp locations XHHW-2 wet locations
Below Grade	XHHW	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.
   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. Compression Connectors:
   1. Manufacturers:
      a. Burndy Hydent.
      b. Thomas & Betts 54000.
   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 ensure 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.
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 torque-ing 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	**Powered from TVSS Panel**
120/208 Volts:	120/208 Volts:
Phase A – Black	Phase A - Purple
Phase B – Red	Phase B - Pink
Phase C – Blue	Phase C - Tan
Neutral – White	Neutral – White with Gray Stripe
Ground – Green	Ground – Green with Orange Stripe
277/480 Volts:	
Phase A – Brown	
Phase B – Orange	
Phase C – Yellow	
Neutral – Gray	
Ground – Green	

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.

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'

3.5 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 megaohm 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

SECTION 16130

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 16 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 16140 - Wiring Devices.
B. Section 16170 - Grounding and Bonding.
C. Section 16190 - Supporting Devices.
D. Section 16195 - Electrical Identification.

1.4 REFERENCES
A. NECA (National Electrical Contractors 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 General Requirement Specification Sections and Sections 16010.
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 16010.
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
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 ½-inch male fixture studs where required.
   2. Concrete Ceiling Boxes: Concrete type.
C. Cast Boxes: NEMA FB 1, Type FD, cast feralloy. Provide gasketed cover and threaded hubs.
D. Wall Plates for Finished Areas: As specified in Section 16140.

2.2 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 16140.
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.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Coordinate installation of outlet box for equipment connected under Section 16180.

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

SECTION 16140

WIRING DEVICES

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 16 as fully as if repeated in each therein.

1.2 SECTION INCLUDES
A. Wall switches.
B. Receptacles.
C. Device plates and decorative box covers

1.3 RELATED SECTIONS
A. Section 16130 - 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 16010.
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 16010.

PART 2 – PRODUCTS

2.1 WALL SWITCHES
A. Manufacturers:
   1. Pass and Seymour.
   2. No Substitutions.

B. Specification Grade Toggle Style: 20A., 120-277V., back and side wired.

	Pass and Seymour
1P	CS20AC1
2P	CSB20AC2
3W	CSB20AC3
4W	CSB20AC4
1P-K	PS20AC1-L
1P-PL	PS20AC1-RPL
3W-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. Pass and Seymour.
   2. No Substitutions.

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.

	Pass and Seymour
S	5361
D	
C	S3733-SS
GFI	2095
IG	IG5362-OSP
HG-S	8301
HG-D	8300
HG-GFI	2095-HG
HG-IGI	IG8300
TR	TR63

D. Range Outlet: 50A., 125/250V., NEMA 10-50R.

	Pass and Seymour
Single	3890

E. Combination Outlet: 15A., 125/250V., NEMA 5-15R & 6-15R.

	Pass and Seymour
Duplex	5290

F. Special NEMA configurations shall be specification grade, unless otherwise specified.

G. Color: Ivory or red, unless otherwise specified. Emergency devices: Red, 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. Standard Cover Plate: Brushed stainless steel.
C. Weatherproof Cover Plate: Gasketed corrosion resistant cast metal with hinged and gasketed device cover.

2.4 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.

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 manufacturer’s 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 stainless-steel plates on switch, receptacle, and blank outlets in finished areas.
J. Connect wiring devices by wrapping conductor around screw terminal.
K. Use standard size stainless-steel plates for outlets installed in masonry walls.
L. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
M. Install protective rings on active flush cover service fittings.

3.4 INTERFACE WITH OTHER PRODUCTS

A. Coordinate locations of outlet boxes provided under Section 16130 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

SECTION 16150

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 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 16130 - 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. Leviton.
B. Accuity.
C. No Substitutions.

2.2 CEILING MOUNTED OCCUPANCY SENSOR

A. Leviton OSC10 – M0W.
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. Leviton OSSMT-GDI.
B. Sensor shall utilize active ultrasonics to detect motion.
C. Sensor shall have two ultrasonic transmitters and one receiver, each 18mm in diameter, and shall operate at 32.768kHz.
D. Sensor shall incorporate an inrush current limiter circuit to protect the relay contacts.
E. Sensor shall utilize a dry relay contact for control of the lighting load.

F. Sensor shall have a time out adjustment from 8 seconds to 32 minutes. Timer shall be linear and controlled by a timer chip.
G. Sensor shall have automatic sensitivity adjustment and be microprocessor controlled.
H. Sensor shall have automatic gain setback to reduce the sensitivity after the sensor has turned off the lighting to prevent false tripping.
I. Sensor shall have transmitter control adjustments to prevent false tripping from hallway traffic.
J. 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.
K. Sensor shall operate at 120VAC and 277VAC.
L. Sensor shall have automatic on/off controls and also a manual override switch to disconnect power to the lighting load.
M. Sensor shall have a real time motion indicator on the front of the unit.
N. Sensor shall mount to a single or double gang switch box.
O. Sensor shall have a high impact injection molded housing.
P. 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.
Q. Sensor for restroom application shall be tamper resistant, incorporation a recessed automatic to off switch.

2.4 OCCUPANCY SENSOR POWER/CONTROL PACK

A. LEVITON OPP20-OD2.
B. Control module shall consist of a DC power supply and a dry contact relay for switching a lighting load.
C. Control module shall be available in versions to accept 120, 230, 277 and 347VAC line voltages.
D. Output shall be 24VDC nominal, and shall be inherently safe, low voltage, limited power output (Class 2).
E. Output shall supply 100mA current, in addition to current consumed internally to operate internal relay.
F. Relay shall utilize normally open, silver alloy dry contacts, and shall be rated for a 20A ballast load at 120V, 230V, 277V and 347V.
G. Relay function shall not require more than 5 mA control current to operate.
H. 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.
I. Control module shall be sized to fit inside a standard 4” X 4” junction box.
J. 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.
K. Slave module shall be available for switching additional circuits. Slave module has same 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

SECTION 16170

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 16 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 16010.
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 16010.

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.
B. Material: Copper.
C. Diameter: ¾-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.
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.
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 moister 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 16670.
V. Provide red plastic sign at main water service meter indicating “main ground location”.

END OF SECTION

SECTION 16180

EQUIPMENT WIRING

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Electrical connections to equipment.

1.2 RELATED SECTIONS
A. Section 16111 - Conduit.
B. Section 16123 - Building Wire and Cable.
C. Section 16130 - 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 16010 - 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 16010 - 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. The schedule below is a sample of what is to be submitted.

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

SECTION 16190

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 16 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 16170 - 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 16010.
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 16010.

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.

B. Description: Galvanized steel.

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 ¼" 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

SECTION 16195

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 16 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 16010.
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: 1¼-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 16123.

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

SECTION 16441

ENCLOSED SWITCHES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. The General Provisions of the Contract, including Conditions of the Contract and Division 01 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. Fusible switches.
B. Non-fusible switches.

1.3 RELATED SECTIONS
A. Section 16195 - Fuses.
B. Section 16477 - 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 Division 01 Specification Sections and Section 16010.
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 Division 01 Specification Sections and Section 16010.
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. GE.
   2. Siemens ITE.
   3. No Substitutions.

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 – stainless-steel.

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 Division 01 Specification Sections.
B. Clean interior of enclosures to remove dust, debris, and other material.
C. Clean surfaces and restore finish.

END OF SECTION

SECTION 16470

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 16 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 16170 - Grounding and Bonding.
B. Section 16195 - Electrical Identification.
C. Section 16475 - 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 16010.
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. 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 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 16010.
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 16.
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.

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: ITE/Siemens 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. ITE/Siemens
   2. Square D.
   3. Or Equal.
E. Fused Switch and Circuit Breaker Manufacturers: Must match existing equipment.
   1. ITE/Siemens
   2. Square D.
   3. Or Equal.

2.2 BRANCH CIRCUIT PANELBOARDS

A. Equipment:
   1. Furnish ITE/Siemens 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 galvanneal 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 neural 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.

2.3 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. Revise directory to reflect circuiting changes required to balance phase loads.
G. Provide engraved plastic nameplates under the provisions of Section 16195.
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 16170.
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

SECTION 16510

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 16 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 16190 - Supporting Devices.

1.4 REFERENCES
A. ANSI C78.379 - Electric Lamps - Incandescent and High Intensity Discharge Reflector Lamps - Classification of Beam Patterns.
B. ANSI C82.1 - Ballasts for Fluorescent Lamps - Specifications.
C. ANSI C82.4 - Ballasts for High Intensity Discharge and Low-Pressure Sodium Lamps (Multiple Supply Type).
D. NEMA WD 6 - Wiring Devices Dimensional Requirements.
E. NFPA 70 - National Electrical Code.
F. NFPA 101 - Life Safety Code.
G. IESNA LM-80-08 IESNA - Approved Method for Measuring Lumen Maintenance of LED Light Source.
H. IESNA TM-21-2011 - Projecting Long Term Lumen Maintenance of LED Light Sources.
I. UL 1310 and 8750 - Light Emitting Diode (LED) Equipment for use in Lighting Products.
J. IEC 61347-2-13 - Particular requirements for electronic control gear for LED modules.
K. IEC-62384 - DC or AC supplied electronic control gear for LED modules - performance requirements.
L. 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 16010.
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. 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 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 16010.
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 25º C.
C. The operating temperature range shall be 0ºto + 25º
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 strobscopic 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. In rush 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:
         1) The initial minimum illuminance level is achieved in 100% of the area of the specified lighting pattern.
         2) 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 (Optional by manufacturer)
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:
      1) Must meet IEC 60929 Annex E for General White Lighting LED drivers.
      2) 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 16130 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. Re-lamp luminaires used for temporary lighting and luminaires that have failed lamps at the time of project turn-over.

END OF SECTION

SECTION 16705

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 16 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 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, cable TV 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, cable TV and sound system devices shall be provided by its respective trade.

2.4 RACEWAYS
A. Per appropriate section with insulated throat bushings on all conduit runs and rubber grommeted 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, cable TV, CCTV and sound systems.

3.2 INSTALLATION
A. Furnish and install the conduits, outlet box, and outlet box raceways as shown on drawings and specified.
B. Stub outlet box conduit to within accessible ceiling cavity.
C. Minimum outlet box conduit sizes shall be 3/4 inch.
D. 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.
E. Mark each conduit end for identification and destination of raceway.
F. Provide required sleeves in all walls and floors as required by low voltage system contractors.
G. Provide pull rope in each raceway.
H. Provide insulating bus wings and locknuts for all raceways.

I. There shall not be more than the equivalent of three 90-degree bends in any single run of conduit between boxes or fittings.
J. 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.
K. 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.
L. 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.
M. Provide blank cover plates for each unused outlet box.
N. All raceway systems shall be mechanically continuous and connected to all electrical outlets, boxes, device mounting brackets, and cabinets, also in accordance with manufacturer's installation sheets.
O. All metal raceway shall be electrically continuous and bonded in accordance with the National Electric Code for proper grounding.
P. Raceway shall be securely supported at intervals not exceeding 5' [1.5m] or in accordance with manufacturer's installation sheets.

END OF SECTION

SECTION 16721

FIRE ALARM AND DETECTION SYSTEM

PART 1 – GENERAL

1.1 DESCRIPTION

A. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.
B. Provide a complete new fire alarm system Fire-Lite MS9600-UDLS. No Substitutions.
C. The peripheral devices shall be manufactured by Fire-Lite.
D. Underwriters Laboratories Inc. (UL) - USA:
   1. Manually Actuated Signaling Boxes
   2. Cabinets and Boxes
   3. Control Units for Fire Protective Signaling Systems
   4. Smoke Detectors for Fire Protective Signaling Systems
   5. Smoke Detectors for Duct Applications
   6. Waterflow Indicators for Fire Protective Signaling Systems
   7. Audible Signaling Appliances
   8. Heat Detectors for Fire Protective Signaling Systems
   9. Visual Notification Appliances
E. All fire alarm wiring shall be in conduit.

1.2 SCOPE

A. The intelligent, microprocessor-controlled, fire alarm detection system shall be extended/modified in accordance to the project specifications and drawings.
B. Basic Performance:
   1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
   2. Initiation Device Circuits (IDC) shall be wired Class B (NFPA Style B) as part of an addressable device connected by the SLC Circuit.
   3. Notification Appliance Circuits (NAC) shall be wired Class B (NFPA Style Y) as part of an addressable device connected by the SLC Circuit.
   4. All circuits shall be power-limited, per UL864 requirements.
   5. A single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
   6. Alarm signals arriving at the main FACP shall not be lost following a primary power failure or outage of any kind until the alarm signal is processed and recorded.
C. Basic System Functional Operation - When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:
   1. The system Alarm LED on the FACP shall flash.
   2. A local sounder with the control panel shall sound.
   3. A backlit 80-character LCD display on the FACP shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
   4. In response to a fire alarm condition, the system will process all control programming and activate all system outputs (alarm notification appliances and/or relays) associated with the point(s) in alarm. Additionally, the system shall send events to a central alarm supervising station via either dial-up over PSTN or Internet or Intranet via PSDN or virtual private network.

1.3 SUBMITTALS

A. General:
   1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
   2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
   3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

B. Shop Drawings:
   1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
   2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
   3. Show annunciator layout, configurations, and terminations.

C. Manuals:
   1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
   2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
   3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

D. Software Modifications
   1. Provide the services of a qualified technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
   2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

1.4 WARRANTY

A. All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one-year period shall be included in the submittal bid.

1.5 APPLICABLE STANDARDS AND SPECIFICATIONS

A. The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.
   1. National Fire Protection Association (NFPA) - USA:
      a. No. 13 - Sprinkler Systems
      b. No. 70 - National Electric Code (NEC)
      c. No. 72 - National Fire Alarm Code
      d. No. 101 - Life Safety Code
      e. No. 38 - Manually Actuated Signaling Boxes
      f. No. 217 - Smoke Detectors, Single and Multiple Station
      g. No. 228 - Door Closers-Holders for Fire Protective Signaling Systems
      h. No. 268 - Smoke Detectors for Fire Protective Signaling Systems
      i. No. 268A - Smoke Detectors for Duct Applications
      j. No. 346 - Waterflow Indicators for Fire Protective Signaling Systems

k. No. 464 - Audible Signaling Appliances
l. No. 521 - Heat Detectors for Fire Protective Signaling Systems
m. No. 864 - Control Units for Fire Protective Signaling Systems
n. No. 1481 - Power Supplies for Fire Protective Signaling Systems
o. No. 1610 - Central Station Burglar Alarm Units
p. No. 1638 - Visual Signaling Appliances
q. No. 1971 - Visual Signaling Appliances
r. No. 2017 - General-Purpose Signaling Devices and Systems
s. CAN/ULC S524-01 Standard for Installation of Fire Alarm Systems
t. The FACP shall be ANSI 864, 9th Edition Listed. Systems listed to ANSI 864, 8th edition (or previous revisions) shall not be accepted.

2. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
3. Local and State Building Codes.
4. All requirements of the Authority Having Jurisdiction (AHJ).

1.6 APPROVALS

A. The system shall have proper listing and/or approval from the following nationally recognized agencies: UL Underwriters Laboratories Inc

PART 2 – PRODUCTS

2.1 EQUIPMENT AND MATERIAL, GENERAL

A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a fire protective signaling system, meeting the National Fire Alarm Code.
B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.
D. All equipment must be available "over the counter" through the Security Equipment Distributor (SED) market and can be installed by dealerships independent of the manufacturer.

2.2 CONDUIT AND WIRE

A. Conduit:
1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements.
2. All wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross-sectional area where three or more cables are contained within a single conduit.
3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.
4. Wiring for 24-volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or backboxes, except where conduit entry is specified by the FACP manufacturer.
6. Conduit shall be 3/4-inch minimum.

B. Wire:
1. All fire alarm system wiring shall be new.
2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG for Notification Appliance Circuits.
3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
4. Wiring used for the multiplex communication circuit (SLC) shall be twisted and support a minimum wiring distance of 10,000 feet when sized at 12 AWG. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit. Shielded wire shall not be required.
5. All field wiring (with exception of external communications Ethernet) shall be electrically supervised for open circuit and ground fault.
6. The fire alarm control panel shall be capable of T-tapping NFPA Style 4 (Class B) Signaling Line Circuits (SLCs). Systems which do not allow or have restrictions in, for example, the amount of T-taps, length of T-taps etc., is not acceptable.

C. Terminal Boxes, Junction Boxes and Cabinets:
1. All boxes and cabinets shall be UL listed for their use and purpose.

D. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold-water pipe or grounding rod. The control panel enclosure shall feature a quick removal chassis to facilitate rapid replacement of the FACP electronics.

2.3 MAIN FIRE ALARM CONTROL PANEL

A. The new FACP shall be a Fire-Lite Model MS-9600-UDLS with a microprocessor-based Central Processing Unit (CPU).

2.4 SYSTEM COMPONENTS

A. All system components shall be Fire-Lite.

B. Intelligent Photoelectric Smoke Detector
1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
2. The detectors shall be ceiling-mounted and available in an alternate model with an integral fixed 135-degree heat-sensing element.
3. Each detector shall contain a remote LED output and a built-in test switch.
4. Detector shall be provided on a twist-lock base.
5. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits.
6. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall periodically flash to indicate that the detector is in communication with the control panel.
7. The detector shall not go into alarm when exposed to air velocities of up to 1500 feet per minute (fpm).

8. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber.
9. All field wire connections shall be made to the base through the use of a clamping plate and screw.

C. Intelligent Thermal Detectors
1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit and have a rate-of-rise element rated at 15 degrees F per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.

D. Intelligent Duct Smoke Detector
1. The smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.

E. Addressable Dry Contact Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any normally open dry contact device) to one of the fire alarm control panel SLCs.
2. The monitor module shall mount in a 4-inch square, 2-1/8-inch deep electrical box.
3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2¾-inch x 1¼-inch x ½-inch. This version need not include Style D or an LED.

F. Addressable Control Relay Module
1. Addressable control relay modules shall be provided to control the operation of fan shutdown and other auxiliary control functions.
2. The control module shall mount in a standard 4-inch square, 2-1/8-inch deep electrical box, or to a surface mounted backbox.
3. The control relay module will provide a dry contact, Form-C relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to ensure that 100% of all auxiliary relays may be energized at the same time on the same pair of wires.
4. The control relay module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.

G. Alphanumeric LCD Type Annunciator (Ann-Bus Mode):
1. The alphanumeric display annunciator shall be a supervised, remotely located back-lit eighty (80) characters LCD display for alarm annunciation in clear English text.
2. The LCD annunciator shall display all alarm and trouble conditions in the system.
3. An audible indication of alarm shall be integral to the alphanumeric display.
4. It shall be possible to connect up to 8 LCD displays and be capable of wiring distances up to 6,000 feet from the control panel.
5. Up to 8 total devices of any kind, LCD, printer gateway, LED, Relay or I/O module may be installed on the ANN-BUS.

H. Annunciation Devices:
1. Visual devices shall be System Sensor SRL type.
2. Audio/Visual devices shall be System Sensor P2RL type.

I. NAC Panels:
1. NAC panels shall be Fire-Lite FCPS-24FS8.

2.5 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

A. All addressable components shall be Fire-Lite.
B. Addressable Devices - General
   1. Addressable devices shall employ the simple-to-set decade addressing scheme. Addressable devices which use a binary-coded address setting method, such as a DIP switch, are not an allowable substitute.
   2. Detectors shall be addressable and intelligent and shall connect with two wires to the fire alarm control panel signaling line circuits.
   3. Addressable smoke and thermal (heat) detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. An output connection shall also be provided in the base to connect an external remote alarm LED.
   4. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72, Chapter 7.
   5. Detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base options shall include a base with a built-in (local) sounder rated for a minimum of 85 DBA, a relay base and an isolator base designed for Style 7 applications.
   6. Detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel.
   7. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
   8. Detectors shall provide address-setting means using decimal switches.

2.6 BATTERIES

A. New batteries shall be installed in the FACP.
B. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
B. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas, new walls in unfinished areas and may be exposed in unfinished areas with existing walls. Smoke detectors shall not be installed prior to the system programming and test period. If construction is ongoing during this period, measures shall be taken to protect smoke detectors from contamination and physical damage.
C. All fire detection and alarm system devices, shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
D. Manual pull stations shall be suitable for surface mounting or semi flush mounting as shown on the plans, and shall be installed not less than 42 inches, nor more than 48 inches above the finished floor.
E. All fire alarm wiring will be in conduit.

3.2 TEST

A. The service of a competent, NICET level II technician shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72, Chapter 10. WRITTEN TEST/REPORT SHALL BE PROVIDED TO OWNER FOR THEIR FILES.
B. The system shall be completely tested in late July 2019 with report submitted to district (Owner) by August 15, 2019. The system shall be tested again in late July 2020 with reports submitted to district (Owner) by August 15, 2020.
C. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
D. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
E. Verify activation of all waterflow switches.
F. Open initiating device circuits and verify that the trouble signal actuates.
G. Open and short signaling line circuits and verify that the trouble signal actuates.
H. Open and short notification appliance circuits and verify that trouble signal actuates.
I. Ground all circuits and verify response of trouble signals.
J. Check presence and audibility of tone at all alarm notification devices.
K. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
L. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
M. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

3.3 FINAL INSPECTION

A. At the final inspection a minimum NICET Level II technician shall demonstrate that the system functions properly in every respect.

3.4 INSTRUCTION

A. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
B. The contractor or installing dealer shall provide a user manual indicating "Sequence of Operation."

END OF SECTION

SECTION 16745

DATA CABLING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, Division 00 Information for Bidders, and Division 01 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES
A. Data Cabling.

1.3 RELATED SECTIONS
A. Section 16111 – Conduit.
B. Section 16130 – Boxes.
C. Section 16705 – Conduit Rough-in for Special Systems.

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. Insure that the cable run from the distribution frame to the information outlet does not exceed 90 meters (295 Feet).
C. Furnish and install all faceplates, equipment racks, equipment trays and all other items necessary to provide connections at all specified information outlets.
D. The cabling system shall be in compliance to EIA/TIA 568A, TSB-67, and ISO/TEC IS 11801.
E. 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-568B, Ethernet and Category 5E, UTP plenum cable.
F. 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.

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 Division 01 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) years' 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 prior 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 category 5E plenum 4-pair 24awg, solid copper unshielded twisted-pair (UTP) cable or quality that exceeds EIA/TIA-568B.
      a. Approved Manufacturers: Mohawk, CommScope, Belden, Siemon.
   2. Fiber Optic Intra-Building Backbone (Multimode) Cable: 18-Strand 62.5-micron multimode, “FDDI” or higher grade, tight buffered (900 micron). Plenum rated distribution cable with armored jacket, orange.
      a. Acceptable Manufacturers: Mohawk, CommScope, Seicor, Beltec.
B. Faceplates:
   1. Data Drop Locations:
      a. Six gang junction box, single gang faceplate.
      b. Acceptable Manufacturers: Hubbell, Lucent, Panduit, Siemon
      c. Cat-5E Data Jack: Cat-5E, high density, T568B wired, orange color “RJ45” jack.
      d. Refer to Drawings for quantity of jacks.
      e. Provide a minimum of (2) data drops at each location, whether specifically indicated or not.

C. Patch Panel
   1. Unshielded Twisted Pair (UTP) Patch Panel and Associated Items:
      a. 48-Port Patch Panels: rack mounted, 48-port cat-5E patch panel, with cable support bar and color-coded label strip, T568B wired in MDF room 57.
         1) Acceptable Manufacturer: Siemon HD5-48, Panduit or equal.
         2) Contractor to provide 48-port patch panels, in quantities as required to accommodate all new data drops. Contractor to allow for ten percent (10%) overage of actual number of required ports.

D. Patch Panels:
   1. Fiber Optic IDF Cabinets and Associated Items:
      a. Fiber Optic Adapter Panels: “LC” adapter panel with eighteen duplex LC multi/single-mode adapters.
         1) Acceptable Manufacturers: Hubbell, Panduit, Siemon
      b. Blank Adapter Panels: Filler panel with no adapters.
         1) Acceptable Manufacturers: Hubbell, Panduit, Siemon

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 and/or in existing cable tray. Cables above accessible ceiling space shall be exposed, tied together and hung in cable rings.
   2. All cables shall be plenum rated.
   3. Furnish and install cabling runs between IT room and all outlets specified on drawings. A dedicated cabling run shall be utilized for each Faceplate Jack.
   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.
   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 manufacturer’s 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 cable rings or 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. 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".
16. Use Velcro® Bands to secure cable bundles from where the cable exits the ceiling and terminates at the equipment room.

B. Grounding: Ground all equipment per manufacturers' instructions and NEC guidelines.
C. Labeling:
   1. 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.
   2. Place labels on Faceplates and inside Outlet Boxes for all Outlet locations.
   3. Label all patch panel terminations with the identical numbers used at outlet locations.
   4. Label the ends of all cabling runs with Panduit Pan-Ty, Brady or equal labels in permanent marker.

3.3 CERTIFICATION AND DOCUMENTATION

A. All circuits must be certified to comply with EIA/TIA 568B 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 568B, 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: Permanent Link
   1. From the station outlet/connector.
   2. From the equipment room.
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 see Section 1.06

END OF SECTION

SECTION 17100

DIRECT DIGITAL CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General Conditions and Division 1, 15 and 16 Specification Sections, apply to this Section.

1.2 REFERENCES

A. ASME MC85.1 - Terminology for Automatic Control.
B. NEMA EMC1 - Energy Management Systems Definitions.
C. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
D. NFPA 70 - National Electrical Code.
E. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.

1.3 SYSTEM DESCRIPTION

A. All control work to be done by Precision Systems, Inc., branch office, Griffith, IN; 219-838-1177 or 708-862-1177 (No Substitutions.) Provide hardware and software as required to fully integrate and support extension to existing Building Automation System. New graphics shall match in quality and type used throughout the district. Floor plan graphics are required too.
B. All control points listed in Section 17600 "Sequence of Operation for HVAC controls" shall be performed by the DDC system and displayed on the Operator Workstation. Any other control work required to complete the sequence of operation specified in Section 17600 may be electric or electronic. Contractor shall provide all transformers, sensors, switches, relays etc. necessary for a complete operating system.
C. Provide automatic temperature control field monitoring and control system using BACnet field programmable microprocessor-based units with communications to the existing Building Automation System.
D. Provide 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.
E. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.
F. Provide control systems consisting of temperature sensors, thermostats, control valves, dampers, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical systems, and to perform functions specified.
G. Furnish and install all power wiring and conduit necessary for the BAS control system for a complete operating system. Install per Division 16.
H. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.

1.4 SUBMITTALS AT PROJECT CLOSEOUT

A. See Division 1 Requirements.
B. Project Record Documents: Record actual locations of control components, including control units, thermostats, and sensors.
    1. Revise shop drawings to reflect actual installation and operating sequences.
    2. Include data specified in "Submittals" in final "Record Documents" form.
C. Operation and Maintenance Data:
    1. Include interconnection wiring diagrams complete field installed systems with identified and numbered, system components and devices.
    2. Include keyboard illustrations and step-by-step procedures indexed for each operator function.
    3. Include inspection period, cleaning methods, cleaning materials recommended, and calibration tolerances.
D. Warranty: Submit manufacturer’s warranty and ensure forms have been filled out in Owners name and registered with manufacturer.

1.5 APPROVED INSTALLING CONTRACTORS, QUALITY ASSURANCE

A. General
   1. The Building Automation System Contractor shall be Precision Control Systems, Inc. branch office; Griffith, IN. 219-838-1177 or 708-862-1177 - No Substitutions.

B. Workplace Safety and Hazardous Materials
   1. Provide a safety program in compliance with the Contract Documents.
   2. The BAS Contractor shall have a corporately certified comprehensive Safety Certification Manual and a designated Safety Supervisor for the Project.
   3. The Contractor and its employees and sub-trades comply with federal, state and local safety regulations.
   4. The Contractor shall ensure that all subcontractors and employees have written safety programs in place that covers their scope of work and that their employees receive the training required by the OSHA having jurisdiction for at least each topic listed in the Safety Certification Manual.
   5. Hazards created by the Contractor or its subcontractors shall be eliminated before any further work proceeds.
   6. Hazards observed but not created by the Contractor or its subcontractors shall be reported to either the General Contractor or the Owner within the same day. The Contractor shall be required to avoid the hazard area until the hazard has been eliminated.
   7. The Contractor shall sign and date a safety certification form prior to any work being performed, stating that the Contractors' company is in full compliance with the Project safety requirements.
   8. The Contractor's safety program shall include written policy and arrangements for the handling, storage and management of all hazardous materials to be used in the work in compliance with the requirements of the authority having jurisdiction at the Project site.
   9. The Contractor's employees and subcontractor's staff shall have received training as applicable in the use of hazardous materials and shall govern their actions accordingly.

C. Quality Management Program
   1. Designate a competent and experienced employee to provide BAS Project Management. The designated Project Manager shall be empowered to make technical, scheduling and related decisions on behalf of the BAS Contractor. At minimum, the Project Manager shall:
      a. Manage the scheduling of the work to ensure that adequate materials, labor and other resources are available as needed.
      b. Manage the financial aspects of the BAS contract.
      c. Coordinate as necessary with other trades.
      d. Be responsible for the work and actions of the BAS workforce on site.

1.6 REGULATORY REQUIREMENTS

A. Conform to the 2015 International Building Code (IBC).
B. Conform to the 2015 International Fuel Gas Code (IFGC).
C. Conform to the 2015 International Fire Code (IFC), excluding Chapter 4.
D. Conform to the 2015 International Energy Conservation Code (IECC).
E. Conform to the 2015 International Mechanical Code (IMC).
F. Conform to the ICC Electrical Code.
G. Conform to NFPA 70, National Electrical Code.
H. Products: Listed and classified by Underwriter's Laboratories, Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 ROOM SENSOR: PROVIDE JCI NS-BTXXXXX-2 OR EQUAL

A. Sensors shall be provided with +/- 1-degree temperature adjustment and override button.

2.2 CONTROL PANELS: PROVIDE JCI PAN-ENCXXXXWDP OF APPROPRIATE SIZE OR APPROVED EQUAL.

A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gages, pilot lights, push buttons and switches flush on cabinet panel face.
B. NEMA 250, general purpose utility enclosures with enameled finished face panel.

2.3 INPUT/OUTPUT SENSORS

A. Electronic Sensors: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.
   1. Thermistor or Resistance Temperature Detectors temperature sensors as follows: Provide JCI TE-6300 series of appropriate type and size or approved equal.
      a. Accuracy: Plus, or minus .3°F at calibration point.
      b. Wire: Twisted, shielded pair cable.
      c. Insertion Elements for cooling system: Brass well with minimum insertion length of 2-1/2 inches. Stainless steel wells are required for all chiller systems.
      d. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
   2. Direct acting for gas or liquid; range suitable for system; proportional output 4 to 20 MA. Water differential pressure sensors shall be as manufactured by Veris with a three-valve manifold.
B. Equipment operation sensors as follows: Provide Veris H708 current sensor of appropriate range or approved equal.
C. Status inputs for Pumps: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

2.4 MISCELLANEOUS DEVICES

A. Relays: Provide IDEC RR2P-ULAC24V series relay with corresponding SR2P-06 relay base, or equal.
   1. All relays are to be installed in control panels.
   2. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.
B. Transformers and Power Supplies: Provide Core Components LE series transformers of appropriate size & type, or Core LD05763 Power Supply mounted in control panels or approved equal.
   1. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.
   2. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.
   3. Unit shall operate between 0° C and 50° C.
   4. Unit shall be UL recognized.
C. Ethernet Switch: Provide CDW FS105 5-Port 10/100MB Ethernet Switch or approved equal.
D. Water Flow Switch: Provide JCI F61KB-11C Water Flow Switch or approved equal.
E. Power Monitoring: Provide Veris E50H2A 5000 Amp BACnet Power Meter, U018-0002 CT transducers as required, AH04 Fuse Kit, & AE012 NEMA 4X Enclosure or approved equal.

2.5 COMMUNICATION CABLE

A. Provide plenum rated when running above ceilings.
B. Exposed cable in mechanical, storage, electrical, etc. rooms to run in minimum ¾" conduit.
C. Cable drops to unit ventilators are to be concealed in pipe chases (either sheet metal by mechanical contractor or architectural chases provided by general contractor) and run in minimum ¾" conduit to allow future removal of cable. Horizontal runs of cable between unit ventilators and in shelving cabinets to also be run in minimum ¾" conduit. Exposed cable drops in Classrooms are not allowed. See electrical drawings of additional requirements.

D. Where exposed cable drops in occupied areas are unavoidable cable to be run in raceway/wiremold.

2.6 CONTACTORS

A. Provide definite purpose controllers equal to Siemens, Square D or Furnas Model 423F35AF. Provide 2, 3 or 4-pole as required by site conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify that conditioned power supply is available to the control units and to the operator work station. Verify that field end devices, wiring, and pneumatic tubing is installed prior to installation proceeding.

3.2 INSTALLATION

A. Install control units and other hardware in position on permanent walls where not subject to excessive vibration.
B. Provide metal thermostat/sensor guards for all thermostats/sensors located in shop area. Plastic are not acceptable.
C. Electrical material and installation shall be in accordance with appropriate requirements of Division 16.
D. Provide liquid tight flexible conduit for all BAS connections to equipment located in the Shop or Outside.
E. Provide liquid tight flexible conduit for all equipment with vibration isolation.
F. BAS Wiring
    1. All conduit, wiring, accessories and wiring connections required for the installation of the BAS, as herein specified, shall be provided by the BAS Contractor unless specifically shown on the Electrical Drawings under Division 16 Electrical. All wiring shall comply with the requirements of applicable portions of Division 16 and all local and national electric codes, unless specified otherwise in this section.
    2. All BAS wiring materials and installation methods shall comply with BAS manufacturer recommendations.
    3. The sizing type and provision of cable, conduit, cable trays, and trunking shall be the design responsibility of the BAS Contractor. If complications arise, however, due to the incorrect selection of cable, cable trays, trunking and/or conduit by the BAS Contractor, the Contractor shall be responsible for all costs incurred in replacing the selected components.

3.3 MANUFACTURER'S FIELD SERVICES

A. Prepare and start systems.
B. Start and commission systems. Allow sufficient time for start-up and commissioning prior to placing control systems in permanent operation.

END OF SECTION

SECTION 17600

SEQUENCE OF OPERATION

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. General HVAC Alarm Sequences.
B. Radiant Ceiling Panel Control.
C. Heat Pump Heat Recovery System Control.
D. Dedicated Outdoor Air Units (Package) Control.

1.2 RELATED WORK
A. Division 17 - Building Automation System.

1.3 SYSTEM DESCRIPTION
A. This section defines the manner and method by which controls function. Requirements for each type of control system operation are specified. Equipment, devices and system components required for control systems are specified in other sections.

1.4 SUBMITTALS
A. Submit under provisions of the general conditions and general requirements of the contract.
B. Submit diagrams indicating mechanical systems controlled and control system components. Label with settings, adjustable range of control and limits. Include written description of control sequence.
C. Include flow diagrams for each control system, graphically depicting control logic.
D. Include draft copies of graphic displays indicating mechanical system components, control system components and controlled function status and value.
E. 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 PROJECT RECORD DOCUMENTS
A. Submit documents under provisions of the general conditions and general requirements of the contract.
B. Accurately record actual setpoints and settings of controls, including changes to sequences made after submission of shop drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

(Not Used.)

PART 3 - EXECUTION

3.1 SCOPE OF WORK
A. This sequence of operation section is inclusive of all requirements of all Division 17 and specified related sections.
B. There is specific information in the other section of this specification that directly affects the scope of work required for this sequence of operation: Especially, but not limited to, the system description, scope of work and schedule requirements set forth in Division 17.

C. Any contradictory information/requirements between sections shall be interpreted to mean that the most stringent, safe or costly requirement shall be included in the scope of work, unless identified by the BAS contractor, in writing, prior to bidding and specifically directed otherwise, in writing, by the owner/architect/engineer.
D. Failure of the contractor to read and understand all sections of this specification and the contract documents shall not be grounds for any additional cost to the owner for materials and labor required to meet the requirements of the contract documents.
E. The BAS contractor for this contract shall furnish and install all new controls for All HVAC equipment in the building in compliance with the controls sequences of operation described below. Any equipment that is not specifically addressed below shall be provided with complete controls based on the most stringent or greatest cost sequence described below.
F. The BAS contractor shall provide a color graphical representation of each new piece of equipment and chilled water system. This is to include all chillers, pumps, etc. Also “System” graphics showing cooling system with pumps and chiller plant with schematic piping diagram indicating all temperature, status and alarm conditions of all equipment. When the operator double clicks on pumps or chillers a graphic representation of the equipment shall be displayed and all BACnet points shall also be displayed.

3.2 SEQUENCE OF OPERATION

A. General HVAC Alarm Sequences
   1. The web server shall provide complete alarm management and logging for every setpoint in the system. Every setpoint shall have an operator adjustable range for alarming that can be easily changed for high and low alarm values by the operator using pull-down menus on the graphic screen. Provide multi-level alarming capability for every setpoint or end device variable with the following minimum capabilities:
      a. Critical Alarm:
         1) Audible/visual alarm is initiated at LAN based workstations.
         2) Alarm is logged to history file
         3) Email is sent.
      b. Non-Critical Alarm:
         1) Audible/visual alarm is initiated at LAN based workstation.
         2) Alarm is logged to history file.
      c. Alarm Acknowledgement:
         1) Alarms are acknowledged by operator at the OWS or and Web Interface
         2) Operator ID is logged with alarm acknowledgment
         3) Alarm acknowledgment shall include a comment field to state the action taken
         4) The comment field shall be a continuous log allowing multiple operators to add comments to the alarm
      d. Email Alarms:
         1) Each alarm type can be configured uniquely
         2) Emails will cascade to different operators on a time delay schedule if not acknowledged.
B. Radiant Ceiling Panel Control
   1. General:
      a. Control electronically with dedicated HVAC controller.
      b. Sequence with associated HVAC unit within same space; see drawings.
      c. Radiant Ceiling Panel shall be sequenced “ON” first to provide heating when associated with HVAC unit.
   2. SYSTEM OFF:
      a. New control valve shall be positioned to 100% closed.
   3. SYSTEM START:
      a. When the associated heating system is started, control valve shall be permitted to control to setpoint.

4. SYSTEM RUN:
    a. Unoccupied Heating Mode:
        1) Control valve shall modulate to maintain space temperature at the unoccupied heating set point (adj.).
    b. Occupied Heating Mode:
        1) Control valve shall modulate to maintain space temperature at the occupied heating set point (adj.).
        2) Set point shall be adjusted remotely from thermostat (+/- 3 to 5 degrees F.).
5. SYSTEM STOP:
    a. Control valve shall be indexed to the “System Off” condition.
6. SAFETIES AND ALARMS:
    a. Annunciate alarms when space temperature exceeds minimum and maximum limits.
7. Sequence control valve on radiant ceiling panel open first when sequenced with another piece of equipment.

C. Heat Pump Heat Recovery System Control:
1. See Section 15880 – Heat Pump Heat Recovery System control for requirements.
    a. The Contractor shall install and wire all components shipped loose with the VRF units.
2. Sequence associated radiant panel with ceiling cassette. Radiant panel control valve to be sequence open first to provide heating during occupied and unoccupied periods of the building.

D. Dedicated Outdoor Air Units (Package):
1. See Section 15860 – Dedicated Outdoor Air Units (Packaged) for additional requirements.
2. Install and wire all loose devices, sensors, etc. provided with equipment.
3. Provide discharge air sensor to control discharge air temperature. Discharge air temperature shall be set at 72 def. F. (adjustable). Make-up air unit to run off its own integral controls/controller to maintain discharge air temperature.
    a. Reset discharge air temperature up when outdoor air temperature drops below 20 deg. F (adj.) or below. Provide user adjustable reset schedule.
    b. Allow unit to operate on 100% return air during unoccupied temperate and extreme cold weather conditions.

END OF SECTION

SECTION 17800

TESTING, ADJUSTING AND BALANCING

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Testing, adjustment, and balancing of hydronic systems.
B. Measurement of final operating condition of HVAC systems.

1.2 RELATED SECTIONS
A. General Conditions - Starting of Systems.
B. Division 15 Specifications.
C. Division 16 Specifications.
D. Division 17 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 Division 1 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 Division 1 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 Division 1 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

2.1 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. Hydronic systems are flushed, filled, and vented.
   6. Pumps are rotating correctly.
   7. Proper strainer baskets are clean and in place.
   8. Service and balance valves are 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 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 manufacturer’s start-up reports prior to balancing systems.

3.3 INSTALLATION TOLERANCES

A. Hydronic Systems: Adjust to within plus or minus 10 percent of design.

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 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing (Including but Not Limited to):
    1. VRF Units.
    2. ERV Unit.
    3. Electric Duct Coil.
    4. Cabinet Unit Heater.
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

END OF SECTION