Project Manual
Project Number: 18-003

Duneland School Corporation 2018 Renovations 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 Bid and Permit: March 28, 2018

ARCHITECTURE
West Suburban Office: 901 McClintock Drive, Suite 100, Burr Ridge, Illinois 60527
South Suburban Office: 1820 Ridge Road, Suite 209, Homewood, Illinois 60430
Company Main: 630.455.4500 Fax: 630.455.4040
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SECTION 00030

ADVERTISEMENT FOR BIDS

ADVERTISEMENT FOR BIDS

1.1 BID INFORMATION

A. Notice is hereby given that sealed bids will be received by the Board of School Trustees of the Duneland School Corporation on April 24, 2018 until 10:30 a.m. CST (local time) for the: 2018 Renovations at Chesterton Middle School. Bids will be opened and publicly read aloud at the Duneland School Corporation Administration Office, 601 West Morgan Avenue, Chesterton, Indiana 46304.

B. A non-mandatory Pre-Bid Conference will be held on April 6, 2018 at 10:30 a.m. at Chesterton Middle School, 651 West Morgan Avenue, Chesterton, Indiana 43604. All Bidders are encouraged to attend and sign in at the meeting. A walk-through of the school will immediately follow the pre-bid meeting.

C. Anticipated Award of Contract date: May 7, 2018

D. Anticipated Start of Construction: June 1, 2018

E. Anticipated Substantial Completion date: August 1, 2018 – Phase 1
October 1, 2018 – Phase 2

F. Lump sum bid proposals will be received for this project at the scheduled time. Bids received after this time shall be returned unopened.

G. Bid security in the form of a bid bond or certified check in an amount equal to 10 percent of the base bid amount shall be submitted with the bid. Should a bid bond be submitted, the bid bond shall be payable to the Duneland School Corporation.

H. Bids shall be submitted on or before the specified closing time in an opaque sealed envelope addressed to: Mr. Greg Lindy, Director of Support Services, 601 W. Morgan Avenue, Chesterton, IN 46304, ATTENTION: 2018 RENOVATION BID – CHESTERTON MIDDLE SCHOOL.

I. The Board of School Trustees of the Duneland School Corporation reserves the right to reject any or all bids or parts thereof, or to waive any irregularities or informalities, and to make the award in the best interest of the Duneland School Corporation. No bid shall be withdrawn for a period of sixty (60) days after the scheduled bid opening date.

J. All bidders must comply with all Board of School Trustees local policies as outlined in the bidding documents.

K. The Architect for the above referenced project is Tria Architecture, Inc., (630) 455-4500.

L. Bidding documents are on file and may be obtained upon receipt of deposit in the amount of $100 for 1 set of the bidding documents consisting of 2 sets of plans, 2 Project Manuals, 1 Compact Disc containing PDF files of drawings and project manual, and 1 set of bid forms from: GRI Gill Repographics, Inc. 17W715 Butterfield Road, Suite B, Oakbrook Terrace, IL 60181, (630) 652-0800, chicagoorders@gillrepro.com.

Board of School Trustees of the Duneland School Corporation

END OF SECTION

SECTION 00100

INSTRUCTIONS TO BIDDERS

PART 1 – GENERAL

1.1 **PROPOSAL**

A. The Board of School Trustees of the Duneland School Corporation will receive sealed bids for the 2018 Renovations at Chesterton Middle School.

B. To receive full consideration bids must contain the following documents properly completed and signed:
   1. Bid Form.
   2. Bid Bond.
   3. Addendum to Contract for Construction.
   4. Certification Regarding Investment Activities in Iran.
   5. Contractor's Bid for Public Work - Form 96.
   6. Responsible Bidder Form.
   7. Fully completed AIA document A305 providing the Contractor's qualifications and references.

1.2 PREPARATION FOR BIDS

A. Proposals to be entitled for consideration must be made in accordance with the following instructions.
   1. Submit one copy of bid on forms provided by the Architect with all blank spaces for bid prices filled in, in ink, or typewritten.
   2. Submit one reproduction of bid forms and associated documents.
   3. Submit bid 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: 2018 RENOVATIONS AT CHESTERTON MIDDLE SCHOOL - BID.
   4. Sealed Bids will be received until 10:30 a.m. CST (local time), on April 24, 2018 for all specified work at Duneland School Corporation Administration Office, 601 West Morgan Avenue, Chesterton Indiana 46304.
   5. Bids received after this time shall be returned unopened.
   6. Erasures or written memorandum on the Bid Form are prohibited. Include additional explanations, statements, or qualifications in a separate sheet attached to the Bid Form.
   7. The Base Bid shall appear only where called for in the Bid Form and shall not appear elsewhere in the proposal. Any Alternate prices (other than those set forth in the Bid Form) shall be listed on the Substitution Sheet.
   8. Fill in all blank spaces for the bid items with prices, or if not applicable, the words "No Bid."

B. The Owner reserves the right to reject any or all bids 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 bids at any time in the bidding process.

E. All costs associated with developing or submitting a bid 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 bids does not commit the Owner or Architect, or any of their agents, to pay any costs incurred in the preparation or submission of a bid.

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

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

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 Bidders.

B. Bidding Documents include the Advertisement to Bid, Instructions to Bidders, the Bid 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 bids.
C. Addenda are written or graphic instruments issued prior to the execution of the Contract which modify or interpret the bidding 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, FAX transmittal, direct mail or United Parcel delivery. Bidders are to consider all addenda, regardless of method of transmittal, as a binding modification to the contract documents.
   2. It is the bidder's responsibility to ascertain from the Architect that they have received all addenda issued to the bidding documents prior to submitting their bids.

1.4 DOCUMENTS

A. The Bidding 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 Bidding 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 bid 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 bid is submitted and if drawings are returned in good condition by May 8, 2018, as well as to the winning bidder.
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 bidding 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. Bidders 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-Bid Conference will be held on April 6, 2018, 10:30 a.m. at Chesterton Middle School, 651 West Morgan Avenue, Chesterton, Indiana 46304. All Bidders are encouraged to attend and sign in at the conference which will also be attended by the Owner, the Architect, and the Engineer. There will be a walk-through immediately following the pre-bid 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-BID 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 BID WITHDRAWAL

A. Any bidder may withdraw their bid prior to the scheduled closing time for receiving bids. All bidders shall hold their Bids open for a period of sixty calendar days from the date of Bid Opening. The Owner and Bidders may agree to extend the period of irrevocability beyond the sixty-day period.

1.8 INTERPRETATION OF BIDDING DOCUMENTS

A. Submit all questions regarding the Bidding Documents to the Architect. Replies will be issued to all bidders of record in the form of an Addendum. Questions received less than five days before the bid 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 bidders 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 bid 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 bonafide Bidder with full consideration given to Contractor's Completion Schedule.

B. In determining the lowest responsible bona fide Bidder and in awarding a contract, the Owner may take into consideration skill, facilities, capacity, experience, ability, responsibility, previous work, financial standing of bidder, amount of work being carried on by bidder, 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 Bidders.
   2. Bid Proposal Form.
   3. General Conditions.
   4. Plans and Specifications.
   5. Addenda

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

1.12 BID SECURITY

A. Accompany bids with a Bid Bond, Certified Check or Bank Draft for an amount of Ten Percent of the Base Bid as a guarantee that, if award is made, the bidder will sign the agreement and furnish the required bonds within five days or forfeit his bid security as liquidated damages, but not as a penalty. Execute Bid Bond on A.I.A. Form A-310, current edition or on form furnished by the Architect.
   1. Make Bid Security payable to: Duneland School Corporation.

B. Where a bid bond is given as the bid security, the bid bond must comply with the rating level required for the performance and payment bond as stated in section 11.4 of the AIA document A201 included in specification section 00700.

C. The bid security of all except the three lowest bidders will be returned within five days after the award of the Contract.

D. The bid security of the successful bidder and the two other bidders will be returned promptly after the Owner and the accepted bidder have executed the agreement, and the appropriate bonds and certificates of insurance have been provided by the successful bidder. Bid security of the other Contractor's will be returned promptly after agreement is finalized.

1.13 PERFORMANCE ASSURANCE

A. Accepted Bidder: Provide a Performance and Labor and Material/Payment bond.
   1. Provide a 100 percent Performance Bond on AIA A312.
   2. Provide a 100 percent Payment Bond on AIA 312.
   3. Deliver bonds within 3 days after execution of the Contract.

1.14 OTHER CERTIFICATIONS AND SUBMITTALS

A. All bidders must complete and sign the following certifications and submit them with their bid proposals. FAILURE TO DO SO MAY RESULT IN DISQUALIFICATION OF BIDDER.
   1. Addendum to Contract for Construction.
   2. Certification Regarding Investment Activities in Iran.
   3. Contractor’s Bid for Public Work - Form 96.
   4. Responsible Bidder Form.
   5. Fully completed AIA document A305 providing the Contractor’s qualifications and references.

1.15 POWER OF ATTORNEY

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

1.16 EMPLOYMENT AND LABOR PROVISIONS

A. The Contractor must comply with all Board of School Trustees local policies as outlined in the bidding documents. See Document 00820 – Duneland School Corporation Responsible Bidder Form.

B. Vendors/Contractors must conform to all federal, state, local and OSHA Regulations now in effect.

C. 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

BID FORM

THE PROJECT AND THE PARTIES

1.1 NAME OF BIDDER: _____

1.2 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 Contract 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 bidding documents for the construction of the 2018 Renovations 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 Bid for all Work:

   _____

   _____

   ($ ___ ___ ___ , ___ ___ ___ , ___ ___ ___ . ___ ___)

2. The base bid consists of all Work specified and required by the proposed Contract Documents.

B. Alternate Bids: The undersigned hereby states the net amount of increase or decrease to the Lump Sum Base Bid for the following Alternates as described in Section 01230.

   ALTERNATE NO. 1: **To remove and replace existing light fixtures, paint existing metal brackets and ceiling in Existing Lobby 1017.**

   ADDED from the Lump Sum $_____

C. Accompanying this proposal is a Bid Security payable to the Board of Education, Duneland School Corporation, which is agreed will be forfeited to the aforementioned as liquidated damages if the undersigned fails to execute the standard form of Owner/Contractor Agreement (AIA Document A101, 2007 Edition, as modified), which is included herein, and furnish evidence of their ability to become bonded and to provide insurance coverage as specified, within five days after notification of the Intent to Award Contract to the undersigned.

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

E. Time of Completion: If awarded the Contract, the bidder agrees to complete all Construction Work and achieve Substantial Completion by August 1, 2018, 5:00 p.m. (Phase 1) and October 1, 2018, 5:00 p.m. (Phase 2) 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.

F. 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 bidder does not change the specified Substantial Completion Date unless the Owner chooses to accept the bidder's date when awarding the contract.

SECTION 00300

BID FORM

1. Specified Substantial Completion Date Phase 1: August 1, 2018, 5:00 p.m.
2. Contractor's Desired Substantial Completion Date – Phase 1: _____.
3. Specified Substantial Completion Date Phase 2: Phase 2 – October 1, 2018, 5:00 p.m.
4. Contractor's Desired Substantial Completion Date – Phase 2: _____.

G. Base Bid 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 bid. 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 Bid.

BREAKDOWN:

Division 01:	General Requirements – Allowances:	$ _____
Division 01:	General Requirements – O&P:	$ _____
Division 01:	General Requirements – Remaining Items:	$ _____
Division 02:	Sitework:	$ _____
	Subcontractor (Legal Name, Address):	_____
		_____
Division 03:	Concrete:	$ _____
	Subcontractor (Legal Name, Address:	_____
		_____
Division 04:	Masonry:	$ _____
	Subcontractor (Legal Name, Address):	_____
		_____
Division 05:	Metals:	$ _____
	Subcontractor (Legal Name, Address):	_____
		_____
Division 06:	Wood and Plastic:	$ _____
	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 10:	Specialties:	$ _____
	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):	_____
Division 17:	Building Automation:	$ _____
	Subcontractor (Legal Name, Address):	_____

TOTAL (Should equal base bid): $ _____

SECTION 00300

BID FORM

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 BID FORM

SECTION 00410

BID BOND

1.1 BID BOND INFORMATION

A. KNOW ALL MEN BY THESE PRESENTS, THAT WE _____ as Principal, hereinafter called the Principal, and _____ a corporation duly organized under the laws of the State of Illinois as Surety, are held and firmly bound unto _____ as Obligee, hereinafter called Obligee, in the sum of _____ Dollars ($_____), for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

B. WHEREAS, the Principal has submitted a bid for: 2018 Renovations at Chesterton Middle School.

C. NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

D. The bid bond must comply with the rating level required for the performance and payment bond as stated in section 11.4 of AIA document A201.

Signed and sealed this _____ day of _____.

_____
(Principal) (SEAL)

_____ _____
(Witness) (Title)

_____
(Surety) (SEAL)

_____ _____
(Witness) (Title)

SECTION 00440

SUBSTITUTION SHEET

1.1 SUBSTITUTION INFORMATION

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

B. Bidders 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 bids.

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

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

E. NOTE: Manufacturer's names and material approved by the Architect during the bidding 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 BIDDER: _____

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 _____, 201__.

CONTRACTOR:

By: _____

Its: _____

SECTION 00497

CONTRACTOR'S BID FOR PUBLIC WORK – FORM 96

CONTRACTOR'S BID FOR PUBLIC WORK - FORM 96

State Form 52414 (R2/2-13)/ Form 9B (Revised 2013)
Prescribed by State Board of Accounts

PART I
(To be completed for all bids. Please type or print)

Date *(month, day, year):* _____

1. Governmental Unit (Owner): _____

2. County: _____

3. Bidder (Firm):_____

   Address: _____

   City/State/ZIP code: _____

4. Telephone Number: _____

5. Agent of Bidder *(if applicable)*: _____

Pursuant to notices given, the undersigned offers to furnish labor and/or material necessary to complete the public works project of _____
(Governmental Unit) in accordance with plans and specifications prepared by _____

_____ and dated _____ for the sum of

_____$_____

The undersigned further agrees to furnish a bond or certified check with this bid for an amount specified in the notice of the letting. If alternative bids apply, the undersigned submits a proposal for each in accordance with the notice. Any addendums attached will be specifically referenced at the applicable page.

If additional units of material included in the contract are needed, the cost of units must be the same as that shown in the original contract if accepted by the governmental unit. If the bid is to be awarded on a unit basis, the itemization of the units shall be shown on a separate attachment.

The contractor and his subcontractors, if any, shall not discriminate against or intimidate any employee, or applicant for employment, to be employed in the performance of this contract, with respect to any matter directly or indirectly related to employment because of race, religion, color, sex, national origin or ancestry. Breach of this covenant may be regarded as a material breach of 1he contract.

SECTION 00497

CONTRACTOR'S BID FOR PUBLIC WORK – FORM 96

CERTIFICATION OF USE OF UNITED STATES STEEL PRODUCTS
(If applicable)

I, the undersigned bidder or agent as a contractor on a public works project, understand my statutory obligation to use steel products made in the United States (I.C. 5-16-6-2). I hereby certify that I and all subcontractors employed by me for this project will use U.S. steel products on this project if awarded. I understand that violations hereunder may result in forfeiture of contractual payments.

ACCEPTANCE

The above bid is accepted this _____ day of _____, _____, subject to the following conditions: _____
_____

Contracting Authority Members:

_____ _____

_____ _____

_____ _____

PART II
(For projects of $150,000 or more - IC 36-1-12-4)

Governmental Unit: _____

Bidder (Firm): _____

Date *(month, day, year):* _____

These statements to be submitted under oath by each bidder with and as a part of his bid. Attach additional pages for each section as needed.

SECTION I EXPERIENCE QUESTIONNAIRE

1. What public works projects has your organization completed for the period of one (1) year prior to the date of the current bid?

Contract Amount	Class of Work	Completion Date	Name and Address of Owner

2. What public works projects are now in process of construction by your organization?

Contract Amount	Class of Work	Expected Completion Date	Name and Address of Owner

3. Have you ever failed to complete any work awarded to you? _____ If so, where and why?

_____

_____

_____

4. List references from private firms for which you have performed work.

_____

_____

_____

SECTION II PLAN AND EQUIPMENT QUESTIONNAIRE

1. Explain your plan or layout for performing proposed work. (Examples could include a narrative of when you could begin work, complete the project, number of workers, etc. and any other information which you believe would enable the governmental unit to consider your bid.)

_____

_____

_____

_____

_____

2. Please list the names and addresses of all subcontractors (i.e. persons or firms outside your own firm who have performed part of the work) that you have used on public works projects during the past five (5) years along with a brief description of the work done by each subcontractor.

_____

_____

_____

_____

_____

3. If you intend to sublet any portion of the work, state the name and address of each subcontractor, equipment to be used by the subcontractor, and whether you will require a bond. However, if you are unable to currently provide a listing, please understand a listing must be provided prior to contract approval. Until the completion of the proposed project, you are under a continuing obligation to immediately notify the governmental unit in the event that you subsequently determine that you will use a subcontractor on the proposed project.

_____

_____

_____

_____

_____

4. What equipment do you have available to use for the proposed project? Any equipment to be used by subcontractors may also be required to be listed by the governmental unit.

_____

_____

_____

_____

_____

5. Have you entered into contracts or received offers for all materials which substantiate the prices used in preparing your proposal? If not, please explain the rationale used which would corroborate the prices listed.

_____

_____

_____

_____

_____

SECTION Ill CONTRACTOR'S FINANCIAL STATEMENT

Attachment of bidder's financial statement is mandatory. Any bid submitted without said financial statement as required by statute shall thereby be rendered invalid. The financial statement provided hereunder to the governing body awarding the contract must be specific enough in detail so that said governing body can make a proper determination of the bidder's capability for completing the project if awarded.

SECTION IV CONTRACTOR'S NON- COLLUSION AFFIDAVIT

The undersigned bidder or agent, being duly sworn on oath, says that he has not, nor has any other member, representative, or agent of the firm, company, corporation or partnership represented by him, entered into any combination, collusion or agreement with any person relative to the price to be bid by anyone at such letting nor to prevent any person from bidding nor to include anyone to refrain from bidding, and that this bid is made without reference to any other bid and without any agreement, understanding or combination with any other person in reference to such bidding.

He further says that no person or persons, firms, or corporation has, have or will receive directly or indirectly, any rebate, fee, gift, commission or thing of value on account of such sale.

SECTION 00497

CONTRACTOR'S BID FOR PUBLIC WORK – FORM 96

SECTION V OATH AND AFFIRMATION

I HEREBY AFFIRM UNDER THE PENALTIES FOR PERJURY THAT THE FACTS AND INFORMATION CONTAINED IN THE FOREGOING BID FOR PUBLIC WORKS ARE TRUE AND CORRECT.

Dated at _____this _____ day of _____, _____

_____
(Name of Organization)

By _____

_____
(Title of Person Signing)

ACKNOWLEDGEMENT

STATE OF _____)
) ss
COUNTYOF_____)

Before me, a Notary Public, personally appeared the above-named _____ and swore that the statements contained in the foregoing document are true and correct.

Subscribed and swom to before me this _____day of _____, _____.

_____
Notary Public

My Commission Expires: _____

County of Residence: _____

SECTION 00497

CONTRACTOR'S BID FOR PUBLIC WORK – FORM 96

Part of State Form 52414 (R2/2-13) **/** Form 96
(Revised 2013)

BID OF

_____

(Contractor)

_____

(Address)

FOR

PUBLIC WORKS PROJECTS

OF

_____

_____

_____

Filed
_____
_____

Action taken
_____
_____

SECTION 00700

GENERAL CONDITIONS

FORM OF GENERAL CONDITIONS

1.1 AIA Document A201, General Conditions of the Contract for Construction, 2007 Edition, attached, is the General Conditions between the Owner and Contractor.

1.2 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™ – 2007

General Conditions of the Contract for Construction

for the following PROJECT:
(Name and location or address)
«Duneland School Corporation - General»
«_»

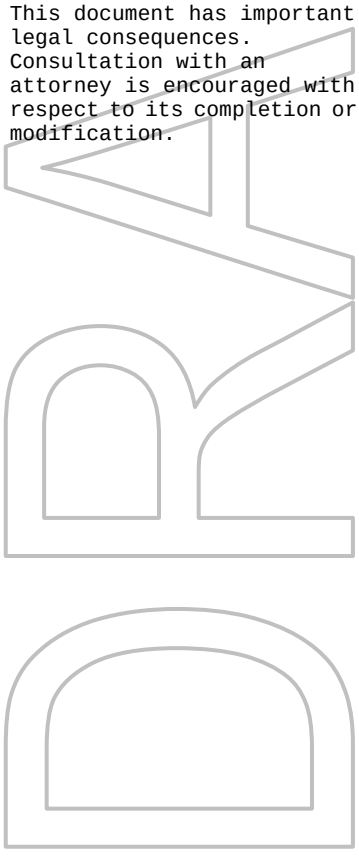
THE OWNER:
(Name, legal status and address)
«Duneland School Corporation»«_»
«601 West Morgan Ave.
Chesterton, Indiana 46304»

THE ARCHITECT:
(Name, legal status and address)
«Tria Architecture, Inc.»«_»
«901 McClintock Drive, Suite 100
Burr Ridge, Illinois 60527»

TABLE OF ARTICLES

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.



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INDEX
(Topics and numbers in bold are section headings.)

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, ~~Specifications, Addenda~~ 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)~~ 1) a written amendment ~~to~~ of the Contract signed by both parties, ~~(2) a Change Order, (3) a Construction Change Directive or (4)~~ 2) a Change Order, 3) a Construction Change Directive, 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 requirements.~~work issued by the Architect.

§ 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.

~~§ 1.1.3 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 WORK

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.~~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 DRAWINGS~~THE PROJECT

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.~~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 SPECIFICATIONS~~THE DRAWINGS

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.~~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 shall be checked against field measurements of existing conditions to be taken by the Contractor.

§ 1.1.7 ~~INSTRUMENTS OF SERVICE~~THE SPECIFICATIONS

~~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.~~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 ~~INITIAL DECISION MAKER~~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 and certify termination of the Agreement under Section 14.2.2.

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. 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 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.

§ 1.2.2 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. Large scale drawings shall take precedence over small scale drawings; figured dimensions on the drawings over scaled dimensions and noted material over graphic representations.

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

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

§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

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

ARTICLE 2 OWNER

§ 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except 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 INFORMATION AND SERVICES REQUIRED OF THE OWNER

~~§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.~~

§ 2.2.2 ~~Except for permits~~ 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.~~Documents.

§ 2.2.3 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.

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

§ 2.2.5 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 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 the Owner's rights under Article 14 hereof

§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ~~ten-day~~ seven-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner ~~may,~~ may immediately without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the ~~reasonable~~ cost of correcting such deficiencies, ~~including Owner's expenses and~~ including, but not limited to, attorney's fees, compensation for the Architect's additional services and expenses made necessary by such default, neglect or failure. Such ~~action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If~~ Change Order shall be deemed signed by the Contractor for the purposes stated in Section 7.2.1 even if the Contractor fails to physically sign such Change Order. If the payments then or thereafter due the Contractor are not sufficient to cover such ~~amounts, the Contractor shall pay the difference to the Owner.~~amount, 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.

§ 2.5 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 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 correlated personal observations with requirements of the Contract Documents.~~performed, 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 he believes are not satisfactory for the use shown, he shall so notify the Architect at least 5 days before bids are due. Signing of the contract and starting work by the Contractor shall indicate his agreement with all details, construction procedures, and materials so shown and/or specified and shall indicate his willingness to construct the project in strict accordance with these Documents and to guarantee the complete project in full compliance with the warranty provisions of the Contract Documents. By executing this contract, the Contractor further acknowledges that he has satisfied himself as to the nature and location of the Work, the general and local conditions, 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 under the Contract. Any failure by the Contractor to acquaint himself with all the available information concerning these conditions will not relieve him from any obligations with respect to the Contract.

§ 3.2.1.3 If work is required in a manner to make it impossible to produce work of the quality required by the Contract, or should discrepancies appear among the Contract Documents, the Contractor shall request in writing an interpretation from the Architect before proceeding with the Work. If the Contractor fails to make such a request, the Architect shall determine the quality of the work required, consistent with the Contract Documents, or which of the conflicting requirements shall govern. 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 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. ~~These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering~~ 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.

~~§ 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, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs ~~those obligations,~~ the obligations in Sections 3.2.2 and 3.2.3, 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, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. ~~If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.~~ 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 replacements of the Work and economic losses which proximately result from the breach of this duty. The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, ~~Subcontractors~~ 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.~~Contractor, any of its 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 this 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 any and all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

§ 3.4.2 Except in the case of minor changes in the Work authorized by the Architect in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the 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 Contract 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

~~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. If required by the Architect, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.~~

~~§ 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.~~

§ 3.5.1 The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new, unless 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).

§ 3.7 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 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 to be addressed by the Architect and Owner. 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 damages, losses, costs 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 21 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 an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are

not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15. 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 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 furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. ~~The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.~~

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner 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 this 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 by the Owner with seven days written notice.

§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

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

§ 3.10.2 The Contractor shall prepare ~~a submittal schedule, promptly after being awarded the Contract and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Architect's approval. The Architect's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Architect reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.~~ 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 silence 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 silence 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, of progress is behind schedule, the Contractor's plan to recover the original 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 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 Contract, 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 maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. ~~These~~ These, along with all operating manuals for all equipment, shall be available to the Architect ~~and shall be~~ 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 record copy for the Owner and Architect the plans and specifications of concealed work, particularly concealed piping and conduit. Any deviations from conditions shown on the Contract Drawings shall be shown and dimensioned on these field record drawings. 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 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.

§ 3.11.2.1 From the field record prints of the Contract Drawings, the Contractor shall furnish and prepare on compact disk in AutoCAD format, a complete set of field record drawings, completely dimensioned to show all changes made during the course of the Work. Mechanical and Electrical field record drawing shall locate by dimensions each run of concealed pipe and conduit. Upon completion of the Work, the Contractor and each Subcontractor shall deliver and submit to the Architect a full set of all field record drawings, relating to the Work, on compact disk in AutoCAD format and two sets of full size prints.

§ 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

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

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

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

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

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

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

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

§ 3.13 USE OF SITE

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

§ 3.13.1 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 and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

§ 3.14.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with prior written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The ~~Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.~~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 or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project. 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 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 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,~~ thereof including, but not limited to, attorney's fees, but shall not be responsible for such defense or loss when a particular design, process or product of a particular manufacturer or manufacturers is required by the Contract ~~Documents,~~ Documents except to the extent of Contractor's fault, or where the copyright violations are contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the Architect.

§ 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~~ law, Contractor waives any right of contribution against and shall defend, indemnify and hold harmless Owner, any Owner's Representative, the Architect and their 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 any 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~~ (these are collectively referred to as "claims") is caused in whole or in part by any negligent act or omission of Contractor, any Subcontractor, anyone directly or indirectly employed by any of them or anyone for whose acts ~~they~~ any of them may be liable, regardless of whether or not ~~such claim, damage, loss or expense~~ 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 Contractor shall have exclusive responsibility to comply with the requirements of the Structural Work Act. 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 under the requirements of the Illinois Structural Work Act. It is understood that this excludes use by Owner, Architect or his Agents or Employees.

§ 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.

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

§ 4.1.2 Duties, responsibilities and limitations of authority of the Architect as set forth in the Contract Documents shall not be restricted, modified or extended without written consent of the ~~Owner, Contractor~~ Owner 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 ~~as to whom the Contractor has no reasonable objection and~~ whose status under the Contract Documents shall be that of the Architect.

§ 4.1.4 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.

§ 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, except as provided in Section 3.3.1.~~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 report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner. 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 per the Indiana Common Construction Wage Act 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 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions ~~or, unless otherwise specifically stated by the Architect,~~ 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 will 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 authorize minor changes in the Work as provided in Section 7.4. The Architect will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Architect will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section ~~9.10.~~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. 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 they 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 duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Architect will 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.~~faith and in the absence of negligence.

§ 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 subcontractors of a separate contractor.

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

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

§ 5.2.1 ~~Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract,~~ Prior to executing the Contract, the Contractor shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. ~~Failure of the Owner or Architect to reply within the 14 day period shall constitute notice of no reasonable objection.~~

§ 5.2.1.1 In addition to the information which may be required prior to the execution of the Contract, not later than twenty-one (21) days after Notice of Award of the Contract, 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~~ 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 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 Contract 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 ~~agreement, written where legally required for validity,~~ 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, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

§ 5.3.1 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 in writing; and

.2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

§ 5.4.3 Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the

Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

§ 6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of ~~subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.~~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 other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

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

§ 6.2 MUTUAL RESPONSIBILITY

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

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

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

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

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

§ 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility 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, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

§ 7.1.4 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 schedules 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 7.3.6.1 through 7.3.6.5.
.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 district 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 7.3.7.

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

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

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

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the

Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 ~~Costs~~ Actual costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;

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

.3 Rental actual 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 related to the Work; and

.5 Additional 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.

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be ~~actual net cost~~ computed in accordance with Section 7.3.7 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 additions.

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

§ 7.5 SUBSTITUTIONS

After the award of the Contract, 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, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

§ 8.2.3 The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time. 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 and 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 an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner ~~pending mediation and arbitration; or by other causes that the Architect determines~~ or by other causes which the Architect and Owner determine, in their sole

discretion, may justify delay, then the Contract Time shall be extended by Change Order 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 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

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

§ 9.2 SCHEDULE OF VALUES

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

§ 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least ~~ten~~ 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. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents. 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 material 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 retention.

§ 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. 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, material suppliers, or other persons or entities making a claim by reason of having 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 issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

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

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

§ 9.5.1 The Architect may withhold a Certificate for Payment in whole or in part, 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 for labor, materials or equipment;

.4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.5 damage to the Owner or a separate contractor;

.6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or

.7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

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

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

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

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

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

~~§ 9.7 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' written 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 shut-down, delay and start-up, plus interest as provided for in the Contract Documents.~~

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

§ 9.8.5 The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Work or designated portion thereof. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents. 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 as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.~~

~~§ 9.9.2 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 written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. ~~The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.~~

§ 9.10.2 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 and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or

encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

~~§ 9.10.3 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 and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.~~

~~§ 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; or~~

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

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

§ 9.11 LIQUIDATED DAMAGES

The Contractor is solely responsible for substantially completing the Work by the scheduled Substantial Completion Dates for each Phase of the Work. This responsibility includes all work including that of the Contractor's forces, subcontractors and suppliers. The Contractor acknowledges that the Owner will suffer significant financial loss, and there will be disruption to the Owner, 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 Owner would not be susceptible to precise calculation. To protect the Owner against said loss and disruption to the School District Community, 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 of Five Hundred Dollars ($500) for each calendar day of delay per each School Campus, per Phase in Substantial Completion. Substantial Completion for this project refers to all scheduled work being a minimum 99% complete.

§ 9.11.2 Payments of Liquidated Damages are in addition to other 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 or the Contractor's Subcontractors or Sub-subcontractors; and

.3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

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

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

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

§ 10.2.5 The Contractor ~~shall~~ 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, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing 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, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time not exceeding 21 days after discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

§ 10.2.9 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

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

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

~~§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or~~

~~expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.~~

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

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

~~§ 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 indemnify 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 LIABILITY INSURANCE

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

.1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be ~~performed;~~performed including private entities performing work at the site and exempt from the coverage on account of number of employees or occupation, which entities shall maintain voluntary compensation coverage at the same limits specified for mandatory coverage for the duration of the project;

.2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's ~~employees;~~employees or persons or entities excluded by statute from the requirements of Section 11.1.1.1 but required by the contract documents to provide the insurance required by that Section;

.3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;

.4 Claims for damages insured by usual personal injury liability coverage;

.5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;

.6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor ~~vehicle;~~vehicle and coverage should be written on a comprehensive automobile policy which will include coverage for owned, non-owned and hired motor vehicles;

.7 Claims for bodily injury or property damage arising out of completed operations; and

.8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

.9 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.

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 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.

.13 The General Liability coverages shall be provided by a commercial General Liability Policy on an occurrence basis.

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

§ 11.1.2.1 The insurance required by Section 11.1.1 shall be written for not less than the following limits, or greater if required by law:

1. Workers' Compensation, Occupational Disease and Employer's Liability Insurance:
   a. State: Statutory limits
   b. Applicable Federal (e.g., Longshoremen's): Statutory limits
   c. Employer's Liability
      $1,000,000 Per Accident
      $1,000,000 Disease, Policy Limit
      $1,000,000 Disease, Each Employee

2A. If written under Comprehensive General Liability Policy Form (including sub-lines specified in Section 11.1.1.9)
   a. Bodily Injury:
      $1,000,000 Each Occurrence
      $2,000,000 Aggregate
   b. Property Damage:
      $1,000,000 Each Occurrence
      $2,000,000 Aggregate
   c. Bodily Injury and Property Damage combined:
      $1,000,000 Each Occurrence
      $2,000,000 Aggregate
   d. Personal Injury:
      $1,000,000 Aggregate

e. Products and Completed Operations to be maintained for one year after final payment: $1,000,000 Aggregate
f. Property Damage Liability Insurance shall provide X, C and U coverages.
g. Broad Form Property Damage Coverage shall include Completed Operations.

2B. If written under Commercial General Liability Policy Form.
a. $2,000,000 General Aggregate
b. $1,000,000 Products Completed Operations Aggregate
c. $1,000,000 Personal and Advertising Injury
d. $1,000,000 Each Occurrence
e. $50,000 Fire Damage (any one fire)
f. $5,000 Medical Expense (any one person)

3. Contractual Liability:
a. Bodily Injury:
$1,000,000 each occurrence
$2,000,000 aggregate

b. Property Damage:
$1,000,000 each occurrence
$2,000,000 aggregate

4. Personal Injury, with Employment Exclusion deleted:
a. $1,000,000 aggregate

5. Business Automobile Liability (including owned, non-owned and hired vehicles):
a. Automobile Liability:
i. Bodily injury:
$1,000,000 each person
$1,000,000 each occurrence
ii. Property Damage:
$1,000,000 Each Occurrence
$1,000,000 Combined Single Limit

6. Umbrella Excess Liability:
$2,000,000 Over Primary Insurance
$10,000 Retention for Self-Insured Hazards
Each Occurrence

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

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents 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 during the Contractor's completed operations.

§ 11.1.5 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.

§ 11.1.6 If the insurance is written on the Comprehensive General Liability policy form, the Certificates shall be AIA Document G705, Certificate of Insurance. If this insurance is written on a Commercial General Liability policy form, ACCORD form 25S will be acceptable. These certificates shall specifically state that the Owner, his representatives, and the Architect are protected by the Contractor's insurance against all liabilities as spelled out in Par. 3.18 of AIA Doc. A201, as modified hereinabove.

§ 11.2 OWNER'S LIABILITY INSURANCE

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

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

§ 11.3.1.1 ~~Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.~~The policy 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 ~~If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.~~Coverage 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 ~~If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.~~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.

~~§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.~~

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

§ 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.

§ 11.3.2 BOILER AND MACHINERY INSURANCE

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

§ 11.3.3 LOSS OF USE INSURANCE

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

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

~~§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.~~

~~§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.~~

~~§ 11.3.7 WAIVERS OF SUBROGATION~~
~~The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.~~

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

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

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

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The ~~Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.~~ Contractor shall furnish a Performance Bond and

Labor and Material Payment Bond in the amount of one hundred percent (100%) of the Contract Sum. Owner requires that the bond surety must carry a BEST RATING of A and that the Owner has no objection to the bond surety.

§ 11.4.2 ~~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.~~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.

§ 11.4.3 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 Indiana and approved by the Owner.

§ 11.4.4 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.

§ 11.4.5 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.

§ 11.4.6 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.

§ 11.4.7 The Contractor must within ten (10) days after the execution of this Agreement furnish a Payment 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 Indiana, 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 Indiana. 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.

§ 11.4.8 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.

§ 11.5 ADDITIONAL INSURANCE REQUIREMENTS

§ 11.5.1 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.

§ 11.5.2 The limits of liability as stated may be arrived at using a Split-Limit or a Combined Single Limit basis. However, the total limit of liability shall not be less than that stated in the requirements.

ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

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

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

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

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

§ 12.2.2 ~~AFTER SUBSTANTIAL COMPLETION~~AFTER 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 an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly at the Contractor's sole expense after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

§ 12.2.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after ~~Substantial~~ 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 provided or referred to by this Article 12, the guarantee period shall begin anew from the date of the completion 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, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract ~~Documents.~~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 except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.~~Laws 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 such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

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

§ 13.3 WRITTEN NOTICE

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

§ 13.4 RIGHTS AND REMEDIES

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

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

§ 13.4.3 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.

§ 13.4.4 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.

§ 13.5 TESTS AND INSPECTIONS

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

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

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

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

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

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

§ 13.6 INTEREST

~~Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may 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 TIME LIMITS ON CLAIMS~~

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

§ 13.8 REGULATIONS

§ 13.8.1 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.

§ 13.8.1.1 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.

§ 13.8.2 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.

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

§ 13.8.3.2.1 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.

§ 13.8.3.2.2 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.

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

§ 13.8.16 Concurrent with the execution of this Contract, the Contractor has executed the Certificate of Eligibility.

§ 13.8.17 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~~

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

~~.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;~~

~~.2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;~~

~~.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 promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.~~

~~§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, 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' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.~~

~~§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor 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' written 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 for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;~~

~~.3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or~~

~~.4 otherwise is guilty of substantial breach of a provision of the Contract Documents.~~

§ 14.2.1 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 above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

.1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 Accept assignment of subcontracts pursuant to Section 5.4; and

.3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds ~~costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the~~ 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 subcontractors, any additional interest or fees which the Owner must pay by reason of a delay in 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.~~the 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 as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

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

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

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

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

.1 cease operations as directed by the Owner in the notice;

.2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and

.3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

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, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

§ 15.1.2 NOTICE OF CLAIMS

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

§ 15.1.3 CONTINUING CONTRACT PERFORMANCE

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

§ 15.1.4 CLAIMS FOR ADDITIONAL COST

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

§ 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a ~~Claim~~ claim for an increase in the Contract Time, written notice as provided herein shall be ~~given. The Contractor's Claim~~ 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~~ delay only one claim is necessary.

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

§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor ~~and Owner waive Claims against each other~~ 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 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

§ 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. ~~Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered.~~ Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

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

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

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

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the ~~parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.~~parties, 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.~~

~~§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand~~

~~fails to file for mediation within the time required, 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 15.1.6 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 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. 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 Either party, at its sole discretion, 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 Either party, at its sole discretion, 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 the Owner and Contractor under this Agreement.~~

SECTION 00820

RESPONSIBLE BIDDER FORM

Duneland School Corporation

Responsible Bidding Practices Submission Form

**Refer to the Duneland School Corporation "Policy to establish Responsible Bidding Practices"*

Project: Duneland School Corporation – 2018 Renovations at Chesterton Middle School.

Bid Opening Date: April 24, 2018.

Name of Contractor:

_____

Address:

_____

Telephone:

_____

Name of Primary Contact:

_____

Category of Work:

_____

Contractors proposing to submit bids on any Duneland School Corporation ("School") project estimated to be at least one hundred fifty thousand dollars ($150,000) or more must, prior to the opening of bids, submit a statement made under oath and subject to perjury laws, the following:

1. Attach to this Form a Certificate of Good Standing from the Indiana Secretary of State dated within the last 60 days. (This requirement shall not apply if the bidder is an individual, sole proprietor or partnership.)

2. List all names previously used by the bidder within the last five (5) years:
   _____
   _____
   _____
   _____

3. Within the last five (5) years, has the bidder been determined by a court or governmental agency to be in violation of any federal, state, or local laws, including violations of contracting or anti-trust laws, tax or licensing laws, the Occupational Safety and Health Act (OSHA) violations, federal Davis-Bacon Act violations or violations of the Indiana Common Construction Wage Act? If so, identify the date of the violation and identify the court or agency issuing the determination.
   _____
   _____
   _____
   _____

A Policy to Establish Responsible Bidding Practices and Submission Requirements for Submitting Bids to Perform Construction Work

WHEREAS, the Duneland School Corporation is required by law to award capital improvement contracts to the "lowest responsive and responsible" bidder; and,

WHEREAS, the Duneland School Corporation, based upon its experience, has determined that quality workmanship, efficient operation, safety, and timely completion of projects requires all bidders meet certain minimum requirements in order to be a "responsive and responsible" bidder; and,

WHEREAS, applicable state law also requires that bidders meet certain minimum requirements in order to be a "responsive and responsible" bidder; and,

WHEREAS, the Duneland School Corporation seeks to enhance its ability to identify "responsive and responsible" bidders on all School construction projects by institution of more comprehensive submission requirements which are in compliance with Indiana State law; and,

WHEREAS, the "Responsible Bidding Practices and Submission Requirements" policy will preserve administrative resources by insuring that only qualified contractors and subcontractors are awarded contracts on public works construction projects; and,

WHEREAS, the "Responsible Bidding Practices and Submission Requirements" policy will assure efficient use of taxpayer dollars, will promote public safety and is in the public interest.

THEREFORE, this Policy, which is entitled "Responsible Bidding Practices and Submission Requirements for Submitting Bids to Perform Construction Work," is hereby adopted and reads as follows:

I. Bid Submission Requirements

Contractors proposing to submit bids on any Duneland School Corporation ("School") project estimated to be at least one-hundred fifty thousand dollars ($150,000.00) or more must, prior to the opening of bids, submit a statement made under oath and subject to perjury laws, on a form designated by the School and must include:

(A) A copy of a print-out of the Indiana Secretary of State's on-line records for the bidder dated within sixty (60) days of the submission of said document showing that the bidder is in existence, current with the Indiana Secretary of State's Business Entity Reports, and eligible for a certificate of good standing. If the bidder is an individual, sole proprietor or partnership, this subsection shall not apply;

(B) A list identifying all previous names used by the bidder;

(C) A list of all determinations by a court or governmental agency for violations of federal, state, or local laws including, but not limited to violations of contracting or antitrust laws, tax or licensing laws, environmental laws, the Occupational Safety and Health Act (OSHA), or federal Davis-Bacon and related Acts;

(D) A statement on staffing capabilities, including labor sources;

(E) Evidence of participation in apprenticeship and training programs, applicable to the work to be performed on the project, which are approved by and registered with the United States Department of Labor's Office of Apprenticeship, or its successor organization. The required evidence includes a copy of all applicable apprenticeship certificates or standards for these training programs;

(F) A copy of a written plan for employee drug testing that: (i) covers all employees of the bidder who will perform work on the public work project; and (ii) meets, or exceeds, the requirements set forth in IC 4-13-18-5 or IC 4-13-18-6;

(G) The name and description of the management experience of each of the bidder's project managers and superintendents that bidder intends to assign to work on the project;

(H) Proof of any professional or trade license required by law for any trade or specialty area in which bidder is seeking a contract award; and disclosure of any suspension or revocation within the previous five years of any professional or trade license held by the company, or of any director, office or manager employed by the bidder;

(I) Evidence that the contractor is utilizing a surety company which is on the United States Department of Treasury's Listing of Approved Sureties; and

(J) A written statement of any federal, state or local tax liens or tax delinquencies owed by the bidder to any federal, state or local taxing body in the last five years.

The School reserves the right to demand supplemental information from the bidder, (additional) verification of any of the information provided by the bidder, and may also conduct random inquiries of the bidder's current and prior customers.

II. Post-Bid Submissions from Subcontractors

All bidders shall provide a written list that discloses the name, address, and type of work for each first-tier subcontractor from whom the bidder has accepted a bid and/or intends to directly contract with or hire on any part of the public work project, including individuals performing work as independent contractors, within five (5) business days after the date the bids are due.

In addition, each such subcontractor contracting directly with the bidder shall be required to adhere to the requirements of Section I of this Ordinance as though it were bidding directly to the School, except that such subcontractors shall submit the required information (including the name, address, and type of work for each of their subcontractors) to the successful bidder no later than five (5) business days after the subcontractor's first day of work on the public work project and the bidder shall then forward said information to the School. Payment shall be withheld from any subcontractor contracting directly with the bidder who fails to timely submit said information until such information is submitted and approved by the School.

Upon request, the School may require any subcontractors to provide the required information (including name, address, type of work on the project and the name of the subcontractor with whom the subcontractor has a direct contract). Payments shall be withheld from any

subcontractor who fails to timely submit this information until this information is submitted and approved by the School. Additionally, the School may require the successful bidder and relevant subcontractor to remove the nonresponsive or non-responsible subcontractor from the project and replace it with a responsive and responsible subcontractor.

Failure of a subcontractor to submit the required information shall not disqualify the successful bidder from performing work on the project and shall not constitute a contractual default and/or breach by the successful bidder. However, the School may withhold all payments otherwise due for work performed by a subcontractor, until the subcontractor submits the required information and the School approves such information. The School may also require that successful bidder to remove the subcontractor from the project and replace it with a responsive and responsible subcontractor.

The disclosure of a subcontractor ("Disclosed Subcontractor") by a bidder or a subcontractor shall not create any rights in the Disclosed Subcontractor. Thus, a bidder and/or subcontractor may substitute another subcontractor ("Substitute Subcontractor") for a Disclosed Subcontractor by giving the School written notice of the name, address, and type of work of the Substitute Subcontractor. The Substitute Subcontractor is subject to all of the obligations of a subcontractor under this Ordinance.

III. Validity of Pre-Qualification Classification

Upon designation by the School that a contractor's or subcontractor's submission in anticipation of a bid is complete and timely, and upon any further consideration deemed necessary by the School, the contractor or subcontractor may be pre-qualified for future School public works projects. A contractor's classification as "qualified" shall exempt the contractor or sub-contractor from the comprehensive submission requirements contained herein for a period of twelve (12) months. Thereafter, contractors or subcontractors who are pre-qualified must submit a complete application for continuation of "pre-qualified" standing, on a form provided by the School, (also referred to as the "short form") by December 31st for the upcoming calendar year. Failure by any pre-qualified contractor or subcontractor to timely submit its complete application for continuation of "pre-qualified" standing shall result in automatic removal of the designation, effective January 1 of the upcoming year. However, the "removed" contractor or subcontractor shall still be permitted to bid on School public works projects.

Any material changes to the contractor's status, at any time, must be reported in writing within ten (10) days of its occurrence to the School. The pre-qualification designation is solely within the discretion of the School and the School specifically reserves the right to change or revoke the designation for a stated written reason(s).

Denial of pre-qualification shall be in writing and shall be forwarded to the contractor within seven (7) working days of such decision. Any contractor denied or losing pre-qualification status may request reconsideration of the decision by submitting such request in writing to the School within five (5) business days of receipt of notice of denial.

IV. Incomplete Submissions by Bidders

It is the sole responsibility of the potential bidder to comply with all submission requirements applicable to the bidder in section I above by no later than the public bid opening. Post-bid

submissions must be submitted in accordance with section II above. Submissions deemed inadequate, incomplete, or untimely by the School may result in the automatic disqualification of the bid.

V. Responsive and Responsible Bidder Determination

The School, after review of complete and timely submissions, shall, in its sole discretion, after taking into account all information in the submission requirements, determine whether a bidder is responsive and responsible. The School specifically reserves the right to utilize all information provided in the contractor or subcontractor's submission or any information obtained by the School through its own independent verification of the information provided by the contractor.

VI. Certified Payroll

For projects in which the cost is at least $150,000, the successful bidder and all subcontractors working on a public work project shall submit a certified payroll report utilizing the federal form now known as a WH-347 which must be prepared on a weekly basis and submitted to the School within ten (10) calendar days after the end of each week in which the bidder or subcontractor performed its work on the public work project. These certified payroll reports shall identify the job title and craft of each employee on the project, e.g. journeyman electrician or apprentice electrician.

The School may withhold payment due for work performed by a bidder if the bidder fails to timely submit its certified payroll reports until such time as such certified payroll reports are submitted. The School may also withhold payment due for work performed by a subcontractor if the subcontractor fails to timely submit its certified payroll reports until such time as such certified payroll reports are submitted. The School shall not withhold payment to a bidder for work performed by the bidder or for work performed by subcontractors who have submitted their certified payroll reports, because one or more other subcontractors failed to timely submit their certified payroll reports.

VII. Public Records

All information submitted by a bidder or a subcontractor pursuant to this Policy, including certified payrolls, are public records subject to review pursuant to the Indiana Access to Public Records law (IC 5-14-3).

VIII. Penalties for False, Deceptive, or Fraudulent Statements/Information

Any bidder that willfully makes, or willfully causes to be made, a false, deceptive or fraudulent statement, or willfully submits false, deceptive or fraudulent information in connection with any submission made to the School shall be disqualified from bidding on all School projects for a period of three years.

IX. Conflicting Policies

Any Policy or provision of any Policy in conflict with the provisions of this Policy is hereby repealed.

X. Severability

If any provision of this Policy is found to be invalid, the remaining provisions of this Policy shall not be affected by such a determination. These other provisions of this Policy shall remain in full force and effect without the invalid provision.

This Policy, which is entitled "Responsible Bidding Practices and Submission Requirements for Submitting Bids to Perform Construction Work," is hereby adopted by the Duneland School Corporation on the 12th day of January 2016.

Ralph D. Ayres

Kristin Kroeger

Ron Stone

John R. Marshall

Mike Trout

4. State whether the bidder intends to employ its own employees or whether the bidder intends to utilize subcontractors to be utilized by the bidder for the project. If the bidder intends to use subcontractors for the project, identify all subcontractors the bidder intends to utilize.

   _____
   _____
   _____
   _____

5. Provide evidence of the bidder's participation in apprenticeship and training programs applicable to the work to be performed on the project which are approved by and registered with the United States Department of Labor's Office of Apprenticeship or any similar organization. Include copies of all applicable certificates or standards for such training programs.

6. Provide a copy of the bidder's workplace drug-testing policy that covers all employees of the bidder and meets or exceeds the requirements of Indiana Code 4-13-18.

7. Identify, by name and description of experience, each of the bidder's project managers and superintendents that bidder intends to assign to work on the project.

   _____
   _____
   _____
   _____

8. If applicable, identify all professional or trade licenses required by law to be held, for any trade or specialty area for which the bidder seeks a contract award.

   _____
   _____
   _____
   _____

9. If applicable, state whether any professional or trade license held by the bidder, or any directors, officer, or manager employed by the bidder, has been suspended or revoked within the last five (5) years.

   _____
   _____
   _____
   _____

10. Provide evidence that the surety company utilized by the bidder is on the United States Department of Treasury's Listing of Approved Securities.

11. Identify any federal, state, or local tax liens or delinquencies owed by the bidder to any federal, state, or local taxing body within the last five (5) years.

    _____
    _____
    _____
    _____

SECTION 00820

RESPONSIBLE BIDDER FORM

VERIFICATION

I swear or affirm, under the penalties for perjury, that the foregoing information is true and that I am duly authorized by the bidder to make the representations herein. I understand and acknowledge that any material changes to the bidder's status or as to any of the information provided on this Form must be reported to the School Corporation within ten (10) days from the date of the occurrence or the change of status and that the School Corporation reserves the right to request additional information and verification of any of the information submitted pursuant to this Form.

Bidder: _____

By: _____

Its: _____

Date: _____

SECTION 01100

SUMMARY

PART 1 – GENERAL

1.1 PROJECT

A. Project Name: 2018 Renovations at Chesterton Middle School.
B. Owner's Name: Duneland School Corporation.
   1. The Project consists of the construction of:
      a. Concrete Foundations and Slabs
      b. Steel Structure
      c. Gypsum wall construction
      d. Flooring
      e. Ceiling and Light Fixtures
      f. Mechanical Renovations
      g. Electrical Renovations
      h. Roofing
      i. Vertical Wheelchair Lift

1.2 CONTRACT DESCRIPTION

A. Work covered by Contract Documents: As defined in 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 1, 2018, 5:00 p.m. (Phase 1) and October 1, 2018, 5:00 p.m. (Phase 2). 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 November 1, 2018, 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. Beginning on June 1, 2018 – no time restrictions.
   2. After August 1, 2018 – construction to occur between the hours of 3pm and 11pm.
   3. 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.
   4. Note: Village noise ordinance (call to verify times).

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. Certificate of Insurance and all Bonds to be submitted to the Architect within 3 business days upon issuance of the Letter of Intent.

C. All Shop Drawings to be submitted to the Architect within 21 calendar days upon issuance of the Letter of Intent.

1.10 PROJECT PHASING:

A. Phase 1: (anticipated start of construction, June 2018) – All work required to complete scope indicated - including but not limited to: interior work on first and second floors.
   1. All work under this phase must be 99% complete no later than August 1, 2018.

B. Phase 2 : (anticipated start of construction, June 2018) – All work required to complete the vertical wheel chair lift scope indicated on drawing including final inspection.
   1. All work under this phase must be 99% complete no later than October 1, 2018.

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 01270 - Unit Prices: Monetary values of unit prices, payment and modification procedures relating to unit prices.
C. 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 retaintage 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. Current construction photographs specified in Section 01300.
4. 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.
5. 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.

6. 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 CERTIFIED PAYROLL FOR PUBLIC WORKS PROJECTS

A. Effective August 10, 2005 the Public Act 94-0515 amended the Prevailing Wage Act., all contractors and their subcontractors who are engaged in public works projects must provide a certified monthly payroll report either in person, by mail or electrically for the Owner's records.

B. Each Contractor or Subcontractor performing Work on this Project shall comply in all respects with all laws governing the employment of Labor, Social Security, and Unemployment Insurance of both the State and Federal government. There shall be paid to each employee engaged in Work under this Contract at the site of the Project, no less than the minimum wage for the classifications of labor employed in compliance with 820 ILCS 130/1 et seq.. as now existing or hereafter amended.

C. In accordance with 820 ILCS 130/5, the Contractor and each subcontractor shall make and keep, for a period of not less than 3 years, records of all laborers, mechanics, and other workers employed by them on the Project; the records shall include each worker's name, address, telephone number, social security number, classification or classifications, the hourly wages paid in each period, the number of hours worked each day, and the starting and ending times of each work day.

D. The Contractor and each subcontractor shall submit monthly, in person, by mail, or electronically a certified payroll to the District. The certified payroll shall consist of a complete copy of the records. The certified payroll shall be accompanied by a statement signed by the contractor or subcontractor which avers that:
   1. such records are true and accurate;
   2. the hourly rate paid to each worker is not less than the general prevailing rate of hourly wages required; and
   3. the contractor or subcontractor is aware that filing a certified payroll that he or she knows to be false is a class B misdemeanor.

E. Upon 2 business days' notice, the contractor and each subcontractor shall make available for inspection for the records to the District, its officers and agents, and to the Director of Labor and his deputies and agents at all reasonable hours at a location within the State. The Contractor and each subcontractor shall permit his/her employees to be interviewed on the job, during working hours, by compliance investigators of the Department or the Department of Labor.

1.6 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.

1.7 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. Inspection and testing Allowances.
C. 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.

SECTION 01210

ALLOWANCES

1.7 INSPECTION AND TESTING ALLOWANCES

A. Costs Included in Inspecting and Testing Allowances: Cost of engaging the inspecting or testing agency of record; execution of inspecting and tests; and reporting results.

B. Costs Not Included in the Inspecting and Testing Allowances:
   1. Costs of testing services used by Contractor separate from Contract Document requirements.
   2. Costs of testing services used by the Contractor from a source other than the testing agency of record.
   3. Costs of retesting upon failure of previous tests as determined by Architect.
   4. The allowance does not include incidental labor required to assist the testing agency or costs for retesting if previous tests and inspections result in failure. The cost for incidental labor to assist the testing agency shall be included in the Contract Sum.

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 contingency allowance of $50,000.00 for use according to owner's instructions.

B. Allowance No. 2: Testing and Inspection Allowance: Include the sum of $5,000.00 for payment of inspecting and testing services specified in Section 01400.

END OF SECTION

SECTION 01230

ALTERNATES

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Alternate submission procedures.
B. Documentation of changes to Contract Sum and Contract Time.

1.2 RELATED SECTIONS
A. Section 00100 – Instructions to Bidders: Instructions for preparation of pricing for alternatives.

1.3 ACCEPTANCE OF ALTERNATES
A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option. Immediately accepted alternates will be identified in the Owner-Contractor Agreement.
B. The Owner may accept any Alternate within (30) days of the date of contract.
C. State the amount of Alternates prices to be added or deducted from the Base Bid price on the Bid Form.
D. Perform all portions of the work affected by this Section in accordance with the requirements of the Contract Documents.
E. Comply with requirements relative to materials and workmanship contained in the respective specification sections.
F. Coordinate related work and modify surrounding work to integrate the Work of each Alternate.

1.4 SCHEDULE OF ALTERNATES
Alternate No. 1: To remove and replace existing light fixtures, paint existing metal brackets and ceiling in Existing Lobby 1017.

State the amount to be ADDED to the lump sum base bid if existing light fixtures in Existing Lobby 1017 are to be removed and replaced along with associated electrical work. Existing metal brackets and ceiling to be painted. Refer to drawings for more information.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION – NOT USED

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 Work
B. Take photographs as evidence of existing project conditions.

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. Selected sheets will cost $250for all sheets within a single discipline.
   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

1.5 TESTING AND INSPECTION AGENCIES

A. Contractor will employ and pay for services, from Testing Allowances, of an independent testing agency to perform specified testing and inspection.
B. Testing Agency of record: The Testing Agency of Record shall be identified by the Owner within 15 days of the Letter of Intent.
C. Employment of agency in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.
D. Inspection sampling and testing is required for:
   1. Section: 02316; Fill and Backfill.
   2. Section: 03200; Concrete Reinforcement.
   3. Section: 03300; Cast-in-Place Concrete.
   4. Section: 04065; Mortar and Masonry Grout.
   5. Section: 05120; Structural Steel.
E. Additional services as requested by Architect
F. Testing Agency:
   1. Testing agency: Comply with requirements of ASTM E 329, ASTM E 548, ASTM E 543, ASTM C 1021, ASTM C 1077, ASTM C 1093, and ASTM C 1021.
   2. Inspection agency: Comply with requirements of ASTM D290.
   3. Laboratory: Authorized to operate in State in which Project is located.
   4. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
   5. Testing Equipment: Calibrated at reasonable intervals with devices of accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

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 MOCK-UPS

A. Tests will be performed under provisions identified in this section and identified in the respective product specification sections.
B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, accessories and finishes.
C. Accepted mock-ups shall be a comparison standard for the remaining Work.
D. Where mock-up has been accepted by Architect and is specified in product specification sections to be removed, remove mock-up and clear area when directed to do so.

3.3 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.

3.4 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.

3.5 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.

3.6 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. Surveying for laying out the work.
E. Cleaning and protection.
F. Starting of systems and equipment.
G. Demonstration and instruction of Owner personnel.
H. 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. Division 15 - Mechanical

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 GRADES, LINES AND LEVELS

A. Contractor lay out all of the work under this contract.
   1. Establish all working lines, levels, elevations and measurements.
B. Owner will furnish:
   1. A certified topographic survey of existing site, giving all grades and lines of streets, alleys, pavements and adjoining property, rights-of-way, encroachments, boundaries and contours of building site.
   2. Locations, dimensions and data pertaining to existing:
      a. Buildings.
      b. Underground obstructions.
      c. Trees and landscaping.
      d. Other improvements.
   3. Information as to available service and utility lines, both public and private.
C. Location of survey's baseline control points.
   1. Benchmark and temporary benchmark location and elevation of each.
D. Quality Assurance
   1. All layout work which establishes site layout dimensions or elevations or exterior building dimensions, angles or grade floor elevations shall be done by a qualified engineer or surveyor.
   2. Qualifications of Contractor's Engineer/Surveyor:
      a. Experienced in layout work of similar complexity.
      b. Licensed by State of Illinois.
E. Submittals. Architect may at any time require written verification of grades, lines and levels by a licensed surveyor as work progresses.
F. Laying Out The Work
   1. Prior to the beginning of the actual work, perform the following:
      a. Each subcontractor shall lay out their portion of the work.
      b. Establish all required bench marks and reference lines.
      c. Verify all building dimensions.
      d. Verify conformance of all actual general dimensions with those indicated on the Architect's plan.
      e. Notify the Architect immediately if any conflict whatsoever exists.
G. Survey Upon Completion
   1. Upon completion, Owner may provide a survey performed by a licensed surveyor indicating the location of the Work of this Contract and including the following data:
      a. Building location and dimensions of all walls.
      b. Elevations of finished floor at all exterior exits.
      c. Spot elevations, storm, sanitary and watermain manholes, and all invert elevations.
      d. Spot elevations of corners of all new pavement and on a 50' grid within paved areas.
   2. All areas found to be non-conforming to the Contract Documents shall be corrected by the responsible Contractor.

1.5 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.

1.6 PROJECT CONDITIONS

A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.
C. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
D. 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.
E. 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.
F. Noise Control: Provide methods, means, and facilities to minimize noise produced by construction operations.
G. Pest Control: Provide methods, means, and facilities to prevent pests and insects from damaging the work.
H. Rodent Control: Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
I. 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.

1.7 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 Division 15 specifications.

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 two 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 two 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 two 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 troubleshooting; 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 02316

FILL AND BACKFILL

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Filling, backfilling, and compacting for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.
B. Backfilling and compacting for utilities outside the building to utility main connections.
C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.2 RELATED SECTIONS
A. Section 02310 - Grading: Site grading.
B. Section 02315 - Excavation: Removal and handling of soil to be re-used.
C. Section 02318 - Rock Removal: Removal of rock during excavating.
D. Section 03300 - Cast-In-Place Concrete.

1.3 REFERENCES
A. Unless otherwise noted the most current issue of the reference shall be used.
B. Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction.
C. ASTM C 136 - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
D. ASTM D 698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3).
E. ASTM D 1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method.
F. ASTM D 2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.
G. ASTM D 2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).
H. ASTM D 2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).
I. ASTM D 3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth).

1.4 DEFINITIONS
A. Finish Grade Elevations: Indicated on drawings.
B. Subgrade Elevations: 6 inches below finish grade elevations indicated on drawings, unless otherwise indicated.
C. SOIL MATERIALS:
   1. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.
   2. Satisfactory Soil Materials: ASTM D2487 soil classification groups CL, GC GW, GP, GM, SW, SP, SC and SM, free of rock or gravel larger than 2 inches (50 mm) in any dimension, debris, waste, frozen materials, vegetation and other deleterious matter and as per AASHTO T180 and IDOT references above.
   3. Unsatisfactory Soil Materials: ASTM D2487 soil classification groups ML, MH, CH, OL, OH and PT and as per AASHTO T180 and IDOT references above.
   4. Subsoil Structural Fill: Select site excavated subsoil or approved off-site imported inorganic materials meeting the following requirements:
      a. Graded
      b. Free of lumps or rocks greater than three inches in size.
      c. Free of roots and other organic materials.
      d. Conforming to ASTM D2487 group symbol CL.

SECTION 02316

FILL AND BACKFILL

1.5 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Samples: 5 lb sample of each type of fill; submit in air-tight containers to testing laboratory.
C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
   1. Test Reports: In addition to test reports required under field quality control, submit the following:
      a. Laboratory analysis of each soil material proposed for fill and backfill from on-site and borrowed sources.
      b. One optimum moisture-maximum density curve for each soil material.
      c. Report of actual unconfined compressive strength and/or results of bearing tests.
D. Compaction Density Test Reports.

1.6 PROJECT CONDITIONS

A. Provide sufficient quantities of fill to meet project schedule and requirements. When necessary, store materials on site in advance of need.
B. When fill materials need to be stored on site, locate stockpiles where designated.
   1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
   2. Prevent contamination.
   3. Protect stockpiles from erosion and deterioration of materials.
C. Verify that survey bench marks and intended elevations for the Work are as indicated.

PART 2 – PRODUCTS

2.1 FILL MATERIALS

A. General Fill: Satisfactory soil materials as noted in definitions above from Subsoil excavated on-site or from off-site source.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches except where permitted by sieve analysis, and debris.
   3. Free from all organic materials, roots, black dirt, shale and chert.
B. Structural Granular Fill - Fill Type IDOT Designation CA-1: Angular crushed stone, conforming to Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, Latest Edition. Free from Chats, Slag of any designation, Chert, Pit or Bank Run materials and Novaculite Gravel.
   1. CA-1 Composition passing sieve size and percentage under ASTM C 136: 3 inch 95 ± 5 %; 2 inch 60 ± 15 %; 1-1/2 inch, 50 ± 15; 1 inch, 3 ± 3 %.
   2. Free of organic material.
C. Concrete for Fill: Lean concrete.
D. Graded Granular Fill - Fill Type IDOT Designation CA-6: Angular crushed stone, conforming to Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, Latest Edition. Free from Chats, Slag of any designation, Chert, Pit or Bank Run materials and Novaculite Gravel.
   1. CA-6 Composition passing sieve size and percentage under ASTM C 136: 1-1/2 inch, 100% ; 1 inch, 95 ± 5 % ; 1/2 inch, 75 ± 15%; No. 4 , 43 ± 13%; No. 16, 25 ± 15; No. 200 8 ± 4%
E. Open Granular Fill - Fill Type IDOT Designation CA-7: Angular crushed stone; free of shale, clay, friable material and debris. Conforming to Illinois Department of Transportation (IDOT): Standard Specifications for Road and Bridge Construction, Latest Edition. Free from Chats, Slag of any designation, Chert, Pit or Bank Run materials and Novaculite Gravel.
   1. CA-7 Composition passing sieve size and percentage under ASTM C 136: 1-1/2 inch, 100%; 1 inch, 95 ± 5 %; 1/2 inch, 45 ± 15%; No. 4, 5 ± 5%.
F. Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter conforming to IDOT designation FA-1.

G. Topsoil - Fill Type ____: Topsoil excavated on-site or from off-site borrow.
   1. Graded and pulverized.
   2. Free of roots, rocks larger than 1/4 inch, subsoil, debris, large weeds and foreign matter.
   3. Conforming to ASTM D2487 Group Symbol OH.

2.2 ACCESSORIES

A. Geotextile Fabric: Non-biodegradable, woven conforming to IDOT Standard Specification for Road and Bridge Construction for intended use.

2.3 SOURCE QUALITY CONTROL

A. See Section 01400 - Quality Requirements, for general requirements for testing and analysis of soil material.
B. If tests indicate materials do not meet specified requirements, change material and retest.
C. Provide materials of each type from same source throughout the Work.
D. CA-7 shall NOT be substituted for CA-6 without exception. CA-7 is not considered to be a self-compacting material and must be compacted to meet or exceed project requirements.
E. Pea gravel shall not be substituted for FA-1 or any other aggregate material without express written permission of the Architect of Record--consultant approval is not sufficient.
F. The use of bank run, spherical aggregates, or other unspecified aggregate materials is strictly prohibited. No substitution shall be permitted.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Identify required lines, levels, contours, and datum locations.
B. See Section 02310 for additional requirements.
C. Verify subdrainage, damp proofing, or waterproofing installation has been inspected.
D. Verify structural ability of unsupported walls to support imposed loads by the fill.

3.2 PREPARATION

A. Scarify subgrade surface to a depth of 6 inches to identify soft spots.
B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill and recompact.
C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
D. If density or compaction requirements for subgrade cannot be achieved, disc, aerate and recompact subgrade for a minimum depth of 10 inches.
E. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

3.3 FILLING

A. Fill to contours and elevations indicated using unfrozen materials.
B. Employ a placement method that does not disturb or damage other work.
C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
D. Maintain optimum moisture content of fill materials to attain required compaction density.
E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 8 inches compacted depth.
F. General Fill: Place and compact material in equal continuous layers not exceeding 12 inches compacted depth.
G. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
H. Correct areas that are over-excavated.
   1. Other areas: Use fill required at specific location, flush to required elevation, compacted to minimum 95 percent Modified Proctor.

I. Compaction Density Unless Otherwise Specified or Indicated: As listed in Fill at Specific Locations.
J. Reshape and re-compact fills subjected to vehicular traffic.

3.4 FILL AT SPECIFIC LOCATIONS

A. Structural Fill at areas designated by Architect/Engineer:
   1. Use Fill Type CA-1.
   2. Maximum depth per lift: 6 inches, compacted.
   3. Compact to minimum 95 percent Modified Proctor.
B. Under Interior Slabs-On-Grade:
   1. Use graded Fill Type CA-6.
   2. Depth: minimum 6 inches compacted.
   3. Compact to 95 percent Modified Proctor.
C. At Foundation Walls, Footings, and foundation related items:
   1. Use Fill Type CA-6.
   2. Fill up to subgrade elevation.
   3. Maximum depth per lift: 12 inches, compacted.
   4. Compact each lift to 95 percent Modified Proctor.
   5. Do not backfill against unsupported foundation walls.
   6. Backfill simultaneously on each side of unsupported foundation walls until supports are in place.
D. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
   1. Bedding: Use open granular Fill Type CA-7. Fill to cover piping maximum of 18 inches above top edge of pipe or other items unless otherwise noted.
      a. Cover drainage piping with CA-7 for maximum 18 inches.
      b. Fill up to subgrade elevation with graded granular CA-6 in lifts not to exceed 8 compacted inches.
   2. Compact to 95 percent Modified Proctor.
E. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches except small diameter (2 inches or less) Polypropylene, Polyvinyl-flouridiene, polyethylene, polybutylene, and Chlorinated Polyvinyl Chloride (CPVC) piping where manufacturer does not permit angular stone:
   1. Under all paved areas and within 3 feet of paving:
      a. Bedding: Use Fill Type CA-7. Fill to cover piping 8 inches above top edge of pipe or other items unless otherwise noted.
      b. Cover with Fill Type CA-6.
      c. Fill up to subgrade elevation.
      d. Compact in maximum 8 inch lifts to 95 percent Modified Proctor.
   2. Under all landscaped areas:
      a. Bedding: Use Fill Type CA-7. Fill to cover piping 8 inches above top edge of pipe or other items unless otherwise noted.
      b. Cover with general fill.
      c. Fill up to subgrade elevation.
      d. Compact in maximum 12 inch lifts to 85 percent Modified Proctor.
F. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches where small diameter (2 inches or less) Polypropylene, Polyvinyl-flouridiene, polyethylene, polybutylene, and Chlorinated Polyvinyl Chloride (CPVC) piping is present and the manufacturer does not permit angular stone:
   1. Under all paved areas and within 3 feet of paving:
      a. Bedding: Use Fill Type FA-1. Fill to cover piping 8 inches above top edge of pipe or other items unless otherwise noted. Consolidate sand prior to placing CA-6 without restricting piping below.
      b. Cover with Fill Type CA-6.
      c. Fill up to subgrade elevation.
      d. Compact in maximum 12 inch lifts to 95 percent Modified Proctor at surface.
   2. Under all landscaped areas:
      a. Bedding: Use Fill Type FA-1. Fill to cover piping 8 inches above top edge of pipe or

other items unless otherwise noted.
b. Cover with general fill.
c. Fill up to subgrade elevation.
d. Compact in maximum 12 inch lifts to 85 percent Modified Proctor.

G. Base material under all paved areas:
1. Use Fill Type CA-6.
2. Depth: minimum as indicated on Drawings.
3. Compact in maximum 6 inch lifts to 95 percent Modified Proctor.

H. At Lawn Areas:
1. Use general fill.
2. Fill up to 6 inches below finish grade elevations.
3. Compact to 85 percent Modified Proctor.
4. See Section 02310 for topsoil placement.

I. Around all Underground structures unless otherwise noted:
1. Bedding: CA-7 Fill to cover piping 8 inches above top edge of pipe or other items unless otherwise noted.
2. Cover with Fill Type CA-6.
3. Fill up to subgrade elevation.
4. Maximum compacted depth of each lift: 8 inches.
5. Compact to 95 percent Modified Proctor.

3.5 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.
B. Top Surface of Filling Under Paved Areas: Plus or minus 1 inch from required elevations.

3.6 FIELD QUALITY CONTROL

A. See Section 01400 - Quality Requirements, for general requirements for field inspection and testing.
B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.
C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D 698 ("standard Proctor"), ASTM D 1557 ("modified Proctor"), or AASHTO T 180.
D. If tests indicate work does not meet specified requirements, remove work, replace and retest.
E. Frequency of Tests: 1 for each 2000 SF or fraction thereof per lift.
F. Proof roll compacted fill at surfaces that will be under paving in the presence of the Testing Agency, Owner, Architect and local municipality. Proof roll with fully loaded 6-wheel dump truck. Areas with 1 inch deflection or greater shall be scarified, aerated, dried, recompacted and retested. Contractor has the option to replace material in lieu of scarification, aeration, drying and recompaction at no cost to the owner.

3.7 CLEAN UP

A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water. Restore any vegetation to original condition.

END OF SECTION

SECTION 03200

CONCRETE REINFORCEMENT

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Reinforcing steel for cast-in-place concrete.
B. Supports and accessories for steel reinforcement.

1.2 RELATED SECTIONS
A. Section 02456 - Concrete-Filled Steel Piles: Reinforcement for pile foundations.
B. Section 02468 - Drilled Concrete Piers (Caissons): Reinforcement for drilled pier foundations.
C. Section 03100 - Concrete Forms and Accessories.
D. Section 03300 - Cast-In-Place Concrete.
E. Section 03386 - Post Tensioned Structural Concrete.
F. Section 04810 - Unit Masonry Assemblies: Reinforcement for masonry.

1.3 REFERENCES
A. Unless otherwise noted the most current issue of the reference shall be used.
B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International.
C. ACI 318 - Building Code Requirements For Reinforced Concrete and Commentary; American Concrete Institute International.
D. ACI SP-66 - ACI Detailing Manual; American Concrete Institute International.
E. ASTM A 82 - Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
F. ASTM A 184/A 184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement.
G. ASTM A 185 - Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
H. ASTM A 497 - Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
I. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
J. ASTM A 704/A 704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
K. ASTM A 767/A 767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement.
L. AWS D1.4 - Structural Welding Code - Reinforcing Steel; American Welding Society.
M. CRSI (DA4) - Manual of Standard Practice; Concrete Reinforcing Steel Institute.
N. CRSI (P1) - Placing Reinforcing Bars; Concrete Reinforcing Steel Institute.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements for submittal procedures.
B. Shop Drawings: Comply with requirements of ACI SP-66. Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
   1. Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in the State in which the Project is located.
C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
D. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

1.5 QUALITY ASSURANCE
A. Perform work of this section in accordance with CRSI (DA4), CRSI (P1), ACI 301, and ACI 318.
   1. Maintain one copy of each document on project site.
B. Welders' Certificates: Submit certifications for welders employed on the project, verifying AWS qualification within the previous 12 months.
C. Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in the state where the project is located.

PART 2 – PRODUCTS

2.1 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615/A 615M Grade 60 (420).
   1. Deformed billet-steel bars.
   2. Galvanized in accordance with ASTM A 767/A 767M, Class I.
B. Reinforcing Steel Mat: ASTM A 704/A 704M, using ASTM A 615/A 615M, Grade 60 (420) steel bars or rods, unfinished.
C. Stirrup Steel: ASTM A 82 steel wire, unfinished.
D. Welded Steel Wire Reinforcing (W.W.R.): ASTM A 185, plain type. Provide in sizes as shown on Drawings and in flat sheets. Roll stock is not permitted.
E. Reinforcement Accessories:
   1. Tie Wire: Annealed, minimum 16 gage.
   2. Bar Supports: Bolsters for spacing, supporting, and fastening reinforcing bars in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire precast concrete or fiber-reinforced concrete of greater compressive strength than concrete unless exceeded herein. Provide continuous length wire type bolsters with continuous sand plates for all slabs on grade. All support items in contact with vapor barrier system must have continuous plates so as to avoid puncture of the system during installation and over total life of structure.
   3. W.W.R. Supports: Chairs, for spacing, supporting, and fastening welded wire reinforcing in place. Provide continuous length wire type chairs with continuous sand plates for all welded wire reinforcing, placed in continuous rows maximum 4 feet on center or spaced sufficiently to support W.W.R. to intended position within concrete--plastic supports are not permitted for W.W.R. All support items in contact with vapor barrier system must have continuous plates so as to avoid puncture of the system during installation and over total life of structure.
   4. Bar and reinforcing Support Manufacturers:
      a. Dayton Richmond Concrete Accessories, Miamiburg, OH.
      b. Meadow Burke Products, Chicago, IL.
      c. Universal Form Clamp Co., Bellwood, IL.
      d. Substitutions: See Section 01600 - Product Requirements.
   5. Provide stainless steel, galvanized, or plastic coated steel components for placement within 1-1/2 inches of weathering surfaces.
   6. Joint Dowel Bars: Plain-steel bars, ASTM A615/A615M, Grade 60 (420). Cut bars true to length with ends square and free of burrs.
F. Reinforcing for concrete topping of precast concrete hollow core plank
   1. Woven wire fabric: 2 inch x 2 inch X 14 gauge, plain type, in flat sheets.

2.2 DELIVERY, STORAGE, AND PROTECTION

A. Properly label all bars with weatherproof tags to facilitate identification.
B. Store reinforcing steel on supports above ground level. Keep covered with tarpaulins.
C. Protect coated bars from damage to coating.

2.3 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.
B. Welding of reinforcement is not permitted unless indicated on drawings. If and when explicitly indicated, perform welding in accordance with AWS D1.4.
C. Locate reinforcing splices not indicated on drawings at point of minimum stress.
   1. Review locations of splices with Engineer.
   2. Minimize reinforcement splices.

PART 3 – EXECUTION

3.1 PLACEMENT

A. Place, support and secure reinforcement against displacement in accordance with CRSI. Do not deviate from required position.
B. Do not displace or damage vapor barrier for slabs on grade.
C. Accommodate placement of formed openings.
D. Lap welded wire fabric one full mesh at side and end laps and wire together.
E. Tie bars at all points where bars cross or as required by CRSI (P1).
F. Provide welded wire fabric in all interior concrete slabs on grade unless noted otherwise on plans.
G. Provide keys and dowels where the walls and other items are shown to be built integrally but are placed as separate pours. Use dowels of the same size and spacing as reinforcing but not less than 48 bar diameters embedment.
H. Splice reinforcing bars as required. Lap continuous reinforcing 48 diameters but not less than 18 inches.
I. Minimum Wall Reinforcing: Two No. 5 bars, continuous top and bottom, unless other sizes or quantities are indicated. Reinforcing bars shall be continuous around corners or corner bars shall be provided of the same size and spacing of reinforcing bars.
J. Prior to pouring concrete, check all reinforcing for contamination and clean as required.
K. Conform to applicable code and requirements of contract documents for concrete cover over reinforcement.
L. Tie bars at all points where crossed or as required by CRSI.
M. Provide welded wire fabric in all interior concrete slabs on grade unless noted otherwise on plans.

3.2 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 01400, will inspect installed reinforcement for conformance to contract documents before concrete placement.

END OF SECTION

SECTION 03300

CAST-IN-PLACE CONCRETE

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Slabs on grade.
B. Concrete elevator shaft walls and foundation walls.
C. Concrete curing.

1.2 RELATED SECTIONS
A. Section 01400 - Quality Requirements: Testing and inspection services.
B. Section 02316 - Fill and Backfill.
C. Section 03200 - Concrete Reinforcement.
D. Section 04810 - Unit Masonry Assemblies: Coordinate placement of vertical reinforcing.
E. Section 05120 - Structural Steel: Placement of anchor bolts.
F. Section 07130 - Sheet Waterproofing
G. Section 07900 - Joint Sealers.
H. Division 15 - Mechanical items for casting into concrete.
I. Division 16 - Electrical items for casting into concrete.

1.3 REFERENCES
A. Unless otherwise noted, the most current issue of references shall be used.
B. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International.
C. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete; American Concrete Institute International.
D. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International.
E. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International.
F. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International.
G. ACI 305R - Hot Weather Concreting; American Concrete Institute International.
H. ACI 306R - Cold Weather Concreting; American Concrete Institute International.
I. ACI 309R - Guide for Consolidation of concrete.
J. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International.
K. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
L. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete.
M. ASTM C 143/C 143M - Standard Test Method for Slump of Hydraulic-Cement Concrete.
N. ASTM C 173/C 173M - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
O. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete.
P. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
Q. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete.
R. ASTM C 1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
S. ASTM D 994 - Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
T. ASTM D 1751 - Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
U. ASTM E 1643-98 Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
V. COE CRD-C 572 - Corps of Engineers Specifications for Polyvinylchloride Waterstop; Corps of Engineers.

1.4 SUBMITTALS

A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Submit manufacturers' data on manufactured products.
C. Samples: Submit two, 12 inch x12 inch samples of vapor barrier materials and all accessories.
D. Samples: Submit two, 12 inch long samples of waterstops and construction joint devices.
E. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction for concrete accessories.
F. Project Record Documents: Contractor shall coordinate with all trades to accurately record the actual locations of all embedded utility lines, conduits, piping and other items that will be concealed from view upon completion of concrete work.
G. Mix Design: Submit concrete mix design for each type and strength of concrete determined by either laboratory trial mix or field test data in accordance with ACI 211.1 and ACI 301. Submit mix design at least 15 days prior to first pour.

1.5 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI 301 and ACI 318.
   1. Maintain one copy of each document on site.
B. Acquire cement from same source and aggregate from same source for entire project.
C. Follow recommendations of ACI 305R when concreting during hot weather.
D. Follow recommendations of ACI 306R when concreting during cold weather.
E. Concrete design mix shall test 15% higher than specified requirements.
F. Test concrete in accordance with Section 01400 - Quality Requirements.
G. All items in contact with vapor barrier system must have continuous plates so as to avoid puncture of the system during installation and over total life of structure.

PART 2 – PRODUCTS

2.1 FORMWORK

A. Comply with requirements of Section 03100.

2.2 REINFORCEMENT

A. Comply with requirements of Section 03200.
B. Bolsters and Chairs for reinforcing support: Comply with requirements of Section 03200 specifically for slab on grade applications.
   1. All support items in contact with vapor barrier system must have continuous plates so as to avoid puncture of the system during installation and over the total life of structure.

2.3 CONCRETE MATERIALS

A. Cement: ASTM C 150, Type I - Normal Portland type.
B. Fine and Coarse Aggregates: ASTM C 33.
C. Lightweight Aggregate: ASTM C 330.
D. Fly Ash: ASTM C 618, Class C or F.
E. Water: Clean and not detrimental to concrete.

2.4 ADMIXTURES

A. Air Entrainment Admixture: ASTM C 260.
B. Chemical Admixtures:
   1. ASTM C 494, Type A - Water Reducing.
   2. Other chemical admixtures may be used only when approved in writing by the Architect prior to use. Under certain conditions the Architect may consider the use of the following admixtures: ASTM C 494/C 494M, Type E - Water Reducing and Accelerating, Type F - Water Reducing, High Range, and Type G - Water Reducing, High Range and Retarding.

3. Do not use chemicals that will result in soluble chloride ions in excess of 0.1 percent by weight of cement.

2.5 VAPOR BARRIER

A. Acceptable products:
   1. Stego Wrap (15 mil) Vapor Barrier by Stego Industries (877) 464-7834 www.stegoindustries.com.
   2. Soco-Shield 15 mil. Vapor Barrier by Socopac (888) 276-2672 www.socoshield.com
   3. Moistop Ultra "A" 15 mil. Vapor Barrier by Fortifiber Building Products (800) 773-4777 www.fortifiber.com
   4. Premolded membrane with Plasmatic Core by W.R. Meadows 1-800-342-5976 www.wrmeadows.com
   5. Vaporguard by Reef Industries 1-800-231-6074 www.reefindustries.com
   6. Substitutions: NOT PERMITTED
B. Vapor Barrier Accessories: As recommended by the manufacturer for complete installation of vapor barrier placed over Granular Fill Material under Concrete Slabs as defined in Section 02316 - Fill and Backfill - and conforming to ASTM E 1643-98. Accessories include, but are not limited to:
   1. Seam Tape
   2. Pipe Boots
   3. Sealant or Mastic adhesive

2.6 CONCRETE ACCESSORIES

A. Reglets: Formed steel sheet, galvanized, with temporary filler to prevent concrete intrusion during placement.
B. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.
C. Bonding Agent: ASTM C 1059, Type II acrylic non-redispersable type.
D. Epoxy Bonding System: ASTM C 881, type as required by project conditions.
E. Non-Shrink Grout: ASTM C 1107; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.
   1. Minimum Compressive Strength at 48 Hours: 2,400 psi.
   2. Minimum Compressive Strength at 28 Days: 7,000 psi.
F. Moisture-Retaining Cover for slabs on grade: ASTM C 171; white burlap-polyethylene sheet.
G. Liquid Curing Compound: ASTM C 309, Type 1, clear or translucent.
H. Anchors to be cast into concrete: As outlined in Section 05120 - Structural Steel.

2.7 JOINT DEVICES AND MATERIALS

A. Waterstops: As defined in Section 03100 - Concrete formwork: FORMWORK ACCESSORIES
B. Joint Filler: Nonextruding, resilient asphalt impregnated fiberboard or felt, 1/2 inch thick and full depth of slab less 1/2 inch.
C. Construction Joint Devices: Integral extruded plastic; 0.0239 inch thick, formed to tongue and groove profile, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.
D. Sealant and Primer: As specified in Section 07900.

2.8 CONCRETE MIX DESIGN

A. Proportioning Normal Weight Concrete: Comply with ACI 211.1 recommendations.
B. Proportioning Structural Lightweight Concrete: Comply with ACI 211.2 recommendations.
C. Concrete Strength: Establish required average strength for each type of concrete on the basis of field experience, as specified in ACI 301.
D. Admixtures: Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer.

E. Concrete for Footings, Foundations and Walls:
   1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 3000 psi.
   2. Concrete weight: Normal (144 lbs. per cubic foot)
   3. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   4. Cement Content: Minimum 470 lb per cubic yard, maximum 517 per cubic yard.
   5. Water-Cement Ratio: Maximum 55 percent by weight.
   6. Total Air Content: 3 percent naturally occurring, per ASTM C 173.
   7. Maximum Slump: 3 inches, plus or minus 1 inch.
   8. Maximum Aggregate Size: 1 inch.
   9. Water reducing agent required.

F. Concrete for elevated slabs greater than 2 inches in thickness:
   1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: Refer to structural drawings.
   2. Concrete weight: Normal (144 lbs. per cubic foot)
   3. Water-Cement Ratio: Maximum 44 percent by weight.
   4. Cement Content: Minimum 470 lb per cubic yard, maximum 517 lb. per cubic yard.
   5. Total Air Content: Maximum 3 percent naturally occurring, per ASTM C 173.
   6. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   7. Maximum Slump: 3 inches plus or minus 1 inch.
   8. Maximum Aggregate Size: 1 inch.
   9. Water reducing agent required.

G. Slabs on Grade:
   1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: Refer to Structural drawings
   2. Concrete weight: Normal (144 lbs. per cubic foot)
   3. Cement Content: Minimum 470 lb. per cubic yard, maximum 517 lb per cubic yard.
   4. Water-Cement Ratio: Maximum 44 percent by weight.
   5. Total Air Content: Maximum 3 percent naturally occurring, per ASTM C 173.
      a. If air entrainment is added for workability, Water-Cement ratio shall be reduced to 40 percent by weight.
   6. Fly Ash Content: Maximum 15 percent of cementitious materials by weight.
   7. Maximum Slump: 3 inches plus or minus 1 inch.
   8. Maximum Aggregate Size: 1-1/2 inch gradations shall include sizes up to 1 inch.
   9. Water reducing agent required.

H. Concrete topping for precast concrete hollow core plank:
   1. Compressive Strength, when tested in accordance with ASTM C 39/C 39M at 28 days: 3000 psi.
   2. Concrete weight: Normal (144 lbs. per cubic foot)
   3. Cement Content: Maximum 470 lb per cubic yard.
   4. Water-Cement Ratio: Maximum 40 percent by weight.
      a. If air entrainment is added for workability, Water-Cement ratio shall be reduced to 40 percent by weight.
   5. Total Air Content: Maximum 3 percent occurring naturally, per ASTM C 173.
   6. Maximum Slump: 3 inches plus or minus 1 inch.
   7. Maximum Aggregate Size: 1/2 inch.
   8. Water reducing agent: required.

2.9 MIXING

A. Transit Mixers: Comply with ASTM C 94/C 94M.

B. Admixtures:
   1. Add acceptable admixtures as recommended in ACI 211.1 and at rates recommended by manufacturer. All admixtures must be approved prior to placing concrete.
   2. Use accelerating admixtures in cold weather only when approved by Architect. Use of admixtures will not relax cold weather placement requirements.

3. Use of calcium chloride is not permitted.
4. Use set of retarding admixtures during hot weather only when approved by Architect.
5. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify lines, levels, and dimensions before proceeding with work of this section.
B. Verify placement and compaction of granular fill for slab on grade applications prior to placement of vapor barrier. Compaction shall meet requirements of Section 02316 - Fill and Backfill as verified by the Testing Agency of Record.
C. Contractor shall coordinate with Division 15 and 16 trades and verify that all Mechanical, Electrical, Plumbing lines or other items placed are wholly within or below the CA-6 granular fill layer for slab on grade applications. Vapor Barrier may not be placed directly over any pipes, conduits or other items, but shall rest firmly on compacted granular fill.

3.2 PREPARATION

A. Formwork: Comply with requirements of Section 03200. Design and fabricate forms to support all applied loads until concrete is cured, and for easy removal without damage to concrete.
B. Where sheet waterproofing will be applied, chamfer corners of concrete on a 45 degree angle measuring minimum 1/2 inch along the full face of the corner.
C. Verify that forms are clean and free of rust before applying release agent.
D. Coordinate placement of joint devices with erection of concrete formwork and placement of form accessories.
E. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent in accordance with manufacturer's instructions.
F. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.3 INSTALLATION OF VAPOR BARRIER

A. Installation shall be in accordance with manufacturer's instructions and ASTM E 1643-98 unless exceed herein.
    1. Unroll Vapor Barrier with the longest dimension parallel with the direction of the pour.
    2. Lap Vapor Barrier over footings and seal to foundation walls.
    3. Overlap joints 6 inches and seal with sealant and seam tape.
    4. Seal all barrier penetrations including pipes, electrical conduit, reinforcing penetrations or other items with pipe boot made from Vapor Barrier and seam tape.
    5. Repair vapor retarder damaged during placement of concrete reinforcing. Repair with vapor retarder material; lap over damaged areas minimum 6 inches and seal watertight. The use of brick type reinforcing supports for W.W.F. is prohibited.
    6. Install compressible filler at slab perimeter and at all locations where slab meets vertical surface.
B. Remove all standing water from vapor barrier prior to placing concrete.
C. Notify Architect for review of vapor barrier installation a minimum of 48 hours prior to placing concrete. Contractor shall complete any remedial work required to comply with installations requirements as determined by the Architect.

3.4 INSTALLATION OF REINFORCING

A. Following placement of vapor barrier, install reinforcement in compliance with Section 03200 and ACI 301. All support items in contact with vapor barrier system must have continuous plates so as to avoid puncture of the system during installation and over total life of structure.

3.5 PLACING CONCRETE

A. Begin placing concrete within 60 minutes from the time truck leaves the concrete plant.
B. Place concrete in accordance with ACI 304R.
C. Do not add water to concrete during transport, delivery, at project site, or during placement unless approved by Architect.
D. Place concrete in a continuous operation and without segregation.
E. Placement of concrete requiring drops less than 10 feet may be by means of bottom discharge bucket, flexible drop chute, elephant-trunk, hopper or tremie, or free fall concrete may be used provided it is directed such that fall is vertical down the center of forms and reinforcing without hitting the sides, or reinforcement. Where a drop of more than 15 feet is required concrete must be pumped into place.
F. Consolidate concrete prior to the point in which the mechanical vibrator will not sink into the concrete by its own weight.
G. Consolidate concrete using a mechanical vibrator by inserting and withdrawing vertically at close uniform intervals, using a systematic pattern of vibration to ensure that all concrete has been adequately consolidated. When pouring multiple lifts, insert mechanical vibrator to a depth of penetrating the previous lift by minimum 6 inches. Use equipment and procedures as recommended by ACI 309R--Do not over consolidate. Do not allow vibrator to contact forms or reinforcing.
H. On surfaces where air void holes are objectionable, use additional vibration. Do not over vibrate.
I. Place concrete for floor slabs in accordance with ACI 302.1R unless exceeded herein.
J. Cold Weather Placement: Comply with ACI 306.1
K. Hot Weather Placement: Comply with ACI 305R.
L. Notify Architect not less than 48 hours prior to commencement of placement operations.
M. Ensure reinforcement, inserts, waterstops, embedded parts, and formed construction joint devices will not be disturbed during concrete placement.
N. Separate slabs on grade from vertical surfaces with joint filler.
O. Place joint filler in floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
P. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface. Conform to Section 07900 for finish joint sealer requirements.
Q. Install joint devices in accordance with manufacturer's instructions.
R. Install construction joint devices in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
S. Slabs on grade shall be placed in continuous strips as per ACI recommendations. The maximum pour area shall not exceed 3600 square feet. Allow 24 hours to elapse between the placement of adjacent strips. Pour in alternating strip pattern so that no two adjoining slabs are poured the same day.
T. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.
U. Place concrete continuously between predetermined expansion, control, and construction joints.
V. Do not interrupt successive placement; do not permit cold joints to occur. Provide construction joints at the termination of all pours.
W. Saw cut joints within 24 hours after placing. Use 3/16 inch thick blade, cut into 1/4 depth of slab thickness. If no spacing of joints is indicated on drawings, place joints at a maximum spacing of 15 feet in each direction.
X. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
Y. Screed floors and slabs on grade level, maintaining surface flatness within maximum 1/8 inch from a level plane.

3.6 PLACING GROUT

A. Mix non-shrink grout in accordance with manufacturer's instructions
   1. Do not mix more grout than can be placed in 20 minutes.
   2. Do not retemper grout.
B. Soak concrete surfaces to receive grout and remove free water just before placing grout. Pack grout to form a full grout bed without air pockets or cavities. Trowel smooth and splay neatly to 45 degrees.

3.7 CONCRETE TOPPINGS FOR PRECAST HOLLOW CORE PLANKS

A. Grout all panel seams and other items as put forth in Section 03415.
B. Prior to placing floor topping, remove deleterious material. Broom and vacuum clean.
C. Place required dividers, edge strips, reinforcing, and other items to be cast in.
D. Place reinforcing in accordance with Section 03200.
E. Place concrete floor toppings to required lines and levels.
   1. Place topping in checkerboard panels not to exceed 30 ft in either direction.
F. Screed toppings level, as outlined in Placing Concrete above.

3.8 CONCRETE FINISHING

A. Repair surface defects, including tie holes, immediately after removing formwork.
B. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas 1/4 inch or more in height. Provide finish as follows:
   1. Smooth Rubbed Finish: Wet concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.
   2. Grout Cleaned Finish: Wet areas to be cleaned and apply grout mixture by brush or spray; scrub immediately to remove excess grout. After drying, rub vigorously with clean burlap, and keep moist for 36 hours.
C. Where sheet waterproofing will be applied, contractor shall fill all voids in excess of 1/4 inch in diameter, remove all oil and form bond breaking material that may hinder adhesion of sheet waterproofing prior to installing waterproofing.
D. Concrete Slabs: Finish to requirements of ACI 302.1R, and as follows:
   1. Wood float surfaces that will receive quarry tile and terrazzo with full bed setting system.
   2. Steel trowel all other surfaces.
E. In areas with floor drains, maintain floor elevation at walls; pitch surfaces uniformly to drains at 1:50 nominal.
F. Do not sprinkle dry cement on surfaces to absorb water.

3.9 CURING AND PROTECTION

A. Comply with requirements of ACI 308 unless exceeded herein. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.
B. Apply evaporation retarder after floating to prevent premature surface setting under dry or windy conditions.
C. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.
   1. Normal concrete: Not less than 7 days.
   2. High early strength concrete: Not less than 4 days.
D. Formed Surfaces: Cure by moist curing with forms in place for full curing period of 7 days minimum. Where forms are removed prior to 7 day curing period, apply curing compound in two coats at right angles using application rate recommended by manufacturer.
E. Surfaces Not in Contact with Forms:
   1. Start initial curing as soon as free water has disappeared and before surface is dry. Keep continuously moist for not less than three days by saturated burlap.
   2. Begin final curing after initial curing but before surface is dry.
      a. Moisture-retaining cover: Seal in place with waterproof tape or adhesive.

F. Concrete slab curing:
   1. Wet cure all concrete slabs for a minimum of 7 days. Completely cover pour area with moisture retaining cover and protect against movement. Keep moisture retaining cover continuously moist for full 7 day period. Do not permit loading or partial loading caused by vehicle traffic or material placement during this curing period.
   2. In no case shall liquid curing compound be used where compound may be incompatible with floor finish materials. If the application of curing compound is questionable, the Contractor shall provide a review report by the finish materials manufacturer prior to the application of those materials to ensure that the proper moisture and other conditions exist and if any remedial work is required.

3.10 FIELD QUALITY CONTROL

A. An independent Testing Agency will perform field quality control tests, as specified in Section 01400.
B. Provide free access to concrete operations at project site and cooperate with appointed firm. Contractor must provide minimum 48 hours notice to testing agency and Architect prior to all concrete pours.
C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
E. Compressive Strength Tests: ASTM C 39/C 39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 50 cu yd or less of each class of concrete placed.
F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents. Record ambient temperature at time of concrete sampling.
G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C 143/C 143M.
H. The testing agency will perform the following:
   1. Obtain representative samples of fresh concrete in accordance with ASTM C 172.
   2. Three concrete test cylinders will be taken for every 50 cu. yds. of each class of concrete placed, but not less than one set of test cylinders for any day's placement.
   3. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.
   4. Perform compression strength tests. Break one cylinder at 7 days and two cylinders at 28 days.
   5. Perform one slump test for each 25 cubic yards of concrete or fraction thereof, but in no case less than two per each day of concrete pour, in accordance with ASTM C 143.
   6. Test for air entrainment, one test for each 50 cubic yards of concrete or fraction thereof, in accordance with ASTM C 231.
   7. If tests indicate concrete strengths below those required or visual defects indicate concrete of poor quality has been placed, additional tests shall be made and reported at the expense of the Contractor. Tests may be compression test on cored cylinders, ASTM C 42 and/or load tests as outlined in ACI 318.

3.11 DEFECTIVE CONCRETE

A. Test Results: The testing agency shall report test results in writing to Architect and Contractor within 72 hours of test.
B. Defective Concrete:
   1. Test samples not conforming to requirements or in-place concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
   2. Improper use or application of reinforcing accessories or other items that may compromise the integrity of the vapor barrier system.
   3. Improper placement of W.W.R. or other reinforcing.

C. Requirements for repair or replacement of defective concrete will be determined by the Architect. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
D. Provide sample area of patch, fill, touch-up, repair, or exposed concrete for approval of the Architect for each type of area requiring repair.
E. Excessive honeycombing or embedded debris in concrete is not acceptable. Notify Architect upon discovery.
F. Allow Architect to inspect concrete surfaces upon removal of forms and prior to backfilling or otherwise covering concrete.

END OF SECTION

SECTION 03356

CONCRETE FLOOR FINISHING

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Finishing slabs on grade and monolithic floor slabs.
B. Surface treatment with concrete hardener, sealer, and slip resistant coatings.

1.2 RELATED SECTIONS
A. Section 03300 - Cast-In-Place Concrete: Prepared concrete floors ready to receive finish.

1.3 REFERENCES
A. Unless otherwise noted the most current issue of the reference shall be used.
B. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International.
C. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on concrete hardener, sealer, and slip resistant treatment, including information on compatibility of different products and limitations.
C. Maintenance Data: Provide data on maintenance renewal of applied coatings.

1.5 QUALITY ASSURANCE
A. Perform Work in accordance with ACI 301.

1.6 DELIVERY, STORAGE, AND HAULING
A. Deliver materials in manufacturer's sealed packaging, including application instructions.

1.7 PROJECT CONDITIONS
A. Coordinate the work with concrete floor placement and concrete floor curing.

1.8 ENVIRONMENTAL REQUIREMENTS
A. Temporary Lighting: Minimum 200 W light source, placed 8 feet above the floor surface, for each 425 sq ft of floor being finished.
B. Do not finish floors until interior heating system is operational.
C. Temporary Heat: Ambient temperature of 50 degrees F minimum at concrete surface.
D. Ventilation: Sufficient to prevent injurious gases from temporary heat or other sources affecting concrete.

PART 2 – PRODUCTS – NOT USED

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that floor surfaces are acceptable to receive the work of this section.

3.2 FLOOR FINISHING

A. Finish concrete floor surfaces in accordance with ACI 301 and ACI 302.1R.
B. Wood float surfaces that will receive quarry tile, ceramic tile, or cementitious terrazzo with full bed setting system.
C. Steel trowel surfaces that will receive carpeting or resilient flooring.
D. Steel trowel surfaces that are scheduled to be exposed.
E. In areas with floor drains, maintain design floor elevation at walls; slope surfaces uniformly to drains at 1/8 inch per foot nominal.

3.3 FLOOR SURFACE TREATMENT

END OF SECTION

SECTION 03395

CURING, SEALING, AND HARDENING CONCRETE FLOORS

PART 1 – PRODUCTS

1.1 MANUFACTURERS

A. Acceptable Manufacturer: Curecrete Distribution, Inc; 1203 West Spring Creek Place, Springville, UT 84663. ASD. Tel: (800) 998-5664. Fax: (801) 489-3307. Email: techsupport@ashfordformula.com. www.ashfordformula.com

B. Substitutions: See Section 01600 - Product Requirements.

1.2 MATERIALS

A. Cure-Seal-Hardener: Ashford Formula; water-based chemically-reactive penetrating sealer and hardener, that seals by densifying concrete so that water molecules cannot pass through but air and water vapor can, while allowing concrete to achieve full compressive strength, minimizing surface crazing, and eliminating dusting.

1. Colorless, transparent, odorless, non-toxic, non-flammable.
2. Containing no solvents or volatile organic compounds.
3. USDA approved for food handling facilities.
4. Allowing traffic on floors within 2 to 3 hours, with chemical process complete within 3 months.
5. No change to surface appearance except a sheen developed due to traffic and cleaning.

B. Water: Clean, potable.

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 01400 - Quality Requirements: Testing laboratory services.
B. Section 04810 - Unit Masonry Assemblies: Installation of mortar and grout.
C. Section 08110 - Steel Doors and Frames: Grouting steel door frames installed in masonry.
D. Section 08110 - Steel doors and Frames: Grouting steel door frames.

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. Engineered Masonry: Type S.
   2. Masonry below grade and in contact with earth: Type S.
   3. Exterior, loadbearing masonry: Type M or S.
   4. Exterior, non-loadbearing masonry: Type M or S.
   5. Interior, loadbearing masonry: Type M or S.
   6. Interior, non-loadbearing masonry: Type N.
   7. Glass unit masonry: Type N or S.
   8. Pointing mortar: Prehydrated Type N with maximum 2 percent ammonium stearate or calcium stearate per cement weight.
B. Stain Resistant Pointing Mortar: One part Portland cement, 1/8 part hydrated lime, and two parts graded (80 mesh) aggregate, proportioned by volume. Add aluminum tristearate, calcium stearate, or ammonium stearate equal to 2 percent of Portland cement by weight.

C. Pointing Mortar For Glass Unit Masonry: ASTM C 270, Prehydrated Type M, using the Property Specification.
   1. Maximum 2 percent ammonium stearate or calcium stearate per cement weight.
   2. Beach sand aggregate.
D. Mortar for Stone: ASTM C 270, Property Specification.
   1. Setting mortar:
      a. Granite: Type S mortar.
      b. Limestone: Type N mortar.
      c. Marble: Type S mortar.
      d. Travertine: Type S mortar.
      e. Quartz-based stone: Type N mortar.
      f. Slate: Type S mortar.
   2. Pointing mortar:
      a. Granite: Type S mortar.
      b. Limestone: Type N mortar.
      c. Marble: Type N mortar.
      d. Travertine: Type N mortar.
      e. Quartz-based stone: Type N mortar.
      f. Slate: Type N mortar.
E. Colored Mortar: Proportion selected pigments and other ingredients to match Architect's sample, without exceeding manufacturer's recommended pigment-to-cement ratio.

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.

2.6 PRECONSTRUCTION TESTING

A. Testing will be conducted by an independent test agency, in accordance with provisions of Section 01400.

B. Mortar Mixes: Test mortars pre-batched by weight in accordance with ASTM C 270 or ASTM C 780 recommendations for preconstruction testing for compressive strength, consistency, mortar aggregate ratio, water content, air content and splitting tensile strength.
   1. Test results will be used to establish optimum mortar proportions and establish quality control values for construction testing.
C. Grout Mixes: Test grout batches in accordance with ASTM C 1019 procedures for compressive strength and slump.
   1. Test results will be used to establish optimum grout proportions and establish quality control values for construction testing.

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. An independent testing agency will perform field tests, in accordance with provisions of Section 01400.
   1. Tests and evaluation listed in this Article will be performed during construction for each 5000 square feet of wall area or fraction thereof.
B. Test and evaluate mortar in accordance with ASTM C 780 procedures.
   1. Test with same frequency as specified for masonry units.
C. Test and evaluate grout in accordance with ASTM C 1019 procedures.
   1. Test with same frequency as specified for masonry units.
D. 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 03200 - Concrete Reinforcement: Reinforcing steel for grouted masonry.
B. Section 04065 - Mortar and Masonry Grout.
C. Section 05120 - Structural Steel: accessories for masonry construction.
D. Section 05500 - Metal Fabrications: Loose steel lintels and fabricated steel items.
E. Section 06100 - Rough Carpentry: Nailing strips built into masonry.
F. Section 07212 - Board and Batt Insulation: Insulation for cavity spaces.
G. Section 07620 - Sheet Metal Flashing and Trim: Rigid Through-wall masonry flashings.
H. 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. Samples; submit three of each for review:
1. Inside, outside corners self-adhering rubberized flashing end dams and outside corners.
2. 2 inch x 6 inches wide x .015 inch thick stainless steel drip with hemmed edge.
3. 2 inch x 1-5/8 inch wide x .015 inch thick stainless steel drip with hemmed edge.
4. Sealant.
5. 12 inch long section of Termination bar.
6. Joint filler: full width x 6 inches long.
7. Preformed Control Joints: 6 inches long.
8. Weep/Cavity Vents: Manufacturer's full color range.
9. Anchors: submit each type of anchor required.
10. Facing Brick: submit bound units to illustrate color, texture, and extremes of color range and sizes.
11. Decorative Concrete Masonry units: submit bound units to illustrate color, texture, and extremes of color range.
12. Glazed Facing Brick: submit bound units to illustrate color, texture, and extremes of color range and sizes.
13. Structural Clay Facing Tile: submit bound units to illustrate color, texture, and extremes of color range and sizes.
D. 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 MOCK-UP

A. Construct a masonry wall as a mock-up panel sized 6 feet long by 4 feet high, which includes an exterior wall corner, flashing end dams and lap joints, window sill condition, cavity insulation with adhesive, mortar and accessories, all typical accessories, control joints with sealant, and structural backup.
B. Locate where directed.
C. Rebuild mock-up or non-conforming work within mock-up to meet intent of all specified components at the direction of the Architect.
D. Mock-up will be used as the standard of quality for all masonry installation on the project.

E. All work shall conform to the specifications and quality established in the mock-up panel.
F. Mock-up may not remain as part of the finished work.

1.7 PRE-INSTALLATION MEETING

A. Convene minimum one week before starting work of this section.
B. Construct Mock-up wall prior to pre-installation meeting.
C. Attendance:
   1. Contractor
   2. Mason contractor.
   3. Mason foreman.
   4. Architect.

1.8 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.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Cold Weather Requirements: Comply with ACI 530.1.
B. Maintain materials and surrounding air temperature to minimum 40 degrees F prior to, during, and 48 hours after completion of masonry work.
C. Do not build on frozen work.
D. Remove and replace all masonry work damaged by freezing.
E. Hot Weather Requirements: Comply with ACI 530.1.
F. Maintain materials and surrounding air temperature to maximum 90 degrees F prior to, during, and 48 hours after completion of masonry work.

1.10 EXTRA MATERIALS

A. See Section 01600 - Product Requirements, for additional provisions.
B. Provide 50 of each size, color, and type of glazed units for Owner's use in maintenance of project.

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. 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.

C. 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. Exterior Single Wythe Joint Reinforcement: Ladder type; ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/A 153M, Class B; 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.

F. Interior Multiple Wythe Joint Reinforcement: 3 Wire Ladder or truss type; spaced 16 inches on center vertically ASTM A 82 steel wire, mill galvanized to ASTM A 641/A 641M, Class 3; 0.1483 inch side rods minimum with 0.1483 inch cross rods and pintles; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

G. Exterior Multiple Wythe Joint Reinforcement: 3 Wire Ladder type; spaced 16 inches on center vertically ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/153M, Class B; 0.1483 inch side rods minimum with 0.1483 inch cross rods and pintles; width as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage on each exposure.

H. Exterior Adjustable Multiple Wythe Joint Reinforcement: Ladder type with adjustable ties or tabs spaced at 16 in on center ASTM A 82 steel wire, hot dip galvanized after fabrication to ASTM A 153/153M, Class B; 0.1483 inch side rods with 0.1483 inch cross rods and adjustable components of 0.1875 inch wire in compliance with ACI 530; width of components as required to provide not more than 1 inch and not less than 1/2 inch of mortar coverage from each masonry face.

1. Vertical adjustment: Not more than 2 inches.
2. Insulation Clips: Provide clips at tabs or ties designed to secure insulation against outer face of inner wythe of masonry.

I. Exterior Cavity Wall Multiple Wythe reinforcement: Contractor choice of Exterior Multiple Wythe joint reinforcing or Exterior Adjustable Multiple Wythe Joint Reinforcing placed at 16 inches on center and in compliance with ACI 530.1. Where a two piece (eye and pintle) adjustable system is used in the backup wythe, an additional ladder reinforcement is to be added to the face wythe one course above or below the 2 piece system and at 16 inches on center vertically and conforming to the characteristics of single wythe reinforcing.

J. 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.

K. Wall Ties: Corrugated formed sheet metal, minimum 7/8 inches x 7 inches x 0.065 inches thick, adjustable hot dip galvanized to ASTM A 153/A 153M, Class B.

L. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
1. Anchor plates: Not less than 0.075 inch thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
2. Wire ties: Triangular shape, 0.1875 inch thick.
3. Vertical adjustment: Not less than 3-1/2 inches.

M. Additional Anchors for Masonry to Structural Steel.
1. Vertical wide flange column - Flanges parallel to wall:
a. STRAP-TYPE COLUMN & WALL ANCHOR with CORRUGATED COLUMN ANCHOR WALL TIE: 1/8 inch x 7 inches long x 2 inches wide x 1-1/2 inch fold back with a 5/8 inch wide x 1 inch deep slot starting 1 inch from end. Wall tie 22 gage x 1 inch (25.4 mm) wide x 24 inches (610 mm) long. All components hot dip galvanized to ASTM A 153/A 153M, Class B-2.
2. Vertical wide flange column - Flanges perpendicular to wall:
a. TWISTED L-TYPE COLUMN & WALL ANCHOR (left and right) and 190-WT CORRUGATED COLUMN ANCHOR WALL TIE 1/8 inch x 1-1/4 inch wide x length with a 1-1/2 inch fold back with a twist to start length from inside of hook. Wall tie 22 gage x 1 inch wide x 24 inches long. All components shall be hot dip galvanized to ASTM A 153/A 153M, Class B-2.

2.4 FLASHINGS

A. Metal Flashing and receivers: As specified in Section 07620.

B. Flexible Flashing and accessories:
1. Acceptable Products and Manufacturers (Obtain all flashing materials and accessories from a single manufacturer):
a. Illinois Products Corp: IPCO Flashing; www.illinoisproducts.com.
b. Dur-O-Wal, Inc.: Dur-O-Barrier-44 Wall Flashing; www.dur-o-wal.com.
c. Grace Construction Products: Perm-A-Barrier Wall Flashing; www.na.graceconstruction.com
d. Hyload Inc.; www.hyload.com
e. Substitutions not permitted.
2. Wall Flashing: Consisting of minimum 26 mils of self-adhering rubberized asphalt waterproofing laminated to a 4 mil high density, cross-laminated polyethylene film. Provide a release paper to protect rubberized asphalt surface prior to installation.

3. Flashing End Dams: Preformed unit consisting of minimum 36 mils of self-adhering rubberized asphalt waterproofing laminated to a 4-mil high density, cross-laminated polyethylene film with 8-inch high legs (16 inch high legs if mortar net is used). Provide a release paper to protect rubberized asphalt surface prior to installation.
4. Inside and Outside Flashing Corners: Preformed unit consisting of minimum 36 mils of self-adhering rubberized asphalt waterproofing laminated to a 4-mil high density, cross laminated polyethylene film with 8-inch high legs (16 inch high legs if mortar net is used). Provide a release paper to protect rubberized asphalt prior to installation.
5. Level Change: Preformed unit consisting of minimum 36 mils of self-adhering rubberized asphalt waterproofing laminated to a 4-mil high density, cross laminated polyethylene film with 8-inch high legs (16 inch high legs if mortar net is used). Provide a release paper to protect rubberized asphalt prior to installation.
6. Flashing Primer / Substrate cleaner: Liquid; brush or roller applied; by same manufacturer as flashing.
7. Metal Drip Edge: 2-inch wide x 0.015-inch thick stainless steel strip with preformed drip and hemmed edge (1/4-inch drip at 45 degree angle) for all supported conditions.
8. Metal Drip edge preformed corners for 2-inch wide drip: same material as drip edge and as provided by drip edge manufacturer.
9. Metal Drip Edge: 6-inch wide x 0.015-inch thick stainless steel strip with preformed drip and hemmed edge (1/4-inch drip at 45 degree angle) for wherever flashing is unsupported across air space.
10. Metal Drip edge preformed corners for 6-inch wide drip: same material as drip edge and as provided by drip edge manufacturer.
11. Sealant for bedding drip edge: One component gun grade polyurethane sealant as specified in 07900.
12. Sealant for flashing edges corners and seams: mastic sealant as recommended by flashing Manufacturer and Compatible with flashing material.
13. Termination Bar 1/8 inches x 1 inch stainless steel with sealant ledge and predrilled pilot holes at 12 inches o.c
    a. Expansion anchors for termination bar: Material compatible with termination bar that will not cause galvanic action.

2.5 BOARD INSULATION

A. Rigid Insulation for Cavity Walls: As specified in Section 07212.

2.6 ACCESSORIES

A. Rigid insulation adhesive: as specified in section 07212.
B. Preformed Control Joints: Polyvinyl chloride material meeting ASTM D 2287 with a durometer hardness minimum of 80 when tested in conformance with ASTM D-2240. Provide with corner and tee accessories, fused joints.
    1. Manufacturers:
        a. Illinois Products Corp.; www.illinoisproducts.com.
        b. Dur-O-Wal Inc.; www.dur-o-wal.com.
        c. Heckmann Building Products, Inc; www.heckmannbuildingprods.com.
        d. Hohmann & Barnard, Inc; www.h-b.com.
        e. Substitutions: See Section 01600 - Product Requirements.
C. Frame installation contractor to provide bitumastic coating for all exterior door frames for the entire length of the frame prior to frame installation.
D. Joint Filler: Closed cell polyvinyl chloride; meeting ASTM D 1667 Type VE-41; oversized 50 percent to joint width; self expanding; 3 and 6 inch wide x maximum lengths available.
    1. Manufacturers:
        a. Illinois Products Corp.; www.illinoisproducts.com.
        b. Dur-O-Wal Inc.; www.dur-o-wal.com.
        c. Heckmann Building Products, Inc; www.heckmannbuildingprods.com.
        d. Hohmann & Barnard, Inc; www.h-b.com.

e. Substitutions: See Section 01600 - Product Requirements.

E. Weep/Cavity/Cell Vents: Molded PVC grilles, insect resistant.
   1. Manufacturers:
      a. Illinois Products Corp.; www.illinoisproducts.com.
      b. Dur-O-Wal Inc.; www.dur-o-wal.com.
      c. Heckmann Building Products, Inc; www.heckmannbuildingprods.com.
      d. Hohmann & Barnard, Inc; www.h-b.com.
      e. Substitutions: See Section 01600 - Product Requirements.

F. Cavity Drip/Insulation Retaining Ring: Molded PVC grilles, insect resistant. PVC clip-type retainer for rigid board insulation; attaches to loop wires on horizontal joint reinforcement
   1. Manufacturers:
      a. Illinois Products Corp.; www.illinoisproducts.com.
      b. Dur-O-Wal Inc.; www.dur-o-wal.com.
      c. Heckmann Building Products, Inc; www.heckmannbuildingprods.com.
      d. Hohmann & Barnard, Inc; www.h-b.com.
      e. Substitutions: See Section 01600 - Product Requirements.

G. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

H. Beam and Column Isolation Wrap: Contractor choice of closed cell Expanded Polyethylene, closed cell Neoprene or closed cell PVC. Minimum of ½ inch thick, continuous wrap provided in largest sheets available.
   1. Expanded Polyethylene:
      a. Structure: Closed cell
      b. Density: 1.5
      c. Compression Deflection (Force to compress 75% of original) (PSI at 25%): 6
      d. Water Absorption (% by Volume): 0.5
      e. Applicable Standard: ASTM D 1056 / D 624 / C 272
   2. Neoprene:
      a. Structure: Closed cell
      b. Density: 8 to 12
      c. Compression Deflection (Force to compress 75% of original)(PSI at 25%):2-5
      d. Applicable Standard: ASTM D 1056
   3. PVC:
      a. Structure: Closed cell
      b. Density: 3 to 5
      c. Compression Deflection (Force to compress 75% of original)(PSI at 25%): 12.5
      d. Applicable Standard: ASTM D 1667

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. Wetting of Brick: Wet brick prior to laying if the initial rate of absorption exceeds 30 g/30 sq. in. (g/194 sq. cm) per minute when tested per ASTM C 67. Allow units to absorb the water so they are damp but not wet at the time of laying.

B. Determine any adjustments in mortar mix to accommodate brick absorption and weather conditions necessary to produce appropriate bond to brick and to insure water-resistive wall construction.

C. Install and coordinate placement of metal anchors supplied for securing materials of other sections type, size, finish and spacing as indicated in the drawings and as required by ACI 530.

D. Determine requirements for temporary bracing of walls which require bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.
E. Consult and coordinate masonry work with other crafts to avoid future cutting and patching.
F. Provide column isolation wrap at all intersections of steel and masonry unless otherwise noted.

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 WEEPS (CELL VENTS)

A. Install weeps in cavity walls at 24 inches on center horizontally immediately above through-wall flashings for brick.
B. Install weeps in cavity walls at 32 inches on center horizontally immediately above through-wall flashings for CMU.
C. Install cell vents at head joints per manufacturer recommendations.

3.7 CAVITY WALL

A. Do not permit mortar to accumulate in cavity, at lintel locations, or at the bottom of cavity air space.
   1. Maintain cavity free from mortar droppings and other obstructions by utilizing one of the following:
      a. Provide daily monitoring of cleanouts and remove excess material to eliminate mortar dropping buildup.
      b. Provide pull up board in cavity to prevent mortar droppings in cavity when workmanship alone does not prevent mortar droppings.
      c. Provide cavity drainage board complying with no interior water intrusion when tested in accordance with ASTM E514.
B. Build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor barrier materials.
C. Fill in cleanouts and install weeps at brick and/or CMU units at cleanout locations when approved by Architect. Mortar color shall match surrounding units to the satisfaction of the Architect. Repoint as required to obtain proper color.

3.8 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.

3.9 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.

3.10 REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

A. Install horizontal joint reinforcement 16 inches on center.
B. Place masonry joint reinforcement in first and second horizontal joints above openings and the second horizontal joint below openings unless otherwise indicated on drawings. Extend minimum 16 inches each side of openings.
C. Place continuous joint reinforcement in first and second joint below top of walls.
D. All masonry wythes are to have continuous horizontal joint reinforcing at 16 inches on center vertically. Where a two piece (eye and pintle) system is used in the backup wythe an additional ladder reinforcement is to be added to the face wythe one course above or below the 2 piece system 16 inches on center vertically.
E. 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.
F. Provide continuity at corners and wall intersections by using prefabricated "L" and "T" sections. Cut and bend reinforcement units as directed by the manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures and other similar special conditions where continuity of reinforcement is interrupted.
G. Lap joint reinforcement ends minimum 6 inches.
H. Do not continue horizontal joint reinforcement through control and expansion joints.
I. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 24 inches horizontally and 24 inches vertically.
J. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.
K. Provide adjustable wall ties for exterior masonry over steel stud framing, corrugated wall ties are not permitted.
L. 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 24 inches horizontally and 24 inches vertically.
M. Masonry Back-Up: Embed anchors in masonry back-up to bond veneer at maximum 1.77 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 16 on center.
N. Stud back-Up: Secure adjustable veneer anchors to stud framed back-up and embed into masonry veneer at maximum 1.77 sq ft of wall surface per anchor. Place additional anchors at perimeter of openings and ends of panels, so maximum spacing of anchors is 16 on center.
O. Reinforce concrete masonry units of walls and partitions with deformed steel bars as indicated on the drawings.
P. Support and secure reinforcing bars from displacement. Maintain position within tolerances specified by ACI 530.1.
Q. Lap reinforcing bars splices minimum 48 bar diameters.

3.11 REINFORCEMENT AND ANCHORAGES – MULTIPLE WYTHE UNIT 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. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 24 inches horizontally and 24 inches vertically.
F. Reinforce stack bonded unit joint corners and intersections with strap anchors 16 inches on center.

3.12 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 4 inches into adjacent masonry and turn up at least 8 inches to form watertight pan at non-masonry construction. Turn flashing up 16 inches where mortar net is used.
   2. Provide prefabricated end dams at the extremities of all flashings at, above and below all openings except at changes in foundation or brick ledge level.
   3. Provide prefabricated flashing corners and elevation changes at all corners and changes in elevation where flashing is shown or required by this Specification.
   4. Provide stainless steel drip edge for all flashing and extend 1/4-inch beyond the vertical face of the masonry and lap 2 inches at flashing joints. Crimp or hem all exposed edges of drip edge to eliminate sharp edge prior to installation.
   5. Install all rigid flashing receivers as specified in Section 07620.
   6. Remove or cover protrusions or sharp edges that could puncture flashings.

B. Installation of Flexible Flashing:
   1. Extend flashing a minimum of 8 inches vertically and return into mortar joint for full width of face shell.
   2. Clean surface of the wall which is to receive the adhesive side of the flexible flashing material. Maintain surface free of dust, dirt, protrusions, and all foreign materials that would impair the bonding of the flexible flashing to the masonry. Allow surface of the wall to dry. Apply the specified flashing primer to all contact surfaces to receive wall flashing. Ensure that flashing material adheres directly to the surface of the wall and the drip edge and is free of void pockets.
   3. Install metal drip edge with a gun-grade sealant on the edges of the masonry foundation wall or structural steel. Extend the bent portion of the drip 1/4-inch beyond the face of the masonry. Maintain straight even length projections.
   4. Install flashing boots and end dams by removing the release paper and setting the items in place. Field trim ends as required to work with face wythe materials.
   5. Install the flashing over the metal drip edge and recess 1/4-inch from the vertical face of the masonry wall. Overlap the flashing segments and any flashing boots and end dams a minimum of 4 inches and install in a manner to direct the flow of water to the exterior and weepholes. Place a bead of sealant along the edge of all overlaps.
   6. Do not apply flexible flashing materials when the ambient temperature is below 25 degrees F. Do not allow flexible flashing materials to be exposed to direct sunlight for more than 30 days.
   7. Provide wide drip edge flashing wherever membrane flashing is unsupported across air space.
   8. Where counter-flashing receiver is required per drawings, install material provided by others.
   9. Provide termination bar with continuous sealant cap wherever top of flashing is not anchored in mortar joint. Provide a bead of sealant along the underside top edge of the flashing to ensure it does not start to peel away from the backup wall.
   10. Protect flashing from UV exposure: Provide Manufacturer approved protection for all flashing that may be exposed to UV radiation for a period of 30 days or more. For materials that have been exposed to UV radiation for more than 30 days, provide Manufacturer's written inspection report and approval that the materials in place will perform as intended. All materials not passing this inspection shall be removed and replaced at no additional cost to the Owner.
   11. Seal lapped ends and penetrations of flashing a minimum of 6 inches and seal watertight with mastic before covering with mortar.
   12. Extend flexible flashings to within 1/4 inch of exterior face of masonry

3.13 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.

3.14 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.

3.15 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.

3.16 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.

3.17 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.

3.18 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.

3.19 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01400.

3.20 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.

3.21 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.

3.4 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01400.
B. High-Strength Bolts: Provide testing and verification of field-bolted connections in accordance with AISC S329 testing at least 20 percent of bolts at each slip critical and direct tension connection. Bolts in non-slip critical or direct tension connections need not be tested, but visually checked for number of bolts and snugness.
C. Shear Connectors: In addition to visual inspection, field welded shear connectors shall be inspected and tested in accordance with AWS D1.1 for stud welding and the following:
D. Bend Test will be performed when visual inspections reveal either less than a continuous 360-degree flash or welding repairs.
E. Tests will be conducted on additional shear connectors when weld fracture occurs on shear connectors already tested, according to requirements of AWS D1.1.

F. The structural steel framing members shown on the contract drawings rely on other non-structural steel building components for final lateral strength and stability (previously referred to as a non-self-supporting frame by the AISC). The following portions of the AISC S303 "Code of Standard Practice for Steel Buildings and Bridges" , Section 7.10.1, shall be modified as follows:
   1. add the words "endeavor to" after the word shall.
   2. in paragraph (b), substitute the word "extraordinary" for the word "special".
   3. add paragraph (c) "However, the Owner's Designated Representative for Design shall not be responsible for lateral strength and stability support or bracing which is dependent upon the Contractors means and methods of construction".

G. The Contractor shall employ the services of a licensed structural Engineer if the Contractor is unable to assume complete responsibility for any and all temporary support and bracing as required by the Contractor's sequence, schedule and procedures of construction. Commencement of erection shall indicate that the contractor understands all temporary support and bracing requirements and assumes responsibility for maintaining the overall stability of the entire structure and of each individual component throughout construction and until such time that all structural work is complete in accordance with the contract documents. Furthermore, the steel fabricator shall indicate upon each shop drawing erection plan "This structure relies upon non-structural steel building components for final lateral strength and stability."

H. Welded Connections: Visually inspect all field-welded connections and test at least 20 percent of welds using one of the following:
   1. Radiographic testing performed in accordance with ASTM E 94.
   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.

END OF SECTION

SECTION 05310

STEEL DECK

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Acoustical roof deck.
B. Roof deck.
C. Composite floor deck.
D. Cellular floor deck.
E. Metal form deck.
F. Supplementary framing for openings up to and including 12 inches.
G. Deck Accessories.
H. Stud shear connectors.

1.2 RELATED SECTIONS
A. Section 03200 - Concrete Reinforcement.
B. Section 03300 - Cast-in-Place Concrete: Concrete topping over metal deck.
C. Section 03300 - Cast-in-Place Concrete: Placement of anchors for bearing plates cast into concrete.
D. Section 04810: Placement of anchors for bearing plates embedded in masonry.
E. Section 05120 - Structural Steel: Support framing for openings larger than 12 inches.
F. Section 05120 - Structural Steel: Steel angle concrete stops at deck edges.

1.3 REFERENCES
A. Unless noted otherwise most current issue of reference shall be used.
B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.
C. ASTM A 108 - Standard Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
D. ASTM A 123/A 123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
E. ASTM A 611 - Standard Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled.
F. AWS D1.1 - Structural Welding Code - Steel; American Welding Society.
G. AWS D1.3 - Structural Welding Code - Sheet Steel; American Welding Society.
H. FM P7825 - Approval Guide; Factory Mutual Research Corporation.
I. SDI (DM) - Publication No. 29, Design Manual for Composite Decks, Form Decks, Roof Decks and Cellular Floor Deck Systems with Electrical Distribution; Steel Deck Institute; Revision D.
J. SDI (DM) - Publication No. 29, Design Manual for Composite Decks, Form Decks, Roof Decks and Cellular Floor Deck Systems with Electrical Distribution; Steel Deck Institute.
K. SSPC-Paint 15 - Steel Joist Shop Primer; The Society for Protective Coatings.
L. SSPC-Paint 20 - Zinc-Rich Primers (Type I, "Inorganic," and Type II, "Organic"); The Society for Protective Coatings.
M. SSPC-Paint 25.1 - Zinc Oxide, Alkyd, Linseed Oil Primer for Use Over Hand Cleaned Steel; Society for Protective Coatings.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittals procedures.
B. Shop Drawings: Indicate deck plan, type and location of welds and fasteners, support locations, projections, openings, reinforcement, pertinent details, and accessories. Provide full dimensions for all openings and supports.
C. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.
D. Certificates: Certify that materials meet or exceed specified requirements.
E. Submit manufacturer's installation instructions.
F. Welders Certificates: Certify welders employed on the Work, verifying AWS qualification within the previous 12 months. Submit for Information only.

SECTION 05310

STEEL DECK

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this Section with minimum 5 years' of experience.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation and other damage during delivery, storage, and handling.
B. Cut plastic wrap to encourage ventilation.
C. Separate sheets and store deck on dry wood sleepers; slope for positive drainage.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Steel Deck:
   1. United Steel Deck, Inc: www.njb-united.com.
   2. Vulcraft/Nucor Corporation: www.vulcraft.com.
   3. Epic Metals Corporation: www.epicdeck.com
   4. Ungalvanized Steel Sheet: ASTM A 1008, Designation SS ASTM A 611.
   5. Substitutions: See Section 01600 - Product Requirements.

2.2 STEEL DECK

A. Acoustical Roof Deck: Non-composite type, steel sheet with plain vertical flute faces perforated with 1/8 inch diameter holes staggered 3/8 inch on center:
   1. Plain Steel Sheet: ASTM A 611, Grade 33, Type 1 ASTM A 611.
   2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
   3. Span Design: 3 spans maximum, unless otherwise noted on contract drawings.
   4. Minimum Metal Thickness, Excluding Finish:____ gage as indicated on contract drawings.
   5. Nominal Height: as indicated on the contract drawings in____ inches.
   6. Profile: Fluted; SDI WR.
   7. Side Joints: Lapped, screw fastened.
   8. End Joints: Lapped 2" minimum, welded or mechanically fastened.
B. Roof Deck: fluted steel sheet:
   1. Plain Steel Sheet: ASTM A 1008, Designation SS, Grade 33, Type 1 ASTM A 611.
   2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
   3. Span Design: 3 spans minimum; unless noted otherwise on the drawings.
   4. Minimum Metal Thickness, Excluding Finish: 22 gage.
   5. Nominal Height: 1-1/2 inch.
   6. Profile: Fluted; SDI WR.
   7. Side Joints: Lapped, screw fastened.
   8. End Joints: Lapped, welded, or mechanically fastened, minimum 2 inch lap.
C. Composite Floor Deck: Fluted steel sheet embossed to interlock with concrete:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
   2. Span Design: 3 spans minimum, unless noted otherwise on the contract drawings.
   3. Minimum Metal Thickness, Excluding Finish: 20 gage.
   4. Nominal Height: as indicated on the contract drawings.
   5. Profile: Fluted; SDI WR.
   6. Side Joints: Lapped screw fastened.
   7. End Joints: Butted, welded or mechanically fastened.

D. Cellular Floor Deck: Composite floor deck equipped with bottom flat sheet to form electrical raceways.
   1. Plain Steel Sheet: ASTM A 611.
   2. Primer: Shop coat of manufacturer's standard primer paint over cleaned and phosphatized substrate.
   3. Span Design:
   4. Minimum Metal Thickness, Excluding Finish: in gage as indicated on the contract drawings.
   5. Nominal Height: as indicated on the contract drawings in inches.
   6. Side Joints: Lapped, screw fastened.
   7. End Joints: butted welded or mechanically fastened.

E. Metal Form Deck: Corrugated sheet steel, with provision for ventilation of concrete:
   1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
   2. Minimum Metal Thickness, Excluding Finish: in gage as indicated on the contract drawings.
   3. Nominal Height: in inches and as indicated on the contract drawings.
   4. Side Joints: Lapped screw fastened.
   5. End Joints: Lapped, welded or mechanically fastened 2" minimum lap.

2.3 ACCESSORY MATERIALS

A. Bearing Plates and Angles: ASTM A 36/A 36M steel, unfinished.
B. Stud Shear Connectors: Made from ASTM A 108 Grade 1015 bars, headed stud type, cold finished carbon steel, AWS D1.1, Type B with arc shields.
C. Welding Materials: AWS D1.1.
D. Fasteners: Galvanized hardened steel, self-drilling self-tapping; corrosion resistant screws.
E. Powder Driven and Pneumatic Fasteners: Fasteners shall have knurled shank; minimum 1/2" diameter steel washer; electroplated zinc conforming to ASTM B633, Sc. Type III.; meet SDI design requirements. Hilti or an approved equal.
F. Weld Washers: Mild steel, uncoated, 3/4 inch outside diameter, 3/8 inch inside diameter. minimum 0.056 inch thick.
G. Side Lap Fasteners: Corrosion resistant hexagonal washer head, self-drilling carbon steel screws, No. 10 diameter minimum.
H. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
I. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, complying with VOC limitations of authorities having jurisdiction.
J. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to the deck.
K. Acoustical Insulation: Per manufacturer's Recommendations.

2.4 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips and cover plates, 20 gage minimum thick sheet steel; of profile and size as indicated; finished same as deck.
B. Sheet Metal Deck Accessories: Metal closure strips and cover plates, 20 gage minimum thick sheet steel; of profile and size as indicated or as recommended by SDI Publication No. 29; finished same as deck. The more astringent requirement shall prevail.
C. Wet concrete pour stops; A36 steel minimum sizes and shapes as indicated by SDI Publication 29 Pour Stop Selection Table, welded to substrate in accordance with SDI standards, or as indicated in the contract drawings. The more astringent requirement shall prevail.
D. Cant Strips: Formed sheet steel, 18 gage thick, 45 degree slope, 3 1/2 inch nominal width and height, flange for attachment.
E. Roof Sump Pans: 14 gage sheet steel, flat bottom bearing flange minimum 3 inches wide, sealed watertight.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.2 INSTALLATION

A. General
   1. Erect metal deck in accordance with applicable Specifications and Commentary in SDI Publication No. 29 and manufacturer's instructions. Align and level.
   2. On concrete and masonry surfaces provide minimum 4 inch bearing.
   3. On steel supports provide minimum 1-1/2 inch bearing.
   4. End Laps shall occur over supporting members only.
   5. Deck Attachment:
      a. Fasten deck to steel support members at ends and intermediate supports at 12 inches on center maximum, parallel with the deck flute and at each transverse flute using methods specified.
      b. Welding: Use 5/8 inch diameter fusion welds unless otherwise noted on contract drawings. Provide weld washers when recommended by manufacturer for gauge used.
      c. Weld deck in accordance with AWS D1.3.
      d. Mechanical Fastening: Screw fasteners, low velocity powder actuated fasteners or pneumatically driven fasteners may be provided in lieu of welding only after approval of Architect and Structural Engineer of Record.
   6. Install powder driven and pneumatic fasteners using a low velocity powder actuated tool or a pneumatic tool.
      a. The nail head stand-off shall be according to the manufacturer's recommendations and verified with an inspection gauge. The power level shall be determined by jobsite testing.
      b. Installation of fasteners shall be in accordance to design requirements and installed by an operator licensed by the manufacturer.
   7. At deck openings from 6 inches to 12 inches in size, provide 2 x 2 x 1/4 inch steel angle reinforcement. Place angles perpendicular to flutes; extend minimum two flutes beyond each side of opening and fusion weld or mechanically attach to deck at each flute. For openings larger than 12 inches comply with Section 05120 - Structural Steel.
   8. Where deck changes direction, install 6 inch minimum wide sheet steel cover plates, of same thickness as deck. Screw fasten 12 inches on center maximum.
   9. Cutting and fitting: Cut and neatly fit deck units and accessories around other work projecting through or adjacent to the decking as shown.
   10. At floor edges, changes in direction, and at all floor openings not previously mentioned install concrete stops upturned to top surface of slab as recommended by SDI publication Nop. 29, or as noted in the contract drawings, to contain wet concrete. The more astringent requirement shall prevail.
   11. Close openings above walls and partitions perpendicular to deck flutes with a double row of foam cell closures.
      a. Bottom flutes are not to be installed in any area where the roof is not watertight.
   12. Place metal cant strips in position and fusion weld.
   13. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
   14. Weld stud shear connectors through steel deck to structural members below.
   15. Do not use floor or roof deck units for storage or working platforms until permanently secured.
   16. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

B. Decks at Roofs
   1. Deck Fastening: Weld at 12" on center over all interior supports and 6" on center over all exterior supports unless a more restrictive spacing is indicated on contract drawings.
   2. Deck Sidelaps: Provide one sidelap screw per span unless a more restrictive spacing is indicated on contract drawings.

3. Place metal cant strips in position and screw fasten.
4. Position roof drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
5. Bottom flutes are not to be installed in any area where the roof is not watertight.

C. Decks at Floors
1. From Deck Fastening: fasten form deck to support members as indicated on contract drawings, but in no case less than the following:
   a. At sheet ends and end laps: fasten each sheet edge plus one intermediate (3 fasteners per sheet).
   b. Over intermediate supports: fasten each sheet edge (2 fasteners per sheet).
2. Composite Deck Fastening: fasten composite deck to support members as indicated on contract drawings, but in no case less than the following:
   a. At perimeter supports: fasten each rib for deck perpendicular to support and at 12 inches on center for deck parallel to support.
3. Deck Sidelaps: Provide one sidelap screw per span or 36 inches on center, whichever is smaller.
4. Provide weld washers when recommended by manufacturer for deck gauge used.
5. Place and secure special deep fluted sections for integral concrete bridging.
6. At floor edges, changes in direction, and at all floor openings not previously, mentioned install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.
7. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.
8. At cellular deck intended for electrical raceways level and align deck within 1/8 inch horizontally and vertically. Butt ends, allow for maximum 1/8 inch gap. Install sheet steel covers over gaps wider than 1/8 inch. Tape and seal joints watertight.
9. Position floor drain pans with flange bearing on top surface of deck. Fusion weld at each deck flute.
10. Weld stud shear connectors through steel deck to structural members below, where shown on contract drawings. Maximum spacing of studs or welds at interior supports shall be 16 inches.

3.3 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing agency to perform field quality-control testing.
B. Field welds and fasteners will be subject to inspection.
C. Fastening of decking is subject to inspection and testing. Expense of removing and replacing portions of decking for testing purposes will be borne by owner if fastenings are found satisfactory. Remove work to be found defective and replace with new acceptable work.
D. Shear connector stud welds will be inspected and tested according to AWS D1.1 for stud welding and as follows:
1. Shear connector stud welds will be visually inspected.
2. Bend tests will be performed if visual inspections reveal less than a full 360-degree flash or welding repairs to any shear connector stud.
3. Tests will be conducted on additional shear connector studs if weld fracture occurs on shear connector studs already tested according to AWS D1.1.

E. Impact fastener head stand-off shall be verified with an inspection gage
F. Testing agency will report test results promptly and in writing to Contractor and Architect.
G. Remove and replace work that does not comply with specified requirements.
H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

END OF SECTION

SECTION 05500

METAL FABRICATIONS

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Shop fabricated steel and aluminum items.
B. Fasteners
C. Bollards

1.2 RELATED SECTIONS
A. Section 03300 - Cast-In-Place Concrete: Placement of metal fabrications in concrete.
B. Section 04810 - Unit Masonry Assemblies: Placement of metal fabrications in masonry.
C. Section 09900 - Paints and Coatings: Paint finish.
D. Division 16 – Electrical light fixtures in canopy system

1.3 REFERENCES
A. Unless otherwise noted the most current issue of the reference shall be used.
B. ASTM A 36/A 36M - Standard Specification for Carbon Structural Steel.
C. ASTM A 500 - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
D. ASTM A 563- Standard Specification for Carbon and Alloy Steel Nuts.
E. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws and Studs.
F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; American Welding Society.
G. AWS D1.1 - Structural Welding Code - Steel; American Welding Society.
H. SSPC-Paint 15 - Steel Joist Shop Primer; Society for Protective Coatings.
I. SSPC-SP 2 - Hand Tool Cleaning; Society for Protective Coatings.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
   1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
C. Welders' Certificates: Submit certification for welders employed on the project, verifying AWS qualification within the previous 12 months.

1.5 QUALITY ASSURANCE
A. Design all work under the direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in Illinois.

PART 2 – PRODUCTS

2.1 MATERIALS - STEEL
A. Steel Sections: ASTM A 36/A 36M.
B. Steel Tubing: ASTM A 500, Grade B cold-formed structural tubing.
C. Plates: ASTM 36 / A 36M.
D. Floor plate: ASTM A283 / A 283M
E. Pipe: ASTM A 53/A 53M, Grade B Schedule 40, black finish.
F. Fasteners:
   1. General: Provide type 304 or 316 stainless steel fasteners for exterior use and zinc plated fasteners with coating compliant to ASTM B 633, Class Fe/Zn 5, where built into exterior walls.

2. Bolts and Nuts: Unless otherwise noted, provide regular hexagon-head bolts, ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with hex nuts, ASTM A 563 and flat washers where indicated.
3. Anchor Bolts: ASTM F 1554, Grade 36
4. Machine Screws: ASME B18.2.3.8M
5. Lag Bolts: ASME B18.2.1
6. Plain Washers: Round, carbon steel ASME B18.22.1
7. Lock Washers: Helical, spring type, carbon steel, ASME B 18.21.1
8. Expansion Anchors: Alloy group I stainless steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594

G. Bolts, Nuts, and Washers: ASTM A307 grade A with ASTM A563 hex nuts Provide galvanizing to ASTM A 152/A 153M for galvanized components.
H. Welding Materials: AWS D1.1; type required for materials being welded.
I. Shop and Touch-Up Primer: SSPC-Paint 15, complying with VOC limitations of authorities having jurisdiction.
J. Touch-Up Primer for Galvanized Surfaces: SSPC-Paint 20, Type I - Inorganic, complying with VOC limitations of authorities having jurisdiction.

2.2 MATERIALS - ALUMINUM

A. Extruded Aluminum: ASTM B 221 (ASTM B 221M), 6063 alloy, T6 temper.
B. Sheet Aluminum: ASTM B 209 (ASTM B 209M), 5052 alloy, H32 or H22 temper.
C. Aluminum-Alloy Drawn Seamless Tubes: ASTM B 210 (ASTM B 210M), 6063 alloy, T6 temper.
D. Aluminum-Alloy Bars: ASTM B 211 (ASTM B 211M), 6061 alloy, T6 temper.
E. Aluminum-Alloy Sand Castings: ASTM B 26.
F. Aluminum-Alloy Die Castings: ASTM B 85.
G. Bolts, Nuts, and Washers: Stainless steel alloy 304 or 316.
H. Welding Materials: AWS D1.1; type required for materials being welded.

2.3 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.
B. Fabricate items with joints tightly fitted and secured.
C. Continuously seal joined members by intermittent welds and plastic filler.
D. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
E. Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
F. Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.4 FABRICATED ITEMS

A. Ledge Angles, Shelf Angles, Channels, and Plates Not Attached to Structural Steel Framing: For support of metal decking; prime paint finish.
B. Lintels: As detailed; prime paint finish.
C. Bearing and Leveling Plates: As Detailed; Unfinished.

2.5 FINISHES - STEEL

A. Prime paint all interior steel items. Galvanize and paint all steel exposed to the exterior.
   1. Exceptions: Galvanize items to be embedded in concrete or masonry.
   2. Exceptions: Do not prime surfaces in direct contact with concrete, where field welding is required, and items to be covered with sprayed fireproofing.
B. Prepare surfaces to be primed in accordance with SSPC-SP2.
C. Clean surfaces of rust, scale, grease, mud and foreign matter prior to finishing.
D. Prime Painting: Two coats.
E. Galvanizing of Steel Members: Galvanize after fabrication to ASTM A 123/A 123M. Provide minimum 1.7 oz/sq ft galvanized coating.

F. Galvanizing of Non-structural Items: Galvanize after fabrication to ASTM A 123/A 123M requirements.

2.6 FINISHES - ALUMINUM

A. Exterior Aluminum Surfaces: Class I color anodized.
B. Interior Aluminum Surfaces: Class I color anodized.
C. Comply with AA DAF-45 for aluminum finishes required.

2.7 FABRICATION TOLERANCES

A. Squareness: 1/8 inch maximum difference in diagonal measurements.
B. Maximum Offset Between Faces: 1/16 inch.
C. Maximum Misalignment of Adjacent Members: 1/16 inch.
D. Maximum Bow: 1/8 inch in 48 inches.
E. Maximum Deviation From Plane: 1/16 inch in 48 inches.

PART 3 – EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

A. Clean and strip primed steel items to bare metal where site welding is required.
B. Supply setting templates to the appropriate entities for steel items required to be cast into concrete or embedded in masonry.
C. Coordinate the installation of all items in this section with other trades as required.

3.3 INSTALLATION

A. Install items plumb and level, accurately fitted, free from distortion or defects.
B. Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
C. Field weld components indicated on drawings.
D. Perform field welding in accordance with AWS D1.1.
E. Obtain approval prior to site cutting or making adjustments not scheduled.
F. After erection, prime welds, abrasions, and surfaces not shop primed or galvanized, except surfaces to be in contact with concrete.

3.4 ERECTION TOLERANCES

A. Maximum Variation From Plumb: 1/4 inch per story, non-cumulative.
B. Maximum Offset From True Alignment: 1/4 inch.
C. Maximum Out-of-Position: 1/4 inch**.**

END OF SECTION

SECTION 05531

GRATINGS AND FLOOR PLATES

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Formed metal floor, mezzanine, and stair tread gratings.

1.2 RELATED SECTIONS
A. Section 05500 - Metal Fabrications.

1.3 REFERENCES
A. Unless otherwise noted the most current issue of the reference shall be used.
B. NAAMM MBG 531 - Metal Bar Grating Manual; The National Association of Architectural Metal Manufacturers (ANSI/NAAMM MBG 531).

1.4 PERFORMANCE REQUIREMENTS
A. Design Live (Pedestrian) Load: Uniform load of 100 lb/sq ft minimum; concentrated load of 300 lbs.
B. Maximum Spacing Between Bars: To restrict pedestrian shoe heels.

1.5 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate details of component supports, openings, perimeter construction details, and tolerances.

PART 2 – PRODUCTS

2.1 MANUFACTURERS
A. Bar
   1. Inland Steel Co., Tennessee
   2. Ohio Gratings, Inc., Canton, OH 44706
   3. McNichols Co., Tampa, FL 33630-3300

2.2 MATERIALS
A. Aluminum for Lock Forming: ASTM B 221 (ASTM B 221M), extruded, shapes as indicated.
B. Cross Bars: ASTM B 211 (ASTM B 211M) solid bars.

2.3 ACCESSORIES
A. Fasteners and Saddle Clips: Stainless steel:

2.4 FABRICATION
A. Grating Type: NAAMM MBG 531, Pressure Locked Type.
B. Fabricate support framing for openings.
C. Top Surface: Non-slip.

2.5 FINISHES
A. Aluminum: Mill finish.
B. Non-Slip Surfacing: Aluminum oxide.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that opening sizes and dimensional tolerances are acceptable.
B. Verify that supports are correctly positioned.

3.2 INSTALLATION

A. Install components in accordance with manufacturer's instructions.
B. Place frames in correct position, plumb and level.

END OF SECTION

SECTION 06100

ROUGH CARPENTRY

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Structural floor, wall, and roof framing.
B. Floor, wall, and roof sheathing.
C. Preservative treatment of wood.
D. Fire retardant treatment of wood.
E. Miscellaneous framing and sheathing.
F. Telephone and electrical panel boards.
G. Wood nailers and curbs for roofing and items installed on roof.
H. Miscellaneous wood nailers and furring strips.

1.2 RELATED SECTIONS
A. Section 05500 - Metal Fabrications: Miscellaneous steel connectors and support angles for wood framing.
B. Section 06114 - Wood Blocking and Curbing
C. Section 07620 - Sheet Metal Flashing and Trim
D. Section 09260 - Gypsum Board Assemblies

1.3 REFERENCES
A. Unless otherwise noted the most current issue of the reference shall be used.
B. AFPA T10 - Wood Frame Construction Manual; American Forest and Paper Association.
C. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association.
D. AWPA C20 - Structural Lumber -- Fire Retardant Treatment by Pressure Processes; American Wood-Preservers' Association.
E. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce).
F. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce).
G. PRI - 400 - Performance for APA EWS I-Joists; The Engineered Wood Association.
H. PRL-501 - Performance Standard for APA EWS Laminated Veneer Lumber; The Engineered Wood Association.
I. F405 - APA Performance Rated Panels; The Engineered Wood Association.
J. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide technical data on wood preservative materials and application instructions.
C. Samples: For rough carpentry members that will be exposed to view, submit two samples 12 inches in size illustrating wood grain, color, and general appearance.
D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

1.5 QUALITY ASSURANCE
A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
B. Do not use split, warped, twisted or otherwise damaged or unacceptable members. All such members shall be removed from the site at the discretion of the Architect.
C. Do not use moisture damaged materials. All such materials shall be removed from the site at the discretion of the Architect.

1.6 QUALIFICATIONS

A. Design structural site fabricated trusses under direct supervision of a Professional Structural Engineer experienced in design of such trusses and licensed in the State in which the Project is located.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
B. Protect site fabricated trusses from warping or other distortion by stacking in vertical position, braced to resist movement.

PART 2 – PRODUCTS

2.1 SECTION INCLUDES

A. Grading Agency: Western Wood Products Association (WWPA).
B. Sizes: Nominal sizes as indicated on drawings, S4S.
C. Moisture Content: S-dry or MC19.
D. Stud Framing (2 x 2 through 2 x 6):
    1. Species: Douglas Fir-Larch.
    2. Grade: Select Structural.
E. Joist, Rafter, and Small Beam Framing (2 x 6 through 4 x 16):
    1. Machine stress-rated (MSR) as follows:
        a. Fb-single (minimum extreme fiber stress in bending): 1350 psi.
        b. E (minimum modulus of elasticity): 1,300,000 psi.
    2. Species: Douglas Fir-Larch.
F. Miscellaneous Blocking, Furring, and Nailers:
    1. Lumber: S4S, No. 2 or Standard Grade.

2.2 EXPOSED DIMENSION LUMBER

A. Grading Agency: Western Wood Products Association (WWPA).
B. Sizes: Nominal sizes as indicated on drawings, S4S.
C. Moisture Content: S-dry or MC19.
D. Stud Framing (2 x 2 through 2 x 6):
    1. Species: Douglas Fir covered as shown in drawings.
    2. Grade: Select Structural.
E. Joist, Rafter, and Small Beam Framing (2 x 6 through 4 x 16):
    1. Species: Douglas Fir.
    2. Grade: Select Structural covered as shown in drawings.

2.3 EXPOSED BOARDS

A. Moisture Content: Kiln-dry (15 percent maximum).
B. Surfacing: S4S.
C. Species: Douglas Fir.
D. Grade: No. 2, 2 Common, or Construction.

2.4 CONSTRUCTION PANELS

A. Sub-floor/Underlayment Combination: APA Rated OSB Stud-I-Floor.
    1. Exposure Class: Exposure 1.
    2. Span Rating: 16 inches.
    3. Thickness: 3/4 inches, nominal.
B. APA Rated OSB Sub-flooring:
    1. Exposure Class: 1.
    2. Span Rating: 32/16 inches.

C. Plywood Sub-flooring: PS 1, Grade C-D, Exposure I.
   1. Size: Nominal 3/4 inch in 4 foot by 8 foot sheets.
D. APA Rated OSB Roof Sheathing: Exposure 1, and as follows:
   1. Structural I.
   2. Span Rating: 24/16.
E. Plywood Roof Sheathing: PS 1, Grade C-D, Exposure I.
   1. Size: 3/4 inch nominal thickness in 4 foot by 8 foot sheets.
F. FAPA Rated OSB Wall Sheathing: Exposure 1, and as follows:
   1. Structural I.
   2. Span Rating: 24/16.
G. Plywood Wall Sheathing: PS 1, Grade C-D, Exposure I.
   1. Size: Nominal 1/2 inch in 4 foot by 8 foot sheets.
H. Miscellaneous Panels:
   1. Concealed Plywood: PS 1, C-C Plugged, exterior grade.
   2. Exposed Plywood: PS 1, A-D, interior grade.
   3. Electrical Component Mounting: APA rated sheathing, fire retardant treated.

2.5 ACCESSORIES

A. Fasteners and Anchors:
   1. Fasteners: Hot-dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
   2. Drywall Screws: Bugle head, hardened steel, power driven type, length three times thickness of sheathing.
   3. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete.
B. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.
C. Sill Gasket on Top of Foundation Wall: 1/4 inch thick, plate width, closed cell plastic foam from continuous rolls.
D. Sill Flashing: As specified in Section 07620.
E. Subfloor Glue: Waterproof, water base, air cure type, cartridge dispensed.
F. Building Paper: No. 30 asphalt felt.
G. Termite Shield: copper.

2.6 FACTORY WOOD TREATMENT

A. Fire Retardant Treatment: AWPA Treatment C20, Interior Type A Low Temperature (low hygroscopic), chemical treatment pressure impregnated; capable of providing a maximum flame spread/smoke development rating of 25 / 450.
B. Pressure Treatment of Lumber Above Grade: AWPA Treatment C2 using waterborne preservative to 0.25 lb/cu ft retention.
   1. Kiln dry after treatment to maximum moisture content of 19 percent.
   2. Treat wood in contact with roofing, flashing, or waterproofing.
   3. Treat wood in contact with masonry or concrete.
   4. Treat wood less than 18 inches above grade.
C. Pressure Treatment of Lumber in Contact with Soil: AWPA Treatment C2 using waterborne preservative designated in AWPA C2 as suitable for ground contact use to 0.4 lb/cu ft retention.

PART 3 – EXECUTION

3.1 FRAMING INSTALLATION

A. All framing shall be Platform type as put forth in AFPA T10- Balloon Framing is not permissible.
B. Unless otherwise noted, all framing members shall be spaced at 16 inch on center intervals and secured with a minimum of five 10d toenails or screws at the end of each member.
C. Install all framing members in compliance with detailing presented in AFPA T10 - Wood Frame Construction Manual- unless exceeded herein.

D. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.
E. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.
F. Install structural members full length without splices unless otherwise specifically detailed.
G. Install horizontal spanning members with crown edge up and not less than 1-1/2 inches of bearing at each end.
H. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed and comply with fasteners listed above.
I. Provide solid blocking at all joists and other framing in excess of 8 feet span. Provide solid blocking at 8 feet on center across all floor joists. Fit solid blocking at ends of joists over all supporting members.
J. Provide continuous double 2 inch by 4 inch stiffeners over all ceiling joists at 8 foot centers or at mid span for members less than 16 feet. Stiffeners shall by constructed of one flat 2 inch by 4 inch member, with one 2 inch by 4 inch member on edge and nailed to flat member and joists on 16 inch centers.
K. Provide solid blocking at framing in excess of 8 feet span and as detailed. Fit solid blocking at ends of members.
L. Fire blocking: install solid fire blocking of identical sized material to studs or joists between floors where balloon framing is encountered and over all supporting girders or beams.
M. Frame openings with two studs at each jamb for openings not exceeding 4 foot; Frame openings with three studs at each jamb for openings from 4 foot to 8 foot; Frame openings with 5 studs at each jamb for openings exceeding 8 foot; support headers on cripple studs at each end and at center to center spacing.
N. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.2 INSTALLATION OF ACCESSORIES AND MISCELLANEOUS WOOD

A. Place full width continuous sill flashings or termite shield under framed walls over sill gasket. Lap flashing joints 4 inches and seal.
B. Place sill gasket directly on cementitious foundation. Puncture gasket cleanly and fit tightly to protruding foundation anchor bolts.
C. Coordinate installation of LVL beams, wood decking, wood chord metal joists, glue laminated structural units, prefabricated wood trusses, and plywood web joists.
D. Install I-joists in compliance with manufacturer's recommended procedures unless exceeded herein. Provide continuous rim joists at outer edges of all joists both parallel and perpendicular to joists.
E. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.
F. Coordinate curb installation with installation of decking and support of deck openings.
G. See Section 06114 for installation of wood blocking and curbing for roof applications.

3.3 INSTALLATION OF CONSTRUCTION PANELS

A. Install telephone and electrical panel back boards made of plywood or other acceptable structural panels at locations indicated. Size back boards to be minimum 6 inches beyond size of telephone and electrical panels.
B. Sub-flooring/Underlayment Combination: Glue and nail to framing using minimum 2 1/2 inch long nails; staples are not permitted.
C. Sub-flooring: Glue and nail to framing using minimum 2 1/2 inch long nails; staples are not permitted.
D. Underlayment: Secure to sub-flooring with nails and glue.
    1. At locations where resilient flooring will be installed, fill and sand splits, gaps, and rough areas.

2. Place building paper between floor underlayment and sub-flooring.

E. Roof Sheathing: Secure panels perpendicular to framing members, with ends staggered and sheet ends over firm bearing.
   1. Use sheathing clips between roof framing members.
   2. Provide solid edge blocking between sheets.
   3. Screw panels to framing with galvanized screws; staples are not permitted.

F. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using nails or screws of minimum 2 inch length.
   1. Use plywood at building corners, for not less than 96 inches, measured horizontally.
   2. Place building paper horizontally over wall sheathing, weather lapping edges and ends.

3.4 SITE APPLIED WOOD TREATMENT

A. Apply preservative treatment compatible with factory applied treatment at site-sawn cuts, complying with manufacturer's instructions.

B. Allow preservative to dry prior to erecting members.

3.5 TOLERANCES

A. Framing Members: 1/4 inch from true position, maximum.

B. Surface Flatness of Floor: 1/8 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

C. Variation from Plane (Other than Floors): 1/4 inch in 10 feet maximum, and 1/4 inch in 30 feet maximum.

END OF SECTION

SECTION 06114

WOOD BLOCKING AND CURBING

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Roof nailers and curbs.
B. Blocking in wall and roof openings.
C. Preservative treatment of wood.
D. Concealed wood blocking for support of toilet and bath accessories, wall cabinets, wood trim, and all wall mounted items.

1.2 RELATED SECTIONS
A. Section 06100: Rough Carpentry.
B. Section 07620: Sheet metal flashing and trim.
C. Section 09260: Gypsum Board Assemblies.

1.3 REFERENCES
A. Unless otherwise noted the most current issue of the reference shall be used.
B. AWPA C2 - Lumber, Timber, Bridge Ties and Mine Ties -- Preservative Treatment by Pressure Processes; American Wood-Preservers' Association.
C. AWPA C20 - Structural Lumber -- Fire Retardant Treatment by Pressure Processes; American Wood-Preservers' Association.
D. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce).
E. PS 20 - American Softwood Lumber Standard; National Institute of Standards and Technology (Department of Commerce).
F. RIS (GR) - Standard Specifications for Grades of California Redwood Lumber; Redwood Inspection Service.
G. SPIB (GR) - Grading Rules; Southern Pine Inspection Bureau, Inc..
H. WCLB (GR) - Standard Grading Rules for West Coast Lumber No. 17; West Coast Lumber Inspection Bureau.
I. WWPA G-5 - Western Lumber Grading Rules; Western Wood Products Association.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide technical data on wood preservative materials.

1.5 QUALITY ASSURANCE
A. Lumber: Comply with PS 20 and approved grading rules and inspection agencies.
   1. Acceptable Lumber Inspection Agencies: RIS, SPIB, WCLB, and WWPA.
   2. Lumber of other species or grades, or graded by other agencies, is acceptable provided structural and appearance characteristics are equivalent to or better than products specified.
B. Plywood: Comply with PS 1.

PART 2 – PRODUCTS

2.1 DIMENSION LUMBER
A. Grading Agency: Western Wood Products Association (WWPA).
B. Sizes: Nominal sizes as indicated on drawings, S4S. Wood blocking for all wall mounted items shall be 2 x 6 inch nominal unless otherwise noted.
C. Moisture Content: S-dry or MC19.
D. Miscellaneous Blocking, Furring, and Nailers:
   1. Structural grade 1200fb Douglas Fir as defined in Section 06100.

2.2 CONSTRUCTION PANELS

A. Plywood Sheathing: PS 1, Grade C-D, Exposure I. Panels shall be treated as listed in the Factory Wood Treatment article of this section and as listed in the schedule.
B. All other panels as listed in Section 06100.

2.3 ACCESSORIES

A. Fasteners and Anchors:
   1. Fasteners: Hot-dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
   2. Anchors: Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Anchor bolt for anchorage into cavity walls.

2.4 FACTORY WOOD TREATMENT

A. Wood preservative pressure treatment: ACQ Type D preservative; retention level .25
   1. Kiln dry after treatment to maximum moisture content of 19 percent.
   2. Treat wood in contact with roofing, flashing, or waterproofing.
   3. Treat wood in contact with masonry or concrete.
   4. Treat wood less than 18 inches above grade.
B. Fire Retardant Treatment: AWPA Treatment C20, Interior Type, Class A, Low Hygroscopic, Chemically treated and pressure impregnated; capable of providing a maximum flame spread/smoke development rating of 25 / 450.

PART 3 – EXECUTION

3.1 PREPARATION

A. Examine all surfaces to receive parts of the work specified herein. Application or installation of materials constitutes acceptance of the substrate.
B. Verify all dimensions of in-place and subsequent construction and that it accurately fit this part of the work to other construction.
C. Protect lumber and keep under cover both in transit and at job site. Protect from dampness.

3.2 FRAMING

A. Set members level and plumb, in correct position.
B. Place horizontal members with crown side up.
C. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.
D. Coordinate curb installation with installation of decking and support of deck openings.
E. All wood blocking that is installed is to be temporarily protected form moisture utilizing 15 lb. roofing felt.
F. All wood blocking joints to be mitered @ 45 degrees, staggered, and screw fastened together.
G. Provide miscellaneous members as indicated or as required to support finishes, fixtures, specialty items, and trim.

3.3 INSTALLATION OF CONSTRUCTION PANELS

A. Sheathing: Secure with long dimension perpendicular to framing members, with ends over firm bearing and staggered, using screws.

3.4 SCHEDULES

A. Roof Blocking: S/P/F species, 19 percent maximum moisture content, pressure preservative treatment. Roof edge and roof related wood blocking.
B. Treated plywood: Roof edge and roof related conditions.
C. Miscellaneous wood blocking exterior: S/P/F species, 19 percent maximum moisture content, pressure preservative treatment.

D. Miscellaneous wood blocking interior: Provide wood blocking for support of toilet and bath accessories, wall cabinets, wood trim, and all other wall mounted items. Utilize material as listed in this section and in section 06100. Wood blocking for wall mounted items shall be minimum of 2 x 6 inch nominal dimensional lumber. Fasten wood blocking with minimum 2 screws each side into framing. Where conflicts occur, the more astringent requirement shall prevail.

END OF SECTION

SECTION 06200

FINISH CARPENTRY

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Finish carpentry items.
B. Hardware and attachment accessories.

1.2 RELATED SECTIONS
A. Section 06411 – Plastic Laminate Clad Casework.
B. Section 08211 - Flush Wood Doors.
C. Section 09900 - Paints and Coatings: Painting and finishing of finish carpentry items.

1.3 REFERENCES
A. Unless otherwise noted the most current issue of the reference shall be used.
B. ANSI A208.1 - American National Standard for Particleboard.
C. AWI (QSI) - Architectural Woodwork Quality Standards Illustrated; Architectural Woodwork Institute.
D. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association.
E. PS 1 - Construction and Industrial Plywood; National Institute of Standards and Technology (Department of Commerce).

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements for submittal procedures.
B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, accessories, to a minimum scale of 1-1/2 inch to 1 ft.

1.5 QUALITY ASSURANCE
A. Perform work in accordance with AWI Architectural Woodwork Quality Standards Illustrated, Custom grade.
B. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum three years of documented experience.

1.6 REGULATORY REQUIREMENTS
A. Comply with applicable code for fire retardant requirements.

1.7 DELIVERY, STORAGE, AND PROTECTION
A. Protect work from moisture damage.

1.8 PROJECT CONDITIONS
A. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
B. Coordinate the work with plumbing rough-in, electrical rough-in, and installation of associated and adjacent components.

PART 2 – PRODUCTS

2.1 LUMBER MATERIALS
A. Softwood Lumber: Poplar species, maximum moisture content of 6 percent; with vertical grain, of quality suitable for transparent finish.

2.2 SHEET MATERIALS
A. Softwood Plywood: PS 1 Grade A-B; Veneer core.
B. Particleboard: ANSI A208.1; composed of wood chips, sawdust, or flakes of medium density, made with waterproof resin binders; of grade to suit application; sanded faces.

2.3 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: NEMA LD 3, HGS; color as selected by Architect; textured, low gloss finish.
B. Low Pressure Laminate: Melamine; solid color, and matte surface texture.

2.4 ADHESIVE

A. Adhesive: Type recommended by laminate manufacturer to suit application.

2.5 FASTENERS

A. Fasteners: Of size and type to suit application; finish with wood filler in concealed and exposed locations.

2.6 ACCESSORIES

A. Wood Filler: Solvent based, tinted to match surface finish color.

2.7 FABRICATION

A. Shop assemble work for delivery to site, permitting passage through building openings.
B. Cap exposed plastic laminate finish edges with material of same finish and pattern.
C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs.

2.8 SHOP FINISHING

A. Sand work smooth and set exposed nails and screws.
B. Apply wood filler in exposed nail and screw indentations.
C. On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify adequacy of backing and support framing.
B. Verify mechanical, electrical, and building items affecting work of this section are placed and ready to receive this work.

3.2 INSTALLATION

A. Set and secure materials and components in place, plumb and level.
B. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim to conceal larger gaps.

3.3 PREPARATION FOR SITE FINISHING

A. Set exposed fasteners. Apply wood filler in exposed fastener indentations. Sand work smooth.
B. Site Finishing: Refer to Section 09900.

3.4 ERECTION TOLERANCES

A. Maximum Variation from True Position: 1/16 inch.
B. Maximum Offset from True Alignment with Abutting Materials: 1/32 inch.

END OF SECTION

SECTION 07115

BITUMINOUS DAMPPROOFING

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Bituminous dampproofing.

1.2 RELATED SECTIONS
A. Section 02316 - Fill and Backfill.

1.3 REFERENCES
A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing; 1994 (reapproved 2000).
B. ASTM D 1227 - Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing; 1995 (Reapproved 2000).
C. ASTM D 2822 - Standard Specification for Asphalt Roof Cement; 1991 (Reapproved 1997).
D. NRCA ML104 - The NRCA Roofing and Waterproofing; National Roofing Contractors Association; Fifth Edition.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide properties of primer, bitumen, and mastics.

1.5 QUALITY ASSURANCE
A. Perform work in accordance with NRCA Roofing and Waterproofing Manual.
B. Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years' experience.

1.6 ENVIRONMENTAL REQUIREMENTS
A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until dampproofing has cured.

PART 2 – PRODUCTS

2.1 MANUFACTURERS
A. Acceptable Manufacturers:
   1. Karnak Chemical Corp: www.karnakcorp.com.
   2. Mar-Flex Systems, Inc: www.mar-flex.com.
   3. W.R. Meadows, Inc: www.wrmeadows.com.
   4. Substitutions: See Section 01600 - Product Requirements.

2.2 COLD ASPHALTIC MATERIALS
A. Bitumen: Emulsified asphalt, ASTM D 1227; with fiber reinforcement (Type I or II).
B. Asphalt Primer: ASTM D 41, compatible with substrate.
C. Sealing Mastic: Asphalt roof cement, ASTM D 2822, Type I.

PART 3 – EXECUTION

3.1 EXAMINATION
A. Verify existing conditions before starting work.
B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of dampproofing system.
C. Verify that surfaces and site conditions are ready to receive work.
D. Verify items which penetrate surfaces to receive dampproofing are securely installed.

3.2 PREPARATION

A. Protect adjacent surfaces not designated to receive dampproofing.
B. Clean and prepare surfaces to receive dampproofing in accordance with manufacturer's instructions.
C. Do not apply dampproofing to surfaces unacceptable to manufacturer.
D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

3.3 PIPE PENETRATIONS

A. Flash pipe with pre-molded pipe flashings where installation is possible.
B. Where the molded pipe flashings cannot be installed, use field fabricated flashing techniques using uncured EPDM.

3.4 APPLICATION

A. Prime surfaces in accordance with manufacturer's instructions.
B. Apply bitumen with mop.
C. Apply bitumen in one coat, continuous and uniform, at a rate of ____ gal/100 sq ft per coat.
D. Seal items projecting through dampproofing surface with mastic. Seal watertight.

END OF SECTION

SECTION 07130

SHEET WATERPROOFING

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Sheet membrane waterproofing.
B. Cant strips and other accessories.
C. Drainage panels.

1.2 RELATED SECTIONS
A. Section 02316 - Fill and Backfill.
B. Section 03300 - Cast in Place Concrete
C. Section 07212 - Board and Batt Insulation: Insulation used for protective cover.

1.3 REFERENCES
A. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics
B. NRCA ML104 - The NRCA Roofing and Waterproofing Manual; National Roofing Contractors Association; Fifth Edition.

1.4 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data for membrane and surface conditioner.
C. Shop Drawings: Indicate special joint or termination conditions and conditions of interface with other materials.
D. Certificate: Certify that products meet or exceed specified requirements.
E. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and acceptable installation temperatures.
F. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 QUALITY ASSURANCE
A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual for rubberized-asphalt sheet system.
B. Membrane Manufacturer Qualifications: Company specializing in waterproofing sheet membranes with three years' experience.
C. Installer Qualifications: Company specializing in performing the work of this section approved by manufacturer.
D. Commence backfill operations immediately following installation of sheet waterproofing system, or follow Manufacturer's written recommendations for protecting sheet materials from UV radiation. If materials have been exposed to UV radiation for an extended period not recommended by manufacturer, contractor shall coordinate a review by the manufacturer's representative to determine if materials in place are viable for use or require replacement. This review shall be conducted prior to any backfilling operations. Contractor shall replace and pay for all materials determined to require replacement by the manufacturer's representative.

1.6 MOCK-UP
A. Construct mockup 100 sq ft of horizontal waterproofed panel; to represent finished work including internal and external corners.
B. Locate where directed.
C. Mockup may remain as part of the Work.

1.7 ENVIRONMENTAL REQUIREMENTS
A. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application and until liquid or mastic accessories have cured.

SECTION 07130

SHEET WATERPROOFING

1.8 WARRANTY

A. See Section 01780 - Closeout Submittals, for additional warranty requirements.
B. Correct defective Work within a five year period after Date of Substantial Completion.
C. Provide five year manufacturer warranty for waterproofing failing to resist penetration of water.
D. For warranty repair work, remove and replace materials concealing waterproofing.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturers:
   1. Carlisle Coatings and Waterproofing, Sapulpa, OK 74067
   2. Mirafi, Norcross, GA 30092
   3. Sarnafil Waterproofing Systems, Canton, MA 02021
   4. W.R. Meadows, Elgin, IL 60121
   5. Substitutions: See Section 01600 - Product Requirements.

2.2 MEMBRANE MATERIALS

A. "CCW-701 Sheet Membrane Waterproofing System" by Carlisle Coatings and Waterproofing.
B. "Miradri 800/861" by Mirafi.
C. "Waterproofing System 2000" by Sarnafil Waterproofing Systems.
D. "Sealtight Mel-Rol" by W.R. Meadows.

2.3 ACCESSORIES

A. Protection Board: Rigid insulation specified in Section 07212.
B. Drainage Panel: 3/8 inch thick formed plastic, hollowed sandwich.
C. Cant Strips: Premolded composition material.
D. Flexible Flashings: Type recommended by membrane manufacturer.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify substrate surfaces are durable; free of matter detrimental to adhesion or application of waterproofing system.
C. Verify items which penetrate surfaces to receive waterproofing are securely installed.

3.2 PREPARATION

A. Clean and prepare surfaces to receive waterproofing in accordance with manufacturer's instructions.
B. Do not apply waterproofing to surfaces unacceptable to membrane manufacturer.
C. Primer Apply primer at a rate recommended by manufacturer. Protect conditioner from rain or frost until dry.

3.3 INSTALLATION - MEMBRANE

A. Install membrane waterproofing in accordance with manufacturer's instructions.
B. Roll out membrane. Minimize wrinkles and bubbles.
C. Overlap edges and ends and seal by method recommended by manufacturer, minimum 3 inches; unless otherwise noted by manufacturer. Seal permanently waterproof.
D. Reinforce membrane with multiple thickness of membrane material over joints, whether joints are static or dynamic.
E. Weather lap joints on sloped substrate in direction of drainage. Seal joints and seams.
F. Install flexible flashings. Seal items penetrating through membrane with flexible flashings. Seal watertight to membrane.

G. Seal membrane and flashings to adjoining surfaces. Install termination bar at all edges. Install counterflashing over all exposed edges.

3.4 INSTALLATION - PROTECTION BOARD

A. Place protection board directly against membrane; butt joints. Scribe and cut boards around projections, penetrations, and interruptions.
B. Adhere protection board to substrate with compatible adhesive.

3.5 PROTECTION

A. Do not allow waterproofing membrane to be directly exposed to the elements for an extended period of time; per manufacturer's recommendations.

END OF SECTION

SECTION 07212

BOARD AND BATT INSULATION

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Board insulation and integral vapor retarder at cavity wall construction and perimeter foundation wall.
B. Protection Board insulation for sheet water proofing applications.
C. Batt insulation and vapor retarder in exterior wall, ceiling, and roof construction.
D. Batt insulation for filling perimeter window and door shim spaces and crevices in exterior wall and roof.

1.2 RELATED SECTIONS
A. Section 04810 - Unit Masonry Assemblies: Insulation for Cavity spaces.
B. Section 09260 - Gypsum Board Assemblies: Acoustic insulation.

1.3 REFERENCES
A. ASTM C578 - Preformed, Cellular Polystyrene Thermal Insulation.
B. ASTM C 665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2001.
C. ASTM D 2842 - Standard Test Method for Water Absorption of Rigid Cellular Plastics; 2001.
D. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2001.
E. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials; 2000.

1.4 SYSTEM DESCRIPTION
A. Materials of This Section: Provide continuity of thermal barrier at building enclosure.
B. Materials of This Section: Provide thermal protection to vapor retarder in conjunction with vapor retarder materials in Section 07260.

1.5 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide data on product characteristics, performance criteria, and product limitations, ASTM Test Compliance and data.
   1. Provide product data on all materials and accessories comprising a complete installation including but not limited to all adhesives, clips and other accessories.
C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.
D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.6 ENVIRONMENTAL REQUIREMENTS
A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

1.7 SEQUENCING
A. Sequence work to ensure fireproofing, firestop, vapor retarder, air barrier, and other related materials are in place before beginning work of this section.
B. Protection Board for Waterproofing: Provide complete installation of all waterproofing membrane, drainage and all related accessories. Allow Architect access to waterproofing for review prior to installing protection board or backfilling. Complete any remedial work as directed by Architect.

1.8 COORDINATION
A. Coordinate work under provisions of Section 01300
B. Coordinate the work with Section 07260 for installation of vapor retarder.

PART 2 – PRODUCTS

2.1 BOARD INSULATION MATERIALS

A. Extruded Polystyrene Board Insulation: Extruded polystyrene board with natural skin surfaces; with the following characteristics relative to application:
   1. Cavity wall applications; ASTM C 578 type IV.
      a. Board Size: 48 x 96 inch with 16 inch perforations for horizontal reinforcing applications.
      b. Board Thickness: 1-1/2 inches.
      c. Board Edges: Square.
      d. Thermal Resistance of 1 inch thickness at 25 degrees F: 5.6 minimum.
      e. Compressive Resistance: Min. 50 psi.
      f. Board Density: 1.6 lb/cu ft.
      g. Water Absorption, maximum: 0.3 percent, volume.
   2. Foundation or below grade applications; ASTM C 578 type VI.
      a. Board Size: 24 x 96 inch.
      b. Board Thickness: 2 inches.
      c. Board Edges: Square.
      d. Thermal Resistance of 1 inch thickness at 25 degrees F: 5.6 minimum.
      e. Compressive Resistance: 60 psi.
      f. Board Density: 1.8 lb/cu ft.
      g. Water Absorption, maximum: 0.3 percent, volume.
   3. Protection Board for Sheet Waterproofing below grade applications; ASTM C 578 type VI.
      a. Board Size: 48 x 96 inch or 24 x 96 inch.
      b. Board Thickness: 1/2 inches minimum.
      c. Board Edges: Square.
      d. Thermal Resistance of 1 inch thickness at 25 degrees F: 5.6 minimum.
      e. Compressive Resistance: 40 psi minimum for thickness stated.
      f. Board Density: 1.8 lb/cu ft.
      g. Water Absorption, maximum: 0.3 percent, volume.
   4. Manufacturers:
      a. Dow Chemical Co: www.dow.com.
      b. Owens Corning Corp: www.owenscorning.com.
      c. Pactiv Building Products formerly Tenneco Building Product 2907 Log Cabin Drive Smyrna, Georgia 30080-7013 800-241-4402 .
      d. Substitutions: See Section 01600 - Product Requirements.

2.2 MANUFACTURERS - ADHESIVES

A. As manufactured and recommended by insulation manufacturer.
B. Chem Rex, Inc., "Contact Brand PL300 Foam Board Adhesive."
C. Dacar Products, In., "Foamgrab PS."
D. Substitutions: Not permitted.

2.3 BATT INSULATION MATERIALS

A. Batt Insulation: ASTM C 665; preformed glass fiber batt; friction fit, conforming to the following:
   1. Manufacturers:
      a. CertainTeed Corporation: www.certainteed.com.
      b. Johns Manville Corporation: www.jm.com.
      c. Owens Corning Corp: www.owenscorning.com.
   2. Substitutions: See Section 01600 - Product Requirements.

2.4 ACCESSORIES

A. Sheet Vapor Retarder Type 1: Black polyethylene film for above grade application, 10 mil mil thick.
B. Tape: Bright aluminum self-adhering type, mesh reinforced and 2 inch wide.

C. Insulation Fasteners: Impaling clip of unfinished steel with washer retainer and clips, to be adhered to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify site conditions under provisions of Section 01300.
B. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation and adhesive.
C. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.2 BOARD INSTALLATION AT FOUNDATION PERIMETER

A. Adhere a 6-inch wide strip of polyethylene sheet over construction, control, and expansion joints with double beads of adhesive each side of joint.
B. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Full bed 1/8 inch thick.
C. Install boards horizontally on foundation perimeter.
D. Place boards to maximize adhesive contact.
E. Install in running bond pattern.
F. Stagger side joints.
G. Butt edges and ends tightly to adjacent boards and to protrusions.
H. Extend boards over control and expansion joints, un-bonded to foundation 8 inches on one side of joint.
I. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.
J. All Boards to extend a minimum of 24” below outside grade.

3.3 BOARD INSTALLATION AT CAVITY WALLS

A. Adhere a 6-inch wide strip of polyethylene sheet over expansion joints with double beads of adhesive each side of joint.
   1. Extend sheet full height of joint.
B. Install using adhesive recommended by insulation manufacturer for application. Apply adhesive to back of boards:
   1. Three continuous beads per board length.
   2. Full bed 1/8 inch thick.
C. Install boards to fit snugly between wall ties.
   1. Place membrane surface facing out, and tape seal board joints.
D. Install boards horizontally on walls.
   1. Place boards to maximize adhesive contact.
   2. Install in running bond pattern.
   3. Butt edges and ends tightly to adjacent boards and to protrusions.
   4. Place impale fastener locking discs.
E. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.4 PROTECTION OF UNFINISHED WORK

A. Do not permit work to be damaged prior to covering insulation.

3.5 BATT INSTALLATION

A. Install insulation and vapor retarder in accordance with manufacturer's instructions.
B. Install in exterior wall and roof spaces without gaps or voids. Do not compress insulation.
C. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

D. Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.
E. Install with factory applied vapor retarder membrane facing warm side of building spaces. Lap ends and side flanges of membrane over framing members.
F. Staple facing flanges in place at maximum 6 inches on center.
G. Tape seal butt ends, lapped flanges, and tears or cuts in membrane.
H. At metal framing, place vapor retarder on warm side of insulation; lap and seal sheet retarder joints over member face.
I. Tape seal tears or cuts in vapor retarder.
J. Extend vapor retarder tightly to full perimeter of adjacent window and door frames and other items interrupting the plane of the membrane. Tape seal in place.

3.6 PROTECTION OF FINISHED WORK

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

SECTION 07505

ROOFING REPAIRS

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. To provide EPDM (Modified Bitumen) flashing tie-ins and repairs on existing buildings, as shown on the drawings and as specified herein.
   1. Contractor to verify existing roof conditions prior to placing bid.
B. To provide all accessories/appurtenances for a complete repair as shown and specified.
C. To schedule the re-inspection of all existing warranted roof systems in which repair or modification work by the warranty holder to verify compliance with the manufacturers' requirements and continuance of the existing roof system warranty. Cost of same to be borne by the Roofing Contractor.

1.2 RELATED SECTIONS

A. Section 06114 – Wood Blocking and Curbing.
B. Section 07900 – Joint Sealers.

1.3 DEFINITIONS

A. Roofing System Manufacturer: Any of the manufacturers whose systems are specified under "Acceptable Systems" in this section and who hereinafter are called "manufacturer."

1.4 SUBMITTALS

A. Make all submittals in accordance with Section 01300.
B. Roofing Firm Endorsement: At least 3 business days prior to first project coordination meeting, submit roofing firm's name, address, telephone number and manufacturer's endorsement of roofing firm to Architect.
C. Submit written certification that the Roofing Contractor has been as approved applicator of specified roofing system for a period of 5 years or more.
D. Submit Contractor's written certification of licensing under the Illinois Roofing Industry Licensing Act.
E. Shop Drawings: Shop drawings shall represent standards and detailing as specified herein or as indicated in drawings. Manufacturer's standard shop drawings are not acceptable.
   1. Minimum scale: 3" = 1'-0" unless otherwise specified.
   2. Required details: New roof curb tie-in for each roofing system.
F. Product Data: Material safety and technical information sheets for all products being utilized.
   1. Insulation:
      a. Polyisocyanurate.
      b. Perlite.
      c. Perlite Cants.
G. Mechanical Fasteners:
   1. FM approved insulation fasteners and stress plates for each roof deck type.
   2. Screw fasteners.
H. On existing warranted roof systems:
   1. Copy of shop drawings sent manufacturer for review.
   2. Written certification from holder of warranty that modification will not impinge the integrity of the existing warranty.
I. Roofing Cement.
J. Roof Membrane:
   1. EPDM.
   2. Modified Bitumen.
K. Samples:
   1. Insulation: (3) pieces of manufacturer's sample.
   2. Roof membrane and flashing: (3) pieces of manufacturer's sample.

1.5 QUALITY ASSURANCE

A. Qualifications/Requirements of Roofing Contractor.
   1. Be certified by the State of Illinois in accord with the Illinois Roofing Industry Licensing Act, Senate Bill 1664, as amended.
   2. Contractor shall have a minimum of 5 years' experience in successfully applying the specified products and shall be certified by the specified products manufacturer to apply their roofing systems.
   3. On warranted roof systems, be an approved applicator of the system in question for 5 years minimum.

B. Application Qualifications: The application method shall be approved by the manufacturer of the roofing materials which are selected.

C. Roofing contractor is responsible for reviewing the MEP drawings and verifying the number and location of new roof curbs and penetrations to be installed through existing roof systems as well as roof curbs and penetrations being eliminated and removed requiring patching of the existing roof system.

1.6 PRE-INSTALLATION MEETING

A. Convene one week before starting work of this section.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Deliver all materials in manufacturer's original, unopened containers and rolls with all labels intact and legible. All products shall bear Underwriters' Laboratories (UL) label.

B. Deliver materials requiring fire resistance classification packaged with labels attached as required by label service.

C. Deliver materials in sufficient time and quantity to allow continuity of work and compliance with approved construction schedule.

D. Handle rolled goods so as to prevent damage to edges/ends.

E. Store all materials on clean raised platforms with weather-protective covering when stored outdoors.

F. Store rolled goods on end or as required by manufacturer.

G. Provide continuous protection of materials against damage or deterioration with breathable coverings. Coverings such as canvas, visqueen or other non-breathable coverings will not be acceptable.

H. Remove damaged or defective materials from site.

I. Roof Insulation:
   1. Store insulation on clean, raised platforms with weather-protective covering when stored outdoors.
   2. Provide continuous protection of insulation materials against wetting and moisture absorption.
   3. Once insulation has become wet, it shall be removed from the site and not be used in the work. Insulation which has become wet and has dried shall be removed from the site in the same manner as any wet insulation.

J. Comply with all fire and safety regulations.

K. Follow manufacturer's recommendations.

L. All materials shall be new.

M. All unprotected, moist, or otherwise damaged materials or products with evidence of moisture damage such as staining shall be removed permanently from the job.

1.8 PROJECT CONDITIONS

A. Environmental Requirements: (Except as otherwise authorized by Architect following the manufacturer's written request for variance):
   1. It shall be the Contractor's responsibility to verify existing and forecasted weather conditions. If inclement weather is anticipated during the work period, the Contractor shall take adequate precautions to ensure products applied to roofing and building interiors are protected from possible moisture damage/contamination.

2. Wind velocity limitations will be based on ability to remove existing roofing and apply products in specific manner. Special precautions may be necessary at times, due to excessive winds experienced by this region.
3. Special precautions will be required during application of new roofing products when ambient and/or wind chill temperatures are below 40 degrees F.
4. The roofing work shall be coordinated with the work of the Mechanical Contractor, including the Mechanical Contractor's anticipated schedule.
5. Roofing Contractor's project foreman shall attend the roofing repair pre-installation meeting.
6. Subcontractors shall integrate their schedules for the "on-roof' operations.

B. Protection:
1. Avoid heavy traffic on completed work.
2. Restore to original condition or replace work or materials damaged by any roofing operations.
3. Protect paving, grass, and building walls adjacent to hoists and kettles prior to starting work.
   a. Lap suitable protective materials at least 6inches.
   b. Secure protective coverings against the wind.
   c. Leave protective covering in place for duration of the roofing work.
   d. Repair any damage to existing conditions caused by work of this Section.
4. Provide protection of neighboring and adjacent existing roof areas during new construction. Repair and render watertight any damage to the existing roof systems and flashing during demolition and new construction.
5. Protect the existing roof systems flashing and roofing projections to remain during construction.
   a. Flashing that was damaged during removal shall not be reinstalled.
   b. Replace flashing of the same material for damaged flashing at no additional cost to the Owner.
6. Remove protection upon completion of the roofing work.
7. Do not walk across membrane immediately after installation.
8. Remove debris daily from the roof and minimize dust, dirt, and noise with proper equipment.
9. Provide a minimum of two (2) 15-pound minimum size fire extinguishers, utilizing ammonium phosphate agent at site of new roof application on the roof or wherever heating elements are utilized to raise temperature of roof materials.
10. The Contractor must take every precaution to prevent interior leakage, products from falling into interior, or other such occurrences. Installation of the roofing materials shall be accomplished in such a manner that bitumen drippage does not occur.
11. Contractor shall prevent access by the public to any materials, tools, or equipment during the course of the work. The Owner assumes no liability or responsibility whatsoever for any damage, theft, or other acts which occur to Contractor's material, products or equipment.
12. Contractor shall return all improvements on or about the property which are shown to have been altered, removed, or otherwise changed to conditions which have existed previous to starting work or better.
13. The Contractor shall notify the Owner if any seriously deteriorated structural member or roof deck is uncovered prior to placement of new roofing materials.
14. Existing Conditions: May not be shown on drawings. Some modification of details may be required to accomplish intent of documents. All modifications or adjustments are to be approved in advance by Architect. Prior to work, the Contractor shall:
   a. Ascertain to his satisfaction that all aspects of the specifications are workable as specified.
   b. Become completely familiar with all requirements and stipulations contained throughout all Contract Documents and specifications.

c. Verify the existing site conditions with respect to, but not necessarily limited to, the building accessibility, traffic/pedestrian flow, special safety considerations, all parked vehicles, attachment of the existing roofing/accessories, the building dimensions and roofing replacement impediment.

C. Sequencing/Scheduling: At First Project Coordination Meeting:
   1. Roofing Contractor:
      a. Shall provide detailed schedule of all roofing operations.
      b. Ensure that the Project Foreman attends meeting.
   2. Subcontractors shall integrate their schedules for the "on-roof" operations.

1.9 ENVIRONMENTAL REQUIREMENTS

A. Do not apply EPDM roofing membrane during inclement weather and/or ambient temperatures below 20 degrees F or above 95 degrees F.
B. Do not apply roofing membrane to damp or frozen deck surface.
C. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.
D. All SPM sealants and adhesives must be kept at 60 degrees F when the ambient temperature falls below 40 degrees.

1.10 WARRANTY

A. Contractor Guarantee:
   1. Contractor shall guarantee the installation of roofing and flashing under this contract to be watertight for a period of 2 years from the date of substantial completion of the roofing replacement project.
   2. Contractor shall make all repairs during this 2 year period to maintain a watertight roof in conformance with these specifications without additional cost to the Owner.
   3. Contractor shall repair, at his own expense, all the blisters, bubbles, bare spots, slippage of membrane, roofing and flashings and any other defects which are manifested as part of the Contractor's work within 2 years.
   4. Contractor shall respond within 48 hours after notification of leakage to the roof site. If he does not, the Owner shall have the right, without invalidating this guarantee, to make any temporary repairs required, in order to protect the building and its contents from any damage due to the roof leakage. The cost of same will be billed to the contractor.
   5. Conversely, upon diligent response of the Contractor to repair a reported roof leak, it is discovered that the leaks are due to faulty maintenance and/or operation of the building's equipment or accessories unrelated to the roof performance, then the Owner shall reimburse the Contractor for the fair value of the Contractor's time and expenses incurred to respond to a false leak report, not to exceed $100.00 for each occurrence.
B. Guarantee Period:
   1. This period shall be established as commencing from the date that the Architect inspects the repairs and finds them to be in compliance with the contract documents and written approval of same is obtained from holder of the warranty.
   2. The Roofing Contractor shall notify the Architect in writing when the roof is complete for a final inspection.
C. See Section 01780 - Closeout Submittals, for additional warranty requirements.

PART 2 – PRODUCTS

2.1 SINGLE PLY EPDM MEMBRANE SYSTEMS

A. Single Ply EPDM, loose-laid, ballasted systems utilizing 60 mil EPDM. Use one of the following:
   1. Carlisle Syntec Systems.
   2. Firestone Building Products.

2.2 MODIFIED BITUMEN MEMBRANE SYSTEMS

A. Modified bitumen membrane, minimum tensile strength of 200 p.p.i. at 0 degrees F. Use one of the following:
   1. Performance Roof Systems.
      a. Base Sheet: Derbibase.
      b. Interply Sheet: Derbigum GP.
      c. Cap Sheet: Derbicolor GP.
   2. U.S. Intec.
      a. Base Sheet: Intec modified base.
      b. Interply Sheet: BRAI/Flex 5.
      c. Cap Sheet: BRAI/Flex 170 FR.

2.3 MATERIALS

A. Bituminous Materials:
   1. Asphalt primer shall conform to ASTM D41-78 or an approved equal.
   2. Asphaltic plastic roof cement shall conform to ASTM D2822-75.
   3. Elastomeric polymer asphalt sealant, two component, cold-applied conforming to ASTM D1850.
   4. Cold process asphalt adhesive shall conform to ASTM D2823.
   5. Hot applied, extra steep roofing asphalt shall conform to ASTM D312-78, Type IV.

B. Insulation: Shall comply with "Standard Specifications" as outlined by Thermal Insulation Manufacturers' Association (TIMA), and with Technical Bulletin No. 281-1 from the Roof Insulation Committee (RIC/TIMA).
   1. Tapered Polyisocyanurate: 1/8 inch per foot, 1/4 inch per foot, and 1/2 inch per foot taper; field verify thickness; facing compatible with roof system.
   2. Flat Rigid Board/Polyisocyanurate: Field verify to match existing facings compatible with roof system.
   3. Flat Rigid Board/Perlite: Facings compatible with roof system; thickness as indicated; preformed rigid mineral aggregate board composed of expanded perlite, cellulose binders and waterproofing agents that meet requirements of ASTM C728-82.
   4. Tapered Edge Strips/Cants:
      a. Cants, tapered edge strips, saddles/crickets, and the above required tapered insulation board system shall be preformed and rigid mineral aggregate board composed of expanded perlite, cellulose binders and waterproofing agents meeting the requirements of ASTM C-728-82.
      b. Cant Strips shall have a nominal 4 inches face or as required by the job conditions:
         1) Cant Strip Corp. of America.
         2) DeSoto Strip Supply Co.
         3) Approved equal.
      c. Tapered edge strips shall be a minimum of 1-1/2 inches thick, tapered to 0 inches on 18 inches wide panels or as is required by the job conditions.
         1) Cant Strip Corp. of America.
         2) DeSoto Strip Supply Co.
         3) Approved equal.
      d. All layers of insulation shall be classified UL Class "A" and FM approved Class "1". In addition, the total insulation system shall be installed per FM's "I-60/I-90" wind uplift criteria and "Loss Prevention Data Sheet".

C. Adhesive Materials:
   1. Surface Conditioner: Compatible with membrane, as recommended by membrane manufacturer.
   2. Membrane Adhesives: As recommended by membrane manufacturer.
   3. Insulation Adhesive: As recommended by insulation manufacturer.
   4. Thinner and Cleaner: As recommended by adhesive manufacturer, compatible with sheet membrane.

D. Accessories:

1. Prefabricated Roof Specialties: Refer to Section 15870.
2. Insulation Fasteners: Appropriate for purpose intended and approved by Factory Mutual and system manufacturer; length required for thickness of material with metal washers.
3. Sealants: As recommended by membrane manufacturer.
4. Stack Boots: Flexible boot and collar for pipe stacks through membrane by membrane manufacturer.
5. SPM Manufacturers Water Cut-Off Mastic: Provide as needed to sheet metal manufacturer.
6. Stone Ballast: Washed, round and smooth.
   a. Reuse existing stone ballast where applicable.
   b. ASTM D448, gradation size No. 4: 3/4 inches to 1-1/2 inches diameter with a majority of stone 1 inch in diameter.
   c. ASTM D448, gradation size No. 1: 1-1/2" to 3'1/2" diameter with a majority of the stone 2-1/2" in diameter.
   d. ASTM D448, gradation size No. 2: 1" to 2 1/2" diameter with a majority of the stone 2" in diameter.

PART 3 – EXECUTION

3.1 EXISTING ROOFING

A. At work areas indicated, remove all existing roofing system materials including the ballast, roof membrane, and base flashing. Remove insulation and vapor barrier to the existing roof deck where necessary to provide the work indicated.
B. Properly dispose of all roof debris to off-site location.
C. Protect surrounding areas from damage during construction.
D. At tie-in, do not remove more roofing than can be covered with new roofing at end of each day's work or prior to rain. Properly waterproof all areas prior to leaving the job site each day.
E. Do not leave any roof deck open overnight or during rain. Water damage caused by this work shall be borne by this contractor.
F. Coordinate with the General and Mechanical Contractors the cutting of existing roof membranes to install new curbs so as to render the same watertight, prior to leaving the job site each day. Mechanical Contractor to provide the Roofing Contractor with a schedule of new roof curb installation 5 days in advance of start of the work.
G. At tie-ins to the existing roof system with guarantees still in effect, Roofing Contractor shall:
   1. Prepare tie-in shop drawing.
   2. Contact holder of guarantee and verify the required information to be submitted.
   3. Submit shop drawings to the holder of guarantee for review.
   4. Submit to Architect the manufacturer's approved shop drawings and letter of certification from the guarantee holder verifying that the tie-in, if properly installed, will in no way affect or modify the existing guarantee.
   5. Contractor to pay for all inspections to maintain the guarantee.

3.2 EXISTING ROOF PREPARATION

A. Prior to installing new roofing tie-in, the Contractor shall inspect all existing rooftop conditions, including but not limited to, roof deck, accessories, units, drainage, penetrations, etc. Contractor shall verify the roof repair may be installed in strict accordance with the original design, manufacturer's current recommendations, and other pertinent codes and regulations.
B. The Contractor shall protect surrounding areas from damage during the roof removal. Provide 1/2 inch plywood walk boards on 1 inch expanded polystyrene insulation in traffic areas and surrounding all work areas of any trade. In addition take any other measures to prevent damage to roofing system by any trade.
C. Roofing materials shall not be applied when moisture in any form, such as dew, can be seen or felt on the surface to which the materials are to be applied.
D. Contractor shall not leave any roof deck open overnight or during rain. Water damage caused by this work shall be borne by this Contractor.

E. Existing Roof Surface Preparation (Modified Bitumen):
   1. Wire brush off the existing ceramic granules or aluminum coating 18 inches out from cut edge.
   2. Prime clean the existing modified bitumen.
F. Built-up Roofing:
   1. Completely spud back existing gravel ballast 18 inches around the entire curb or roof opening.
   2. Prime clean and spud the existing built-up roofing.
G. EPDM Roofing:
   1. Remove gravel ballast if present to 18 inches beyond curb dimension. Carefully remove gravel ballast, debris and dirt from area in which curb is to be installed. Sweep off build-up of residual debris. Sweep up debris, dirt, dust and deposit into garbage bag or suitable container to prevent it from blowing back onto the roof.
   2. Wash the existing EPDM membrane 18 inches out from the vertical plane to remove all accumulated debris. Scrub power washed membrane with a mixture of water and soap using a scrub brush. Thoroughly rinse.
   3. Splice wash the existing membrane.

3.3 INSPECTION

A. Roofing Contractor to receive from General Contractor a schedule of roof demolition five days prior to work. Roofing Contractor to coordinate demolition and installation with the General Contractor.
B. Verify that all work of subcontractors which penetrates the roof deck or requires traffic on roof deck has been completed.
C. Examine surfaces for inadequate anchorage, foreign material, moisture, unevenness or other conditions which would prevent execution and quality of installation of a specified roofing and flashing system and accessory items.
D. All surfaces shall be dry, smooth, and free of projections and holes that might rupture the membrane.
   1. Immediately before application of roofing, thoroughly clean the surface of dust and loose material.
E. Do not proceed with any work until all defects are corrected to the satisfaction of and with written approval of the roofing system manufacturer.
F. Inspect roof deck and roof edge conditions for defects or conditions that will affect the progress of roofing system manufacturer.

3.4 INSTALLATION

A. Manufacturer's Instructions:
   1. Install roofing repairs with flashing systems and all accessory items in strict accordance with the system manufacturer's printed instructions current at date of bidding documents and the manufacturer-approved shop drawings.
   2. When items of conflict arise between the manufacturer's recommendations and the contract documents, the more stringent will govern, unless it violates the manufacturer's warranty requirements.
B. Insulation:
   1. Install the new insulation to the height of existing insulation.
   2. Set insulation in solid mopping of hot steep asphalt.
   3. All insulation joints greater than 1/4 inch to be filled with insulation strips.
C. Base Flashing for Modified Bitumen Roofing Systems:
   1. Curb flashing shall be done using the longest pieces that are practical.
   2. All flashings and termination shall be done in accord with the manufacturer's standard details.
   3. Nail the top of the base flashing to the wood nailer strip at 4 inches on center with 1 inch hard roofing nails with 1 inch washer heads and termination strip. Cover with fabric mesh set in roofing cement.

4. In all cases, the stripping ply shall be installed on the bottom/base membrane ply of the multi-ply roofing systems at the end of each work day.
5. Stripping plies, "mopped and flopped," shall be set in place and in all cases shall be mechanically fastened to vertical wall in order to prevent slippage.

D. EPDM Base Flashing:
1. Install bonding adhesive to the roof curb and splice adhesive to the existing EPDM.
2. New 60 mil EPDM base flashing should be cut to fit, providing a 6 inch horizontal edge beyond the end of the cut edge of the existing membrane. Thoroughly clean on the side to receive adhesive with splice wash before applying adhesive.
3. Apply bonding adhesive to that portion of the flashing coming in contact with the curb. Apply the splice adhesive to areas coming in contact with EPDM and the securement strip.
4. Allow the adhesive to "flash-off". Perform finger-push test to verify readiness of adhesive to be bonded.
5. Two crew members (minimum) are to handle the new base flashing, folding in half vertically. Position on the top of the new base flashing horizontally, hand press into position. Slowly lower and roll the new membrane into position. Press into position with an open hand.
6. Position new base flashing so that it is tight to the substrate. Wrinkles are unacceptable.
7. Following installation of new 60 mil EPDM base flashing, roll all flashing with a rubber roller. For roof curbs, nail off new base flashing 4 inches on center with 1 inch cap head nails.
8. Thoroughly clean horizontal edge of the base flashing with splice wash.
9. Apply splice adhesive over edge of base flashing edge. Install SPM lap sealant into and over the edge of the base flashing.
10. Using an SPM lap sealant screed, tool lap sealant into and over the edge of the cover strip.
11. At base flashing laps, intersections with field seams are to be covered with uncured EPDM patches and/or cover strips to be cut to extend 3 inches beyond condition.
12. Following the Architect's inspection and approval and for a period of 48 hours for the SPM lap sealant to cure, re-install tongue and groove.

E. Modified Base Sheet Set in Steep Asphalt:
1. Embed base sheet in steep asphalt mopped to the entire surface of the prepared deck or insulation with steep asphalt at a rate of 20 pounds per 100 square feet or as recommended by modified bitumen membrane manufacturer.
2. All layers of roofing shall be laid free of wrinkles, creases or fishmouths. Sheets shall be laid directly behind the hot asphalt or cold adhesive applicator. Sufficient pressure shall be exerted on the roll during application to ensure prevention of air pockets.
3. Base sheet shall be installed dry on cant.

F. Interply Modified Bitumen:
1. Prior to installing interply sheet, unroll and allow to relax, re-roll and then install.
2. Install one ply of interply sheet over the base sheet utilizing heat welding.
3. Lap sheets 3 inches on side laps and 4 inches on end laps.
4. Lap base sheet ply 18 inches.
5. Off set end laps 24 inches minimum.

G. Modified Bitumen Cap Membrane:
1. Prior to installing ply, unroll and allow the ply to relax, re-roll and then install.
2. Install one ply of interply sheet down all valleys prior to installing field of modified bitumen.
3. Starting at the low areas, position membrane without stretching over the substrate utilizing maximum sizes recommended by the manufacturer in an approved layout.
4. Each ply shall be laid so that the flow of water is over or parallel to (but never against) the lap.
5. Position adjoining sheets in such a manner that the side laps overlap the lap of the underlying sheet 4 inches. End laps should overlap the underlying sheet by a minimum of 6 inches.
6. All end laps must be staggered at least 5’-0" apart.
7. All layers of roofing shall be laid free of wrinkles, creases or fishmouths. Sheet shall be installed utilizing heat welding. Sufficient pressure shall be exerted on roll during

application to ensure prevention of air pockets and produce 3/8 inches bleed out on side lap.

8. Loose ceramic granules, of matching color, shall be broadcast over bitumen. Bleed out excess bitumen seepage, spillage, etc., in order to maintain aesthetic quality of surfacing sheet.

H. Modified Bitumen Laps and Seams:
   1. Splice laps in accordance with manufacturer's written specifications. All the splicing and bonding surfaces shall be dry, clean, tight bonded, and sealed.
   2. Laps and seams to be fully adhered to lap surface and bead to form a smooth transition.

3.5 ADJUST AND CLEAN

A. Carefully inspect all completed work. Correct all defects.
B. Clean up mastic spills and spatterings. Remove all surplus materials.
C. Provide adequate protection of all completed work until the Substantial Completion. Prevent traffic, storage or movement of any materials/equipment on the completed roofing systems.
D. Clean up all rubbish, debris, surplus materials, tools, and equipment, and remove from site.
E. Provide 1/2 inch plywood walk boards on 1 inch expanded polystyrene insulation in areas of heavy traffic and take any other measures to prevent damage to roofing system by any trade.

END OF SECTION

SECTION 07620

SHEET METAL FLASHING AND TRIM

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Copings, flashings, counter-flashings, gutters, downspouts, fabricated sheet metal items, and fabricated sheet metal items, and through wall rigid flashings.
B. Reglets and accessories.

1.2 RELATED SECTIONS
A. Section 04810 - Unit Masonry Assemblies
B. Section 06100 - Rough Carpentry
C. Section 06114 - Wood Blocking and Curbing
D. Section 07505 – Roofing Repairs
E. Section 07900 - Joint Sealers.

1.3 REFERENCES
A. ASTM A 666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2000.
B. ASTM B 370 - Standard Specification for Copper Sheet and Strip for Building Construction; 1998.
C. ASTM D 226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 1997a.
D. SMACNA (ASMM) - Architectural Sheet Metal Manual; Sheet Metal and Air Conditioning Contractors' National Association; 1993, Fifth Edition.

1.4 DESIGN REQUIREMENTS
A. Sheet Metal Flashings: Comply with the criteria of SMACNA "Architectural Sheet Metal Manual." and Copper Development Association "Copper in Architecture - Handbook."]

1.5 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
C. Samples: Submit two full size samples, 12" inches long illustrating typical coping material and finish. Include continuous cleats, backer plates, cover plates and/or drive cleats.

1.6 SUBMITTALS AT PROJECT CLOSEOUT
A. Section 01700 - Execution Requirements Procedures for submittals.
B. Warranty: Submit manufacturer's 20 year material warranty. Ensure forms have been completed in Owner's name and registered with manufacturer.
C. Warranty: Submit contractor's two year workmanship warranty.

1.7 QUALITY ASSURANCE
A. Perform work in accordance with SMACNA Architectural Sheet Metal Manual requirements and standard details, except as otherwise indicated.
B. Maintain one copy of each document on site.
C. Fabricator and Installer Qualifications: Company specializing in sheet metal work with five years of documented experience.

1.8 PRE-INSTALLATION CONFERENCE
A. See Section 01300 - Administrative Requirements for additional requirements.
B. Convene one week before starting work of this section.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Section 01600 - Product Requirements: Transport, handle, store, and protect.
B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
   1. When material is stored on the roof it must be placed on ½" minimum plywood on 1" rigid insulation. Ends of plywood shall exceed end of sheet metal goods by 2'-0".
C. All field cutting of sheet metal performed over new roofing shall be permitted only where the new roof is protected by ½" minimum plywood on 1" rigid insulation.
D. Prevent contact with materials which may cause discoloration or staining.

1.10 PROJECT CONDITIONS

A. Project Coordination: Section 01300 - Administrative Requirements.
B. Coordinate with the work of Section 04810 for installing recessed flashing reglets and rigid through wall flashings.

1.11 WARRANTY

A. Section 01780 - Closeout Submittals
B. Sheet Metal Contractor to issue guarantee of workmanship to correct defective work within a two year period after Date of Substantial Completion. Defective work includes failure of water-tightness or seals and oil canning due to rupture restricted expansion/contractors or faulty workmanship.
C. Material warranty from the sheet metal manufacturer for a period of 20 years against deterioration of color, chalking and film integrity.

PART 2 – PRODUCTS

2.1 SHEET MATERIALS

A. Pre-Finished Galvanized Steel: ASTM A 653/A 653M, with G90/Z275 zinc coating; minimum 0.02 inch 24 gauge core steel, shop pre-coated with PVDF coating; color as selected by Architect from Manufacturer's standard range.
   1. PVDF (Polyvinylidene Fluoride) Coating: Superior Performance Organic Finish, AAMA 2605; multiple coat, thermally cured fluoropolymer finish system; color as scheduled.
B. Pre-Finished Aluminum Sheet: ASTM B 209 (ASTM B 209M), H005 alloy, H12 or H14 temper;.063 inch thick; plain finish shop pre coated with PVDF coating of color as selected by Architect from Manufacturer's standard range.
C. Stainless Steel: ASTM A 666 Type 304, soft temper, 0.015 inch thick; smooth No. 4 finish.
D. Copper: ASTM B370, cold rolled 20 oz/sq ft thick; natural finish.
E. Lead Coated Copper: ASTM B 101, 24 (7320) ounce-weight of bare copper, HOO (cold-rolled) temper.

2.2 ACCESSORIES

A. Fasteners: Same material and finish as flashing metal, with soft neoprene washers.
B. Underlayment: ASTM D 226, organic roofing felt, Type I ("No. 15").
C. Slip Sheet: Rosin sized building paper.
D. Primer: Zinc Molybdate type.
E. Protective Backing Paint: Zinc molybdate alkyd.
F. Sealant: Polyurethane type, manufactured by:
   1. Tremco: Dymeric
   2. Sonnoborn: NPI.

2.3 FABRICATION - GENERAL

A. Form sections true to shape, accurate in size, square, and free from distortion or defects.
B. Fabricate cleats of same material as sheet, minimum 3 inches wide, interlocking with sheet a minimum of 1/2 inch.
   1. Drill pilot holes at 4" o.c. for attachment to wood.
   2. Drill pilot holes at 6" o.c. for attachment to masonry or concrete.
C. All fastener locations will have predrilled pilot holes:
   1. Nails - 1/4" diameter @ 4" o.c.
   2. Screw Fasteners - 5/16" diameter @ 1'-0" o.c.
D. Form pieces in longest possible lengths.
E. Hem exposed edges on underside 1/2 inch; miter and seam corners.
F. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
G. Fabricate corners from one piece with minimum 24-inch long legs; welded for rigidity, seal with sealant and post finished to match adjacent finish..
H. Fabricate vertical faces with bottom edge formed outward 1/4 inch (6 mm) and hemmed to form drip.
I. Fabricate flashings to allow toe to extend 2 inches over roofing gravel. Return and brake edges.

2.4 GUTTER AND DOWNSPOUT FABRICATION

A. Gutters: Profile as indicated.
B. Downspouts: Rectangular profile, unless indicated otherwise.
C. Gutters and Downspouts: Size for rainfall intensity determined by a storm occurrence of 1 in 5 years in accordance with SMACNA Architectural Sheet Metal Manual.
   1. Fabricate gutters to profile and size specified in Design Requirements Article of this Section.
   2. Fabricate gutters to rectangular profile.
D. Accessories: Profiled to suit gutters and downspouts.
   1. Anchorage Devices: In accordance with SMACNA requirements.
   2. Gutter Supports: Brackets.
   3. Downspout Supports: Brackets.
E. Splash Pads: Precast concrete type, of size and profiles indicated; minimum 3000 psi at 28 days, with minimum 5 percent air entrainment.
F. Seal metal joints.

2.5 FACTORY FINISHING

A. PVDF coating: Multiple coat, thermally cured, fluoropolymer system conforming to AAMA 605.2.
B. Primer Coat: Finish concealed side of metal sheets with primer compatible with finish system, as recommended by finish system manufacturer.
   1. All metal materials to be delivered to the site with protective, strippable plastic film.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify existing conditions before starting work.
B. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
C. Verify roofing termination and base flashings are in place, sealed, and secure.
   1. Verify that surfaces to receive sheet metal are smooth and clean will not impinge upon the integrity of the sheet metal.
D. Verify that all wood blocking to receive sheet metal is properly installed, anchored without warps and covered with EPDM.

E. Do not start sheet metal work until conditions relevant to sheet metal work are acceptable. Commencing of work will indicate acceptance of condition.

3.2 PREPARATION

A. Install starter and edge strips, and cleats before starting installation.
B. Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.
C. Lay out joints to be symmetrical about the building corners. May require more than one run be cut down to attain symmetry.
D. Paint dissimilar metals with bituminous paint to form a complete barrier.

3.3 INSTALLATION

A. Secure flashings in place using concealed fasteners as indicated.
   1. Apply plastic cement compound between metal flashings and felt flashings.
      a. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles. Install work watertight, without buckles, warps, fastening stresses or distortion. Allow for expansion and contraction.
B. Apply plastic cement compound between metal flashings and felt flashings.
C. Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
D. Seal metal joints watertight.
E. Continuous Cleats: Set in water cut-off mastic supplied by the Roofing Contractor or sealant, as indicated in the drawings. Secure to the surface with nail fasteners through 1/4-inch predrilled pilot holes at 4-inch on center.
F. Verify that height of roof base flashing and termination bar allows for installation of counter-flashing and sealant below weep holes and through-wall flashing.
G. Copings: Set continuous cleat in a full bed of water cut-off mastic supplied by the roofing contractor. Cover roof edge with rosin paper. Set the outside and inside corners. Secure with ¾" x ¼" Atlas HHA stainless steel Type A point screw fasteners with neoprene washers that are covered with sealant, following Architect's approval.
   1. Lay out coping joints symmetrical about the building corners. May require multiple cutting at 10'-0" lengths to achieve same. Install backer plates at joint locations. Nail through predrilled 1/4-inch pilot holes. Apply continuous sealant to backer plate vertical and horizontal surfaces as indicated in drawings.
   2. Run joints at +10'-0", except where the cut pieces are required for symmetry between existing corners.
   3. Secure coping to continuous cleat and pull coping over roof edge wood block. Cut 10'- 0" lengths to size to provide symmetrical placement between existing building corners.
   4. Verify coping is tight to wood blocking. Anchor with 1-¼" x ¼" Atlas HHA stainless steel screw fasteners, Type A points with neoprene washers. Cover with sealant, following Architect's approval.
   5. Install sealant to each side of joints.
   6. Install drive cleat.
H. Fascias:
   1. Set continuous cleat in full bed of [sealant] water cut-off mastic supplied by Roofing Contractor. Secure with nails at 4" on center through ¼" pre-drilled pilot holes.
   2. Set the outside and inside corners. Secure with nails at 4" o.c. through ¼" pre-drilled pilot holes.
   3. Lay out fascia joints symmetrical about corners. May require multiple cutting to achieve lengths of 10'-0".
   4. Install backer plates at joint locations in full bed of water cut-off mastic supplied by the roofing contractor. Nail through pre-drilled pilot holes. Install bond breaker tape down the center, as indicated on drawings.
   5. Apply continuous sealant to backer plate vertical and horizontal surfaces as indicated in drawings.
   6. Apply continuous sealant to top of backer plate.

7. Running joints at +10'-0", except where the cut pieces are required for symmetry between the existing corners.
8. Secure fascia to continuous cleat and nail at 4" o.c. through 1/4-inch pre-drilled pilot holes.

I. Counter-flashing:
1. Overlap the base flashing a minimum of 3".
2. Install continuous butyl caulk tape to vertical portion of the counter-flashing.
3. Secure to the masonry with 1-¼" x 3/16" tapcons with climaseal corrosion resistive coating and neoprene washers at 1'-0" on center through 5/16" pre-drilled pilot holes. Cover with sealant following the Architect's approval.
4. Lap counter-flashing pieces 3" with bead of sealant and between pieces.
5. Cover fastener heads with sealant after the Architect's approval.
6. Fill sealant reservoir with sealant to shed water.
7. Counter-flashing Corner Pieces: Install pieces per Steps 1 through 6 in 3.3.P.. above.

J. End Wall Flashings:
1. Set in full bed of water cut-off mastic.
2. Secure with screw fasteners through ¼" pre-drilled pilot holes as indicated on drawings.
3. Coordinate installation with roofing contractor.
4. Have the roofing contractor flash in vertical flange of end wall flashing.
5. Install coping, or standing seam siding, over the end wall flashing by:
6. Secure to end wall flashing vertical flange and pulling coping over the roof edge wood blocking, or, securing to the continuous clip and laying against mansard

K. Thru Wall Flashing: Coordinate with masonry contractor.

L. Miscellaneous Flashings: Install as indicated on drawings.
1. Coordinate with interfacing contractors.

3.4 CLEANING

A. Leave material clean and free of stains.
B. Remove all sheet metal debris from roof top daily.
C. Remove all sheet metal debris from site daily.

3.5 FIELD QUALITY CONTROL

A. See Section 01400 - Quality Requirements, for field inspection requirements.
B. Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

3.6 SCHEDULE

A. Endwall flashings
B. Through-Wall Flashing in Masonry:
1. Material: Stainless Steel.

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:.
   2. With minimum 3 years' documented experience installing work of this type.
   3. Able to show at least 5 satisfactorily completed projects of comparable size and type.
   4. Licensed by authority having jurisdiction.
   5. Approved by firestopping manufacturer.

1.5 MOCK-UP
A. Install one firestopping assembly representative of each fire rating design required on project.
   1. Where one design may be used for different penetrating items or in different wall constructions, install one assembly for each different combination.
   2. Where firestopping is intended to fill a linear opening, install minimum of 1 linear ft.
B. If accepted, mock-up will represent minimum standard for the Work.
C. If accepted, mock-up may remain as part of the Work. Remove and replace mock-ups not accepted.

1.6 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 08800 – Glazing: Glazing sealants and accessories.
B. 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.

E. Type S5 - Concrete Paving Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Class 25, Uses T, I, M and A; single component.
1. Color: As selected by Architect from Manufacturer's full line of colors.
2. Applications:
a. Joints in sidewalks and vehicular paving.
b. Compressible filler joints adjacent to foundations.

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. Non-fire-rated steel doors and frames.
B. Steel frames for wood doors.
C. 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 DOORS

A. Exterior Doors:
   1. Grade: NAAMM HMMA 861, physical performance Level A.
      a. Minimum Hardware Reinforcing:
         1) Butts: #7 gauge steel.
         2) Locks: #12 gauge steel.
         3) Surface Applied Hardware: #12 gauge steel.
   2. Core: Foamed in place polyurethane.
   3. Top Closures for Out swinging Doors: Flush with top of faces and edges.
   4. Texture: Smooth faces.
   5. Finish: Factory primed, for field finishing.
   6. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer's standard coating thickness.
   7. Weatherstripping: See Section 08710 - Hardware

B. Interior Doors, Non-Fire-Rated:
   1. Grade: NAAMM HMMA 860, physical performance Level A.
      a. Minimum Hardware Reinforcing: Same as specified for exterior doors.
   2. Core: Mineral rock wool, 6 lb. density or fiberglass.
   3. Thickness: 1-3/4 inches.
   4. Texture: Smooth faces.
   5. Finish: Factory primed, for field finishing.
   6. Minimum Reinforcing Size:
      a. Butts and Pivots: Full interior width at door by 10-inches long.
      b. Closers: Inverted channel, 6-inch sides by 18 inches long.

c. Other Surface Applied Hardware: To template.
d. Locks: To template.

C. Drilling and tapping for surface applied hardware shall be done in the field.
D. Provide hardware reinforcing for closers on all doors.
E. Interior Doors, Fire-Rated:
1. Grade: NAAMM HMMA 861, physical performance Level A.
2. Fire Rating: As indicated on Door and Frame Schedule, with temperature rise ratings as required by code, tested in accordance with NFPA 252.
a. Provide units listed and labeled by UL.
b. Attach fire rating label to each fire rated unit.
3. Minimum Hardware Reinforcing: Same as specified for interior non-fire rated doors.
4. Texture: Smooth faces.
5. Finish: Factory primed, for field finishing.

2.4 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. Exterior Door Frames: Fully welded.
a. Galvanizing: All components hot-dipped zinc-iron alloy-coated (galvannealed) in accordance with ASTM A 653/A 653M, with manufacturer’s standard coating thickness.
b. Weatherstripping: See Section 08710 - Hardware
10. Interior Door Frames, Non-Fire-Rated: Fully welded type.
11. Interior Door Frames, Fire-Rated: Fully welded type.
a. Fire Rating: Same as door, labeled.
B. Mullions for Pairs of Doors: Fixed, 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.

2.5 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. Bitumastic coating for interior side of steel frames:
   1. Installing contractor applied, ultra-high build, single-component coat tar for protecting steel substrates subject to aggressive conditions and below grade requirements complying with MIL-C-18480-B and Bureau of Reclamation CA50 specifications. 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.
   2. Frame installation contractor to provide bitumastic coating for all exterior door frames for frame prior to frame installation.
E. 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.
F. 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.
G. Temporary Frame Spreaders: Provide for all factory- or shop-assembled frames.

2.6 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 06200 - Finish Carpentry.
B. Section 08110 - Steel Doors and Frames.
C. Section 08710 - Door Hardware.

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, and 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. (formerly Weyerhaeuser Door

Division)
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

3.6 FINISH SCHEDULE

A. Factory finish shall be selected by Architect from manufacturer’s full range. Design intent is to match the building standard finish at the school.
   1. Architect will identify an existing door in-field that will be used as the building standard finish control, during the shop drawing phase of the project.

END OF SECTION

SECTION 08710

DOOR HARDWARE

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes commercial door hardware for the following:
   1. Swinging doors.
   2. Other doors to the extent indicated.
B. Door hardware includes, but is not necessarily limited to, the following:
   1. Mechanical door hardware.
   2. Electromechanical door hardware.
   3. Cylinders specified for doors in other sections.
C. Related Sections:
   1. Division 08 Section “Door Hardware Schedule”.
D. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 80 - Fire Doors and Windows.
   5. NFPA 101 - Life Safety Code.
   6. NFPA 105 - Installation of Smoke Door Assemblies.
   7. State Building Codes, Local Amendments.
E. Standards: All hardware specified herein shall comply with the following industry standards:
   1. ANSI/BHMA Certified Product Standards - A156 Series
   2. UL10C – Positive Pressure Fire Tests of Door Assemblies

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.
B. Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of door hardware, as well as procedures and diagrams. Coordinate the final Door Hardware Schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
   1. Format: Comply with scheduling sequence and vertical format in DHI's "Sequence and Format for the Hardware Schedule."
   2. Organization: Organize the Door Hardware Schedule into door hardware sets indicating complete designations of every item required for each door or opening. Organize door hardware sets in same order as in the Door Hardware Sets at the end of Part 3. Submittals that do not follow the same format and order as the Door Hardware Sets will be rejected and subject to resubmission.
   3. Content: Include the following information:
      a. Type, style, function, size, label, hand, and finish of each door hardware item.
      b. Manufacturer of each item.
      c. Fastenings and other pertinent information.
      d. Location of door hardware set, cross-referenced to Drawings, both on floor plans and in door and frame schedule.
      e. Explanation of abbreviations, symbols, and codes contained in schedule.
      f. Mounting locations for door hardware.
      g. Door and frame sizes and materials.
      h. Warranty information for each product.

4. Submittal Sequence: Submit the final Door Hardware Schedule at earliest possible date, particularly where approval of the Door Hardware Schedule must precede fabrication of other work that is critical in the Project construction schedule. Include Product Data, Samples, Shop Drawings of other work affected by door hardware, and other information essential to the coordinated review of the Door Hardware Schedule.
    a. Keying Conference to occur prior to submitting door hardware schedule.

C. Shop Drawings: Details of electrified access control hardware indicating the following:
1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication, and control of the access control system electrified hardware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
    a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
    b. Complete (risers, point-to-point) access control system block wiring diagrams.
    c. Wiring instructions for each electronic component scheduled herein.
2. Electrical Coordination: Coordinate with related sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified installer of Windstorm assemblies.

E. Keying Schedule: After a keying meeting with the owner has taken place prepare a separate keying schedule detailing final instructions. Submit the keying schedule in electronic format. Include keying system explanation, door numbers, key set symbols, hardware set numbers and special instructions. Owner must approve submitted keying schedule prior to the ordering of permanent cylinders/cores.

F. Informational Submittals:
1. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

G. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete door hardware installation in quantity as required in Division 01, Closeout Submittals.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum 5 years of documented experience in producing hardware and equipment similar to that indicated for this Project and that have a proven record of successful in-service performance.

B. Installer Qualifications: A minimum 3 years documented experience installing both standard and electrified door hardware similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

C. Door Hardware Supplier Qualifications: Experienced commercial door hardware distributors with a minimum 5 years documented experience supplying both mechanical and electromechanical hardware installations comparable in material, design, and extent to that indicated for this Project. Supplier recognized as a factory direct distributor by the manufacturers of the primary materials with a warehousing facility in Project's vicinity. Supplier to have on staff a certified Architectural Hardware Consultant (AHC) available during the course of the Work to consult with Contractor, Architect, and Owner concerning both standard and electromechanical door hardware and keying.

D. Source Limitations: Obtain each type and variety of door hardware specified in this section from a single source unless otherwise indicated.
1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
2. Provide electromechanical door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

E. Each unit to bear third party permanent label demonstrating compliance with the referenced standards.
F. Keying Conference: Conduct conference to comply with requirements in Division 01 Section "Project Meetings." Keying conference to incorporate the following criteria into the final keying schedule document:
   1. Function of building, purpose of each area and degree of security required.
   2. Plans for existing and future key system expansion.
   3. Requirements for key control storage and software.
   4. Installation of permanent keys, cylinder cores and software.
   5. Address and requirements for delivery of keys.
G. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), and Contractor(s) to review proper methods and the procedures for receiving, handling, and installing door hardware.
   1. Prior to installation of door hardware, conduct a project specific training meeting to instruct the installing contractors' personnel on the proper installation and adjustment of their respective products. Product training to be attended by installers of door hardware (including electromechanical hardware) for aluminum, hollow metal and wood doors. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
   2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
   3. Review sequence of operation narratives for each unique access controlled opening.
   4. Review and finalize construction schedule and verify availability of materials.
   5. Review the required inspecting, testing, commissioning, and demonstration procedures
H. At completion of installation, provide written documentation that components were applied to manufacturer's instructions and recommendations and according to approved schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
B. Tag each item or package separately with identification related to the final Door Hardware Schedule, and include basic installation instructions with each item or package.
C. Deliver, as applicable, permanent keys, cylinders, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner shall be established at the "Keying Conference".

1.6 COORDINATION

A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing standard and electrified hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing hardware to comply with indicated requirements.
B. Door Hardware and Electrical Connections: Coordinate the layout and installation of scheduled electrified door hardware and related access control equipment with required connections to source power junction boxes, low voltage power supplies, detection and monitoring hardware, and fire and detection alarm systems.
C. Door and Frame Preparation: Doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of standard and electrified door hardware that fails in materials or workmanship within specified warranty period after final acceptance by the Owner. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of the hardware.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
   1. Ten years for mortise locks and latches.
   2. Seven years for heavy duty cylindrical (bored) locks and latches.
   3. Five years for exit hardware.
   4. Twenty five years for manual surface door closer bodies.
   5. Two years for electromechanical door hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 – PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. General: Provide door hardware for each door to comply with requirements in Door Hardware Sets and each referenced section that products are to be supplied under.

B. Designations: Requirements for quantity, item, size, finish or color, grade, function, and other distinctive qualities of each type of door hardware are indicated in the Door Hardware Sets at the end of Part 3. Products are identified by using door hardware designations, as follows:

C. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

D. Substitutions: None permitted. Hardware listed is District Standard.

2.2 HANGING DEVICES

A. Hinges: ANSI/BHMA A156.1 certified butt hinges with number of hinge knuckles as specified in the Door Hardware Sets.
   1. Quantity: Provide the following hinge quantity, unless otherwise indicated
      a. Two Hinges: For doors with heights up to 60 inches.
      b. Three Hinges: For doors with heights 61 to 90 inches.
      c. Four Hinges: For doors with heights 91 to 120 inches.
      d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.
   2. Hinge Size: Provide the following, unless otherwise indicated, with hinge widths sized for door thickness and clearances required:
      a. Widths up to 3’0”: 4-1/2” standard or heavy weight as specified.
      b. Sizes from 3’1” to 4’0”: 5” standard or heavy weight as specified.
   3. Hinge Weight and Base Material: Unless otherwise indicated, provide the following:

a. Exterior Doors: Heavy weight, non-ferrous, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate standard weight.
b. Interior Doors: Standard weight, steel, ball bearing or oil impregnated bearing hinges unless Hardware Sets indicate heavy weight.

4. Hinge Options: Comply with the following where indicated in the Hardware Sets or on Drawings:
   a. Non-removable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while door is closed; for the all out-swinging lockable doors.

B. Pin and Barrel Continuous Hinges: ANSI/BHMA A156.26 Grade 1-600 certified pin and barrel continuous hinges with minimum 14 gauge Type 304 stainless steel hinge leaves, concealed teflon coated stainless pin, and twin self-lubricated nylon bearings at each knuckle separation. Factory trim hinges to suit door height and prepare for electrical cut-outs.

2.3 DOOR OPERATING TRIM

A. Flush Bolts and Surface Bolts: ANSI/BHMA A156.3 and A156.16, Grade 1, certified.
   1. Manual flush bolts to be furnished with top rod of sufficient length to allow bolt location approximately six feet from the floor.
   2. Furnish dust proof strikes for bottom bolts.
   3. Surface bolts to be minimum 8” in length and U.L. listed for labeled fire doors and U.L. listed for windstorm components where applicable.
   4. Provide related accessories (mounting brackets, strikes, coordinators, etc.) as required for appropriate installation and operation.
B. Door Push Plates and Pulls: ANS/BHMA A156.6 certified door pushes and pulls of type and design specified in the Hardware Sets. Coordinate and provide proper width and height as required where conflicting hardware dictates.
   1. Push/Pull Plates: Minimum .050 inch thick, size as indicated in hardware sets, with beveled edges, secured with exposed screws unless otherwise indicated.
   2. Door Pull and Push Bar Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door unless otherwise indicated.
   3. Offset Pull Design: Size, shape, and material as indicated in the hardware sets. Minimum clearance of 2 1/2-inches from face of door and offset of 90 degrees unless otherwise indicated.
   4. Fasteners: Provide manufacturer's designated fastener type as indicated in Hardware Sets.

2.4 CYLINDERS AND KEYING

A. General: Cylinder manufacturer to have minimum (10) years’ experience designing secured master key systems and have on record a published security keying system policy.
B. Source Limitations: Obtain each type of keyed cylinder and keys from the same source manufacturer as locksets and exit devices, unless otherwise indicated.
C. Cylinders: Original manufacturer cylinders complying with the following:
   1. Mortise Type: Threaded cylinders with rings and cams to suit hardware application.
   2. Rim Type: Cylinders with back plate, flat-type vertical or horizontal tailpiece, and raised trim ring.
   3. Bored-Lock Type: Cylinders with tailpieces to suit locks.
   4. Mortise and rim cylinder collars to be solid and recessed to allow the cylinder face to be flush and be free spinning with matching finishes.
   5. Keyway:
D. District wide key system – Removable Core, Schlage 6 pin E Keyway, 0 bitted. Master Key System Code #470545
E. Key Quantity: Provide the following minimum number of keys:
   1. Change Keys per Cylinder: Two (2)
   2. Master Keys (per Master Key Level/Group): Five (5).
   3. Construction Keys (where required): Ten (10).
F. Construction Keying: Provide construction master keyed cylinders.

G. Key Registration List (Bitting List):
   1. Provide keying transcript list to Owner's representative in the proper format for importing into key control software.
   2. Provide transcript list in writing or electronic file as directed by the Owner.
H. Key Control Cabinet: Provide a key control system including envelopes, labels, and tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet. Key control cabinet shall have expansion capacity of 150% of the number of locks required for the project.
   1. Provide (1) key control cabinet per school.
I. Key Control Software: Provide one network version of "Key Wizard" branded key management software package that includes one year of technical support and upgrades to software at no charge. Provide factory key system formatted for importing into “Key Wizard” software.

2.5 MECHANICAL LOCKS AND LATCHING DEVICES

A. Mortise Locksets, Schlage ADA Lever Handled, type as specified below in Hardware Groups.
B. Cylindrical Locksets, Schlage ADA Lever Handled, type as specified below in Hardware Groups.

2.6 LOCK AND LATCH STRIKES

A. Strikes: Provide manufacturer's standard strike with strike box for each latch or lock bolt, with curved lip extended to protect frame, finished to match door hardware set, unless otherwise indicated, and as follows:
   1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
   2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
   3. Aluminum-Frame Strike Box: Provide manufacturer's special strike box fabricated for aluminum framing.
   4. Double-lipped strikes: For locks at double acting doors. Furnish with retractable stop for rescue hardware applications.
B. Standards: Comply with the following:
   1. Strikes for Mortise Locks and Latches: BHMA A156.13.
   2. Strikes for Bored Locks and Latches: BHMA A156.2.
   3. Strikes for Auxiliary Deadlocks: BHMA A156.5.
   4. Dustproof Strikes: BHMA A156.16.

2.7 ELECTRIC STRIKES

A. Standard Electric Strikes: Heavy duty, cylindrical and mortise lock electric strikes conforming to ANSI/BHMA A156.31, Grade 1, UL listed for both Burglary Resistance and for use on fire rated door assemblies. Stainless steel construction with dual interlocking plunger design tested to exceed 3000 lbs. of static strength and 350 ft-lbs. of dynamic strength. Strikes tested for a minimum 1 million operating cycles. Provide strikes with 12 or 24 VDC capability and supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike.
B. Surface Mounted Rim Electric Strikes: Surface mounted rim exit device electric strikes conforming to ANSI/BHMA A156.31, Grade 1, and UL Listed for both Burglary Resistance and for use on fire rated door assemblies. Construction includes internally mounted solenoid with two heavy-duty, stainless steel locking mechanisms operating independently to provide tamper resistance. Strikes tested for a minimum of 500,000 operating cycles. Provide strikes with 12 or 24 VDC capability supplied standard as fail-secure unless otherwise specified. Option available for latchbolt and latchbolt strike monitoring indicating both the position of the latchbolt and locked condition of the strike. Strike requires no cutting to the jamb prior to installation.

2.8 CONVENTIONAL EXIT DEVICES

A. General Requirements: All exit devices specified herein shall meet or exceed the following criteria:
   1. At doors not requiring a fire rating, provide devices complying with NFPA 101 and listed and labeled for "Panic Hardware" according to UL305. Provide proper fasteners as required by manufacturer including sex nuts and bolts at openings specified in the Hardware Sets.
   2. Where exit devices are required on fire rated doors, provide devices complying with NFPA 80 and with UL labeling indicating "Fire Exit Hardware". Provide devices with the proper fasteners for installation as tested and listed by UL. Consult manufacturer’s catalog and template book for specific requirements.
   3. Except on fire rated doors, provide exit devices with hex key dogging device to hold the pushbar and latch in a retracted position. Provide optional keyed cylinder dogging on devices where specified in Hardware Sets.
   4. Devices must fit flat against the door face with no gap that permits unauthorized dogging of the push bar. The addition of filler strips is required in any case where the door light extends behind the device as in a full glass configuration.
   5. Lever Operating Trim: Where exit devices require lever trim, furnish manufacturer's heavy duty escutcheon trim with threaded studs for thru-bolts.
      a. Lock Trim Design: As indicated in Hardware Sets, provide finishes and designs to match that of the specified locksets.
      b. Where function of exit device requires a cylinder, provide a cylinder (Rim or Mortise) as specified in Hardware Sets.
   6. Vertical Rod Exit Devices: Provide and install interior surface and concealed vertical rod exit devices as Less Bottom Rod (LBR) unless otherwise indicated. Provide dust proof strikes where thermal pins are required to project into the floor.
   7. Narrow Stile Applications: At doors constructed with narrow stiles, or as specified in Hardware Sets, provide devices designed for maximum 2” wide stiles.
   8. Dummy Push Bar: Nonfunctioning push bar matching functional push bar.
   9. Rail Sizing: Provide exit device rails factory sized for proper door width application.
   10. Through Bolt Installation: For exit devices and trim as indicated in Door Hardware Sets.

B. Conventional Push Rail Exit Devices (Heavy Duty): ANSI/BHMA A156.3, Grade 1 certified panic and fire exit hardware devices furnished in the functions specified in the Hardware Sets. Exit device latch to be stainless steel, pullman type, with deadlock feature.

2.9 DOOR CLOSERS

A. All door closers specified herein shall meet or exceed the following criteria:
   1. General: Door closers to be from one manufacturer, matching in design and style, with the same type door preparations and templates regardless of application or spring size. Closers to be non-handed with full sized covers including installation and adjusting information on inside of cover.
   2. Standards: Closers to comply with UL-10C for Positive Pressure Fire Test and be U.L. listed for use of fire rated doors.
   3. Cycle Testing: Provide closers which have surpassed 15 million cycles in a test witnessed and verified by UL.
   4. Size of Units: Comply with manufacturer's written recommendations for sizing of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Where closers are indicated for doors required to be accessible to the physically handicapped, provide units complying with ANSI ICC/A117.1.
   5. Closer Arms: Provide heavy duty, forged steel closer arms unless otherwise indicated in Hardware Sets.
   6. Closers shall not be installed on exterior or corridor side of doors; where possible install closers on door for optimum aesthetics.
   7. Closer Accessories: Provide door closer accessories including custom templates, special mounting brackets, spacers and drop plates, and through-bolt and security type fasteners as required for proper installation.

B. Door Closers, Surface Mounted (Heavy Duty): ANSI/BHMA A156.4, Grade 1 surface mounted, heavy duty door closers with complete spring power adjustment, sizes 1 thru 6; and fully operational adjustable according to door size, frequency of use, and opening force. Closers to be rack and pinion type, one piece cast iron or aluminum alloy body construction, with adjustable backcheck and separate non-critical valves for closing sweep and latch speed control. Provide non-handed units standard.
C. Door Closers, Surface Mounted (Unitrol): Unitrol arms to have door stop mechanism to absorb dead stop shock on arm and top hinge. Hold-open arms to have a spring loaded mechanism in addition to shock absorber assembly. Arms to be provided with rigid steel main arm and secondary arm lengths proportional to the door width.

2.10 ARCHITECTURAL TRIM

A. Door Protective Trim
   1. General: Door protective trim units to be of type and design as specified below or in the Hardware Sets.
   2. Size: Fabricate protection plates (kick, armor, or mop) not more than 2" less than door width (LDW) on stop side of single doors and 1” LDW on stop side of pairs of doors, and not more than 1" less than door width on pull side. Coordinate and provide proper width and height as required where conflicting hardware dictates. Height to be as specified in the Hardware Sets.
   3. Protection Plates: ANSI/BHMA A156.6 certified protection plates (kick, armor, or mop), fabricated from the following:
      a. Stainless Steel: 300 grade, 050-inch thick.
   4. Options and fasteners: Provide manufacturer's designated fastener type as specified in the Hardware Sets. Provide countersunk screw holes.

2.11 DOOR STOPS AND HOLDERS

A. General: Door stops and holders to be of type and design as specified below or in the Hardware Sets.
B. Door Stops and Bumpers: ANSI/BHMA A156.16, Grade 1 certified door stops and wall bumpers. Provide wall bumpers, either convex or concave types with anchorage as indicated, unless floor or other types of door stops are specified in Hardware Sets. Do not mount floor stops where they will impede traffic. Where floor or wall bumpers are not appropriate, provide overhead type stops and holders.
C. Overhead Door Stops and Holders: ANSI/BHMA A156.6, Grade 1 certified overhead stops and holders to be surface or concealed types as indicated in Hardware Sets. Track, slide, arm and jamb bracket to be constructed of extruded bronze and shock absorber spring of heavy tempered steel. Provide non-handed design with mounting brackets as required for proper operation and function.

2.12 ARCHITECTURAL SEALS

A. General: Thresholds, weatherstripping, and gasket seals to be of type and design as specified below or in the Hardware Sets. Provide continuous weatherstrip gasketing on exterior doors and provide smoke, light, or sound gasketing on interior doors where indicated. At exterior applications provide non-corrosive fasteners and elsewhere where indicated.
B. Smoke Labeled Gasketing: Assemblies complying with NFPA 105 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for smoke control ratings indicated, based on testing according to UL 1784.
   1. Provide smoke labeled perimeter gasketing at all smoke labeled openings.
C. Fire Labeled Gasketing: Assemblies complying with NFPA 80 that are listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for fire ratings indicated, based on testing according to UL-10C.
   1. Provide intumescent seals as indicated to meet UL10C Standard for Positive Pressure Fire Tests of Door Assemblies, and UBC 7-2, Fire Tests of Door Assemblies.

D. Sound-Rated Gasketing: Assemblies that are listed and labeled by a testing and inspecting agency, for sound ratings indicated.
E. Replaceable Seal Strips: Provide only those units where resilient or flexible seal strips are easily replaceable and readily available from stocks maintained by manufacturer.

2.13 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.14 FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.
B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.
C. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.
B. Notify architect of any discrepancies or conflicts between the door schedule, door types, drawings and scheduled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Hollow Metal Doors and Frames: Comply with ANSI/DHI A115 series.
B. Wood Doors: Comply with ANSI/DHI A115-W series.

3.3 INSTALLATION

A. Install each item of mechanical and electromechanical hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.
    1. Installers are to be trained and certified by the manufacturer on the proper installation and adjustment of fire, life safety, and security products including: hanging devices; locking devices; closing devices; and seals.
B. Mounting Heights: Mount door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
    1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
    2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
    3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."
    4. Provide blocking in drywall partitions where wall stops or other wall mounted hardware is located.

C. Retrofitting: Install door hardware to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.
D. Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Division 7 Section "Joint Sealants."
E. Storage: Provide a secure lock up for hardware delivered to the project but not yet installed. Control the handling and installation of hardware items so that the completion of the work will not be delayed by hardware losses before and after installation.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in report whether work complies with or deviates from requirements, including whether door hardware is properly installed, operating 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.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all hardware at the latest possible time frame.
B. Clean adjacent surfaces soiled by door hardware installation.
C. Clean operating items as necessary to restore proper finish. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain mechanical and electromechanical door hardware.

3.8 DOOR HARDWARE SCHEDULE

A. The hardware sets represent the design intent and direction of the owner and architect. They are a guideline only and should not be considered a detailed hardware schedule. Discrepancies, conflicting hardware and missing items should be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application and functionality.
B. Manufacturer’s Abbreviations:
   1. ADA – Adams Rite
   2. GLY – Glynn-Johnson
   3. IVE – Ives
   4. LCN – LCN / Allegion
   5. SCH – Schlage
   6. VON – Von Duprin
   7. ZER – Zero International

3.9 HARDWARE GROUPS

Hardware Group No. 1
Provide each SGL door(s) with the following: 2005

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	CLASSRM SECURITY	L9071J 06A L283-711	643e	SCH
2	EA	PERMANENT CORE	23-030	606	SCH
1	EA	WALL STOP	WS406/407CVX	613	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

Hardware Group No. 2
Provide each SGL door(s) with the following: 1015H

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	STOREROOM LOCK	L9080J 06A	643e	SCH
1	EA	PERMANENT CORE	23-030	606	SCH
1	EA	OH STOP & HOLDER	90F	613	GLY

Hardware Group No. 3
Provide each SGL door(s) with the following: 1015E

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	CLASSRM SECURITY	L9071J 06A L283-711	643e	SCH
2	EA	PERMANENT CORE	23-030	606	SCH
1	EA	SURFACE CLOSER	4040XPT HBMP	689	LCN
1	EA	TOP JAMB MTG PLATE	4040XP-18TJ	689	LCN
1	EA	FLOOR STOP	FS13	613	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER

Hardware Group No. 4
Provide each SGL door(s) with the following: 1015J 1016 2000 2000B
2001B 2006 2007

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5	640	IVE
1	EA	CLASSRM SECURITY	L9071J 06A L283-711	643e	SCH
2	EA	PERMANENT CORE	23-030	606	SCH
1	EA	SURFACE CLOSER	4040XP REG	695	LCN
1	EA	WALL STOP	WS406/407CVX	613	IVE

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.

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. Gypsum wallboard.
D. Joint treatment and accessories.

1.2 RELATED SECTIONS
A. Section 06100 – Rough Carpentry: Building framing system and Gypsum sheathing.
B. Section 06114 - Wood Blocking and Curbing: Wood blocking for support of wall-mounted equipment.

1.3 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.

1.4 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.

1.5 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.

1.6 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.
D. Water-Resistant Gypsum Backing Board: ASTM C 630/C 630M and ASTM C 1396/C 1396M; ends square cut.
E. Fiber Reinforced Gypsum Board for Partition Walls: Laminated ply panel with reinforced gypsum core with multiple ply abrasion resistant paper on front, back and long edges
   1. Thickness: 5/8 in.
   2. Width: 4 ft.
   3. Length: maximum available length in place
   4. Edges: ends square cut, beveled edges
   5. Impact Resistance: Board shall show no failure and withstand 17 impacts when tested in accordance with ASTM E 695, modified.
   6. Indentation Resistance: Not less than the following loads to produce the indicated depth of surface indentation when tested in accordance with ASTM D 1037, modified:
      a. 0.100 in.: 232 lbs.
   7. 3M Surface Abrasion Resistance: Not greater than the following depths when tested using the indicated number of cycles in accordance with ASTM D 4977, modified:
      a. 100: 0.000 in.
   8. Taber Surface Abrasion Resistance: Not greater than the following depths when tested using the indicated number of cycles in accordance with ASTM D 4060, modified:
      a. 50: 0.004 in.
   9. Impact/Penetration Resistance Rating: Not less than 36 ft.-lbs. When tested in accordance with ASTM D 2394, modified.

2.3 CEMENTUOUS BACKING PANELS

A. Manufacturers
   1. Custom Building Products; www.custombuildingproducts.com
   2. FinPan, Inc.; www.finpan.com
   3. United States Gypsum Co; www.usg.com
   4. Substitutions: See Section 01600 - Product Requirements.

5. Cementitious Backer Board for Interior Applications meeting the following requirements:

B. Cementitious Backer Board for interior applications: Meeting or exceeding ASTM C1186 Type A, Grade II aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces, 1/2 inch thick.

C. Cementitious Backer Board for Exterior and cavity Applications meeting the following requirements:
   1. Meeting or exceeding ASTM C1186 Type A, Grade II
   2. Meeting or exceeding ASTM E136 for non-combustibility.
   3. High density, glass fiber reinforced both sides.
   4. Thickness: 1/2 inch.
   5. Size: 32 foot x 5 foot
   6. Tape: 2 inch wide, coated glass fiber tape for joints and corners as recommended by the manufacturer.

2.4 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.
J. Blocking: Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, wood frame openings, toilet accessories, hardware, and other wall mounted items. Comply with Section 06100 for wood blocking.

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. Cementitious Backing Board: Install over studs in accordance with manufacturer’s instructions.
E. 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.

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. Division 15 – Air Outlets and Inlets.
B. Division 16 – 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: “Vantage 10 #VAN-197”.
      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, **15/16 inch wide face.**
   2. Finish: White painted.

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 sheet flooring.
B. Resilient tile flooring.
C. Resilient base.
D. Resilient stair accessories.
E. Rubber tile flooring.
F. Rubber sheet flooring.
G. Rubber wall base.
H. Rubber stair treads and accessories.
I. Installation accessories.
J. Subfloor preparation.

1.2 RELATED SECTIONS
A. Section 03300 - Cast-In-Place Concrete
B. Section 03505 - Self-Leveling Underlayment.
C. Section 06100 - Rough Carpentry; subflooring.

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.
C. FS RR-T-650 - Treads, Metallic and Nonmetallic, Skid Resistant; Federal Specifications and Standards.

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 50 sq ft of flooring, 25 lineal feet of base, and 5 percent of installed stair materials of each type and color specified.

PART 2 – PRODUCTS

2.1 MATERIALS - STAIR COVERING

A. Manufacturers:
   1. Burke Flooring: www.burkeflooring.com
   2. Tarkett Commercial: www.domkotarkettcommercial.com
   3. Roppe Corp: www.roppe.com
   4. Nora; www.norarubber.com
   5. Substitutions: See Section 01600 - Product Requirements.
B. Stair Risers: Full height and width of tread in one piece, matching treads/tactile warning in material and color:
   1. Thickness: 0.080 inch.
   2. Manufacturers:
      a. Same as stair treads
      b. Substitutions: See Section 01600 - Product Requirements.
C. Top of Stair Tactile Warning:
   1. Thickness: 0.080 inch.
   2. Manufacturers:
      a. Same as stair riser/treads
      b. Substitutions: See Section 01600 - Product Requirements.
   3. Minimum Requirements: Comply with FS RR-T-650 requirements corresponding to type specified.
   4. Nominal Thickness: 0.1875 inch.
   5. Style: Contrasting color abrasive grit strips full width
   6. Type: 1-smooth.
   7. Color: As selected by Architect from full range of industry colors.

2.2 MATERIALS - BASE

A. Manufacturers:
   1. Armstrong World Industries, Inc.; www.armstrong.com
   2. Flexco Floors; www.flexcofloors.com
   3. Burke Flooring: www.burkeflooring.com
   4. Johnsonite, Inc.; www.johnsonite.com
   5. Roppe Corp.; www.roppe.com
   6. Nora: www.norarubber.com
   7. Substitutions: See Section 01600 - Product Requirements.

B. Resilient Base: ASTM F 1861, Type TS rubber, vulcanized thermoset; top set Style A and as follows:
   1. Profile: Straight
   2. Height: 4 inch.
   3. Thickness: 0.125 inch thick.
   4. Finish: Satin.
   5. Length: Roll.
   6. Color: Color as selected from manufacturer's standards.
      a. Up to 3 colors to be selected.
   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: Rubber
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 - 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.

3.5 INSTALLATION - STAIR COVERINGS

A. Install stair coverings in one piece for full width and depth of tread.
B. Adhere over entire surface. Fit accurately and securely.

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 09685

TEXTILE COMPOSITE FLOORING

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Textile Composite Flooring

1.2 REFERENCES
A. Unless noted otherwise, the most current issue of the Reference shall be used.
B. ASTM D 2859 – Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering materials.
C. ASTM E 84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
D. ASTM E 648 – Standard test Methods for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
E. CRI 104 - Standard for Installation of Commercial Textile Floorcovering Materials; Carpet and Rug Institute.
F. CRI (GLA) – Green Label testing Program – Approved Adhesive Products; www.carpet-rug.com.
G. CRI (GLC) – Green Label Testing Program – Approved Product Categories for Carpet; www.carpet-rug.com.
H. CRI (GLP) – Green Label Plus Carpet Testing Program – Approved Products; www.carpet-rug.org.
I. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; National Fire Protection Association.

1.3 SUBMITTALS
A. See Section 01300 - Administrative Requirements, for submittal procedures.
B. Shop Drawings: Indicate layout of joints, direction of pile, and tile color locations.
C. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
D. Samples: Submit two samples illustrating color and pattern design for each carpet color selected by Architect.
E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention
F. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.
G. For initial selection of colors and patterns, submit samples in form of actual sections of tile including accessories, showing full range of colors and patterns available, for each type of tile required.
H. Submit manufacturer's certified test results to show that product meets or exceeds product performance specification criteria for testing requirements (i.e. see section 2.3 flame, smoke, Aachen test, etc).

1.4 QUALITY ASSURANCE
A. Manufacturer's Qualifications: Company specializing in manufacturing specified tile with minimum three years documented experience.
B. Installers shall have documented five years' experience as an Installer of at least 10 projects of similar size and complexity to this project. Workmen shall be experienced and skilled craftsmen.
C. Source Quality Control: Prior to tiles being shipped to project, ensure that manufacturer has tested all product and provided written certification that all construction meets or exceeds each minimum of the project specifications.

1.5 ENVIRONMENTAL REQUIREMENTS
A. Store materials in area of installation for minimum period of 24 hours prior to installation.

1.6 EXTRA MATERIALS
A. See Section 01600 - Product Requirements, for additional provisions.
B. Provide ten (10) tiles of each color and pattern selected.

1.7 DELIVERY, STORAGE, AND PROTECTION

A. Deliver carpeting materials in sealed cartons for tiles and sealed containers for related materials. Deliver, store and handle all materials in a manner to prevent damage to materials and previous construction. Store in a safe, dry location, out of the way of other construction as directed. Material must be stored at least 68 degree F. (20 degree C.) for 3 days prior to installation.

1.8 WARRANTY

A. Manufacturer's Warranty:
   1. Provide warranties by Manufacturer agreeing to replace defective materials during one (1) year warranty period following substantial completion. Also submit the following agreed upon warranties (chair pads not required):
   2. Wear - Surface fiber wear shall not be more than 10% by weight in 15 years.
   3. Static – Product will remain static generation at less than 3.0 kV at 70º F, and 20% R.H. for a period no less than 15 years.
   4. No edge ravel, backing separation for a period no less than 15 years
   5. No Dimensional Instability, i.e. shrinkage, stretching, curling and doming which adversely affect the ability of the tile to lay flat for a period no less than 15 years. See Aachen Test.
   6. Antimicrobial preservation properties warranted to be $\geq$ 90% effective for a period no less than 15 years.

B. Installing contractor shall rework any defective product handling or installation workmanship during one (1) year warranty period following substantial completion.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design:
   1. JJ Flooring Group: http://www.jjflooringgroup.com/product
B. Or Approved Equal
C. Substitutions: See Section 01600 - Product Requirements.
D. Products indicated are provided by specified manufacturer. All acceptable manufacturers shall provide products equal in color range, pattern range, performance data, and style to those specified and shall meet or exceed all minimum specifications listed.

2.2 MATERIALS

A. Basis of Design:: Product must meet or exceed all of the following minimum specifications:
   1. Field Pattern: Kinetex – Umbra Stripe
      a. Color to be selected by architect from manufacturer’s full color range
      b. Up to (2) colors may be installed.
   2. Installation Method: Ashlar.
   3. Tile Size: 18” x 36”
   4. Construction: Loop
   5. Dye Method: Solution Dyed
   6. Finish Pile Height: .205 inches
   7. Face yarn weight: 4.5 oz – 5.2 oz/ square ft
   8. Backing: Polyester Felt Cushion
   9. Soil Release: yes
   10. Total Recycled Content: 55.8%
   11. ISO Requirements: Product must be produced by manufacturer that is ISO 9001 and ISO 14001 certified.

2.3 REGULATORY REQUIREMENTS

A. Proposed flooring must meet CRI Green Label Plus, State of Washington Protocol Environmental Safety Test, and GSA Antimicrobial Certification.
B. Flammability Test Requirements:

Flammability	
1. Pill Test (ASTM D2859 or CPSC FF-1-70)	Passes
2. Radiant Panel Test (ASTM E648)	$\geq$ 0.45 watts/cm^2, Class 1
Smoke Density (ASTM E662)	$\leq$ 450 Flaming Mode
Dimensional Stability (Aachen Method Din 54318)	$\leq$ 0.1% change
Static Generation at 70º F (AATCC 134 w/ neolite)	$\leq$ 2.5 kV at 20% R.H.
Lightfastness (AATCC 16E)	4.0 after 60 hours
Crocking (AATCC 165)	4.0 wet, dry
Cold Water Bleed (AATCC 107)	4.0
Gas Fade (AATCC 23)	4.0
Ozone Fade (AATCC 109)	4.0
Antimicrobial (AATCC 174, Part II)	$\geq$ 95.0% reduction
Fungicidal (AATCC 174, Part III)	No growth
Soil/Stain Protection (AATCC 175-1991)	$\geq$ 8.0 on the Red 40 Stain Scale

2.4 TRIM AND ACCESSORIES

A. Sub-Floor Filler: White premix latex; type recommended by flooring material manufacturer.
B. Non-Trowelable Adhesive Installation: Kinetex Adhesive
C. Trowelable Adhesive Installation: Waterproof type recommended and approved by respective manufacturer for use with their materials under site installation conditions. Low VOC adhesives required.
D. Edge Finishing: Provide rubber reducer/transition strip at all exposed edges. Color to be selected by Architect from manufacturer's full range.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that sub-floor and wall surfaces are smooth and flat within manufacturer's tolerances and are ready to receive tile.
B. Verify that sub-floor and wall surfaces are dust-free, and free of substances which would impair bonding of adhesive materials to sub-floor surfaces.
C. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by flooring manufacturer and adhesive materials manufacturer.
    1. Repeat tests until results indicate conditions are within manufacturer's tolerances.
D. Verify locations of existing floor-mounted utilities.
E. Thoroughly inspect all sub-floors before commencement work. Notify Owner in writing immediately of all conditions which will prevent producing satisfactory work.
F. Repair floor defects and irregularities prior to installation.
G. Installation of materials constitutes Contractor's acceptance of previous construction and his assumption of responsibility for all unacceptable finished work caused by previous conditions

3.2 PREPARATION

A. Remove existing carpeting and adhesive.
B. Before starting installation remove all paint, sealers or wax from sub-floor by sanding and scraping.
C. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler.

D. Apply, trowel, and float filler to achieve smooth, flat, hard surface. Prohibit traffic until filler is cured.
E. Vacuum clean substrate.

3.3 INSTALLATION

A. Install tile in accordance with manufacturer's instructions and CRI 104.
B. Blend product from different cartons to ensure minimal variation in color match.
C. Install tiles such that seams are not obvious in the finish work.
D. Provide an installation free of visual imperfections, adhesives, seam cement smears and other foreign matter.
E. Cut tile clean. Fit tiles tight to intersection with vertical surfaces without gaps.
F. Set parallel to building lines, and center pattern within space.
G. Locate change of color or pattern between rooms under door centerline.
H. Fully adhere tile to substrate.
I. Trim tile neatly at walls and around interruptions.
J. Complete installation of edge strips, concealing exposed edges.

3.4 CLEANING

A. Upon completion of work thoroughly inspect entire installation. Remove all defective work and replace with perfect materials.
B. Cut off and trim all loose threads. Remove all visible adhesives, seam cement and scraps. Clean all tiles with an upright beater bar type vacuum cleaner.
C. Remove all rubbish, debris, containers and all excess materials not selected by Owner for its retention and legally dispose of off the Owner's premises.
D. Repair all damage to the Owner's property resulting from installation work. Clean, repair or replace all damage as directed.
E. Clean and vacuum surfaces. Leave premises in clean, accepted condition.

3.5 PROTECTION OF FINISHED WORK

A. Provide and maintain proper protection of finished areas. Do not stack tile cartons higher than is recommended by manufacturer.

END OF SECTION

SECTION 09820

SOUND ABSORPTION MATERIALS

PART 1 – GENERAL

1.1 WORK INCLUDED

A. The work shall consist of installing acoustic partition closure(s) in accordance with the details shown on the plans and the requirements of the specifications. Acoustic partition closure shall be silicone pre-coated, preformed, mass-loaded acoustic foam seal – QuietJoint from EMSEAL. Item

B. Related Work Item
   1. Division 9 – Interior Walls and Partitions

1.2 SUBMITTALS

A. General – Submit the following according to Division 1 Specification Section.

B. Standard Submittal Package Must Include All of the Following:
   1. Typical drawing(s) indicating pertinent dimensions, general construction, joint opening dimensions and product information.
   2. Sample of product representative of material to be supplied.
   3. Color Charts for silicone selection by Architect.
   4. Certification that products have been tested to ASTM E90-09 and are certified by independent laboratory test reports to meet or exceed an STC 53 rating in an STC 56 wall and an OITC 38 rating in an OITC 38 wall.
   5. Certification that products have been tested to ASTM E-84-12 and are certified by independent laboratory test reports to meet or exceed Smoke and Flame Spread Class A.
   6. Certification that products have been tested to ASTM C-518-04 and are certified by independent laboratory test reports to meet or exceed a thermal insulation of R-value 2.85/in depth.
   7. Certification that the material does not contain extruded metal components and that no drilling, or screwing, or fasteners of any type are required attached to anchor the material into the substrates.
   8. Quality and Environmental control: Manufacturer shall be certified to both ISO-9001:2015 (quality management) and ISO-14001:2015 (environmental management), and shall provide written confirmation that formal Quality and Environmental management systems and processes have been adopted.

1.3 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver products to site in Manufacturer's original, intact, labeled containers. Handle and protect as necessary to prevent damage or deterioration during shipment, handling and storage. Store in accordance with manufacturer's installation instructions.

1.4 BASIS OF DESIGN

A. The Basis-Of-Design material is QuietJoint SHH (for opaque substrates) and QuietJoint SHG (when against transparent substrates as manufactured by: (USA & International) EMSEAL JOINT SYSTEMS, LTD 25 Bridle Lane, Westborough, MA 01581-2603, Toll Free: 800-526-8365. (Canada) EMSEAL, LLC 120 Carrier Drive, Toronto, Ontario, Canada M9W 5R1 Toll Free: 800-526-8365. www.emseal.com

B. Alternate manufacturers must demonstrate that their products meet or exceed the performance criteria of the basis of design products and must submit certified performance test reports performed by recognized independent laboratories as called for in section 1.2 Submittals. Submittal of alternates must be made three weeks prior to bid opening to allow proper evaluation time.

1.5 QUALITY ASSURANCE

A. Manufacturer's Checklist must be completed by expansion joint subcontractor and returned to manufacturer at time of ordering material.

B. Warranty – Manufacturer's standard warranty shall apply.

PART 2 – PRODUCTS

2.1 GENERAL

A. Provide a non-invasively-anchored, high-STC/OITC, sound attenuating, fire-resistant, and thermally insulating mass-loaded partition closure for sealing construction-created voids and gaps.
B. Typical locations include, but are not limited to the following: acoustic partition barriers, end of partition to window (SHG 3-sided coating), end of partition to mullion (SHH 2-sided coating), end of partition to wall (SHH), and head of wall (SHH).
C. Provide open-cell foam infused with a mass-loading, fire-retardant impregnation such as QuietJoint by EMSEAL JOINT SYSTEMS LTD.
D. Silicone external color facing to be factory-applied to the foam. Silicone coating to be available in a range of not less than 26 standard colors (final color to be chosen by architect) for coordination with typical building materials.
E. Select the sealant system model appropriate to the design requirements at each gap location that meets the project specification or as defined by the designer of record.

2.2 FABRICATION

A. Supply QuietJoint in full-story, 10-foot (3-meter) lengths, and ship in loosely laid coils inside cardboard boxes.
B. The material is to be sized approximately 10% larger than the field-measured joint width.
C. Supply standard offered width and depth of seal to suit field verified conditions as shown on drawings or custom depths of seal as specified by designer.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Preparation of Work Area
    1. The contractor shall clean the joint opening of all contaminants immediately prior to installation of joint closure.
B. Installation
    1. Consult manufacturer’s installation instructions supplied with materials before proceeding.
    2. Being careful not to stretch it, lay out the material and cut it to the desired length.
    3. Position material over the joint opening and squeeze by hand to ease it into the joint. Position the material so as to ensure a uniform, flat, plane.
    4. The silicone coating will fold at its edges to absorb slight variations in substrates while maintaining a smooth appearance.
    5. Once in desired location, use a plastic putty knife to tuck the edges of the silicone against the substrates to remove any wrinkles.
    6. The internal backpressure of the material will mate it to the mullion, partition, glass or other joint faces. The material is to remain free of any metal components, i.e. fasteners, screws, bolts, extrusions, etc.

3.2 CLEAN AND PROTECT

A. Protect the system and its components during construction. Subsequent damage to the joint closure will be repaired at the general contractor’s expense. After work is complete, clean exposed surfaces with a suitable cleaner that will not harm or attack the finishes.

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 RELATED SECTIONS
A. Section 05500 - Metal Fabrications: Shop-primed items.
B. Section 05510 - Metal Stairs: Shop-primed items.

1.3 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.

1.4 DEFINITIONS
A. Conform to ASTM D 16 for interpretation of terms used in this section.

1.5 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.

1.6 QUALITY ASSURANCE
A. Applicator Qualifications: Company specializing in performing the work of this section with minimum five years' experience.

1.7 REGULATORY REQUIREMENTS
A. Comply with applicable code for flame and smoke rating requirements for products and finishes.

1.8 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.

1.9 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.

1.10 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.

1.11 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 - EXTERIOR

A. Paint ME-OP-3A - Ferrous Metals, Unprimed, Alkyd, 3 Coat:
   1. One coat of alkyd primer.
      a. Glidden Professional: 4360-XXXX Devguard Low VOC Multi-Purpose Tank & Structural Primer.
      b. Benjamin Moore & Co.: P06 Super Spec HP® Alkyd Metal Primer
      c. Sherwin-Williams Kem Bond HS, B50WZ Series

2. Semi-gloss: Two coats of alkyd enamel.
   a. Glidden Professional: GP2406-XXXX Fortis 350 Exterior 100 Percent Acrylic Semi-Gloss Finish.
   b. Benjamin Moore & Co.: Moorcraft Super Spec Latex House & Trim #170
   c. Sherwin-Williams A-100 Exterior Coating, A8 Series

B. Paint MgE-OP-3A - Galvanized Metals, Alkyd, 3 Coat:
   1. Galvanize primer.
      a. Glidden Professional: Devoe Coatings 4360 Devguard Low VOC Multi-Purpose Tank & Structural Primer.
      b. Benjamin Moore: Super Spec HP® Acrylic Metal Primer P04
      c. Sherwin Williams ProIndustrial ProCryl Metal Primer, B66-310 Series
   2. Gloss: 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: 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

2.4 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. Light sanding of existing wood surfaces to remove existing varnish.
   2. Filler coat as necessary to repair imperfections in existing wood surfaces.
   3. One coat of stain if necessary to match existing wood surface color.
      Provide three variations for each type of wood surface to be refinished.
   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

2.5 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.

3.8 SCHEDULE - PAINT COLORS

A. PT-1: Field Color 1
B. PT-2: Paint Color - Ceilings
C. PT-3: District standard color “Burgundy”, to match to Owner’s sample.
D. PT-4: Paint Color (existing metal brackets)
E. PT-5: Match Existing Adjacent Construction
F. PT-6: To be selected by Architect During Construction
G. PT-7: To be selected by Architect During Construction
H. Additional colors may be required for miscellaneous patching and painting throughout the project. The Contractor shall verify in-field, and match to existing, adjacent surfaces.

END OF SECTION

SECTION 14425

VERTICAL WHEELCHAIR LIFTS

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Shaftway Vertical Wheelchair Lift.

1.2 RELATED SECTIONS
A. Section 03300 - Cast-In-Place Concrete: Concrete pit
B. Section 04800 - Masonry Assemblies: Masonry shaftway and anchor placement.
C. Section 06100 - Rough Carpentry: Blocking in framed construction for lift attachment.
D. Section 09260 - Gypsum Board Assemblies: Gypsum board shaftway.
E. Division 16 - Electrical: Dedicated telephone service and wiring connections.
F. Division 16 - Electrical: Lighting and wiring connections at top of shaft.
G. Division 16 - Electrical: Electrical power service and wiring connections.

1.3 REFERENCES
A. ASME A17.1 - Safety Code for Elevators and Escalators.
B. ASME A17.5 - Elevator and Escalator Electrical Equipment.
C. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
D. CSA B44 - Safety Code for Elevators and Escalators.
E. CSA B355 - Lifts for Persons with Physical Disabilities.
F. ICC/ANSI A117.1 - Accessible and Usable Buildings and Facilities.
G. NFPA 70 - National Electric Code.
H. CSA - National Electric Code.

1.4 SUBMITTALS
A. Submit under provisions of Section 01300.
B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Submit manufacturer's installation instructions, including preparation, storage and handling requirements.
   2. Include complete description of performance and operating characteristics.
   3. Show maximum and average power demands.
C. Shop Drawings:
   1. Show typical details of assembly, erection and anchorage.
   2. Include wiring diagrams for power, control, and signal systems.
   3. Show complete layout and location of equipment, including required clearances and coordination with shaftway.
D. Selection Samples: For each finished product specified, provide two complete sets of color chips representing manufacturer's full range of available colors and patterns.

1.5 QUALITY ASSURANCE
A. Manufacturer Qualifications: Firm with minimum 10 years’ experience in manufacturing of vertical platform lifts, with evidence of experience with similar installations of type specified.
B. Installer Qualifications: Licensed to install equipment of this scope, with evidence of experience with specified equipment. Installer shall maintain an adequate stock of replacement parts, have qualified people available to ensure fulfillment of maintenance and callback service without unreasonable loss of time in reaching project site.

1.6 REGULATORY REQUIREMENTS
A. Provide platform lifts in compliance with:
   1. ASME A18.1 - Safety Standard for Platform Lifts and Stairway Chairlifts.
   2. ASME A17.1 - Safety Code for Elevators and Escalators.
   3. ASME A17.5 - Elevator and Escalator Electrical Equipment.
   4. NFPA 70 - National Electric Code.

B. Provide platform lifts in compliance with:
   1. CSA B355 - Lifts for Persons with Physical Disabilities.
   2. CSA B44.1/ASME A17.5 - Elevator and Escalator Electrical Equipment.
   3. CSA - National Electric Code.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.
B. Store components off the ground in a dry covered area, protected from adverse weather conditions.

1.8 PROJECT CONDITIONS

A. Do not use wheelchair lift for hoisting materials or personnel during construction period.

1.9 WARRANTY

A. Warranty: Provide a two year limited warranty for wheelchair lift materials and workmanship.
B. Extended Warranty: Provide an extended manufacturer's warranty covering the wheelchair lift materials and workmanship for the following additional extended period beyond the initial two year warranty. Preventive Maintenance Agreement required.
   1. Five Years (7 years total).

1.10 PREVENTATIVE MAINTANANCE

A. Provide (1) year of preventative maintenance - (2 visitations) a year.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Garaventa Lift; United States - P.O. Box 1769, Blaine, WA 98231-1769. Contact: Joel Graft: 847-395-9988 Email: Joel.Graff@GaraventaLift.com Web:www.garaventalift.com.
B. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 SHAFTWAY VERTICAL WHEELCHAIR LIFT

A. Capacity: 750 lbs (340 kg) rated capacity.
B. Mast Height:
   1. Model GVL SW -168; 171 inches (4343 mm) maximum lifting height, using hydraulic drive, only.
C. Nominal Clear Platform Dimensions:
   1. Standard: 39 inches (992 mm) by 54 inches (1370 mm).
D. Platform Configuration:
   1. On/Off Same Side Entry/Exit: One front opening only.
E. Landing Openings:
   1. Lower Landing: Door.
   2. Upper Landing: Gate.
F. Door Construction:
   1. Door Width:
      a. Lower Landing:
         1) 35-5/8 inches (905 mm).
      b. Upper landing:
         1) 35-5/8 inches (905 mm).

G. Upper Gate Construction
   1. 42 inches (1067 mm) high, pre-hung on an anodized aluminum frame, fitted with a door closer, pull handle, integrated interlock and constructed with a 16 gauge (1.5 mm) galvanized steel kick plate and upper panel as follows:
      a. Panels of 16 gauge (1.5 mm) galvanized steel.

H. Power Door Operator: Automatically opens the door/gate when platform arrives at a landing. Will also open at landing by pressing call button or by gently pulling door.
   1. ADA Compliant and obstruction sensitive.
   2. Low voltage, 24 VDC with all wiring concealed.
   3. Provide power operators at the following locations:
      a. Lower Landing: Door.
      b. Upper landing: Door or Gate.

I. Lift Components:
   1. Machine Tower: Custom aluminum extrusion.
   2. Base Frame: Structural steel tubing.
   3. Platform Side Wall Panels: 16 gauge (1.5 mm) galvanized steel sheet. Custom aluminum extrusion tubing frame.
   4. Fold down seat required.

J. Base Mounting and Access to Lift at Lower Landing:
   1. Pit Mount: Lift to be mounted in pit with dimensions to meet manufacturers requirements for the platform size specified. Pit construction shall be in accordance to Section 03300.

K. Hydraulic Drive:
   1. Drive Type: Chain hydraulic.
   2. Emergency Operation: Manual device to lower platform and auxiliary battery power to raise or lower platform.
   3. Safety Devices:
      a. Slack chain safety device.
      b. Shoring device.
   4. Travel Speed: 17 fpm (5.2 m/minute).
   5. Motor: 3.0 hp (2.2 kW); 24 volts DC.
   6. Power Supply:
      a. 120 VAC single phase; 60 Hz on a dedicated 15 amp circuit.
      b. Powered by continuous building mains converted to 24 VDC equipped with auxiliary battery power system capable of running lift up and down for a minimum of 5 trips with rated load. Required for high usage lifts.

L. Platform Controls: 24 VDC control circuit with the following features.
   1. Direction Control: Illuminated tactile and constant pressure buttons with dual platform courtesy lights and safety light.
   2. Illuminated and audible emergency stop switch shuts off power to lift and activates audio alarm equipped with battery backup.

M. Call Station Controls: 24 VDC control circuit with the following features.
   1. Direction Control: Constant pressure switches.
   2. Safety indicator lamp.
   3. Keyed operation.
   4. Call Station Mounting:
      a. Lower:
         1) Wall mounted recessed.
      b. Upper:
         1) Wall mounted recessed.

N. Safety Devices and Features:
   1. Grounded electrical system with upper, lower, and final limit switches.
   2. At all landings a solenoid activated interlock shall electrically monitor that the door is in the closed position and the lock is engaged before lift can move from landing.

3. Electrical disconnect shall shut off power to the lift.
4. Hands free phone with dedicated phone line (by others)

O. Finishes
1. Aluminum Extrusions: Champagne anodized finish.
2. Ferrous Components: Electrostatically applied baked powder finish, fine textured.
1) Color: Satin Grey, RAL 7030.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.
B. Verify shaft and machine space are of correct size and within tolerances.
C. Verify required landings and openings are of correct size and within tolerances.
D. Verify electrical rough-in is at correct location.
E. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.
B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install lifts in accordance with applicable regulatory requirements including ASME A 17.1, ASME A 18.1 and the manufacturer's instructions.
B. Install lifts in accordance with applicable regulatory requirements including CSA B355, and manufacturer's instructions.
C. Install system components and connect to building utilities.
D. Accommodate equipment in space indicated.
E. Startup equipment in accordance with manufacturer's instructions.
F. Adjust for smooth operation.

3.4 FIELD QUALITY CONTROL

A. Perform tests in compliance with ASME A 17.1 or A18.1 and as required by authorities having jurisdiction.
B. Perform tests in compliance with CSA B355 and required by authorities having jurisdiction.
C. Schedule tests and inspections with agencies and Architect, Owner, and Contractor present.

3.5 PROTECTION

A. Protect installed products until completion of project.
B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 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. Illinois Administrative Code, including, but not limited to:
      a. Illinois State Plumbing Code
      b. Illinois Accessibility Code
   14. National Electric Code (NEC)
   15. National Electric Manufacturers' Association (NEMA)
   16. All applicable sections of National Fire Protection Association (NFPA)
   17. Underwriters' Laboratories (UL)
   18. Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

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 Illinois.
   2. Drain down entire piping system, flush and fill.
   3. Disconnect, remove, transport, properly and lawfully dispose of all incidental and miscellaneous materials, hardware, equipment associated with the above items.
   4. Maintain temporary 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 15140

SUPPORTS AND ANCHORS

PART 1 – GENERAL

1.1 WORK INCLUDED
A. Pipe and equipment hangers and supports.
B. Equipment bases and supports.
C. Sleeves and seals.
D. Flashing and sealing equipment and pipe stacks.

1.2 RELATED SECTIONS
A. Section 15242 - Vibration Isolation.
B. Section 15260 - Piping Insulation.
C. Section 15510 - Hydronic Piping.
D. Section 15535 – Refrigerant Piping and Specialties.

1.3 REFERENCES
A. American Society of Mechanical Engineers:
   1. ASME B31.1 – Power Piping.
   2. 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 2012 International Mechanical Code for support of plumbing or hydronic piping.

PART 2 – PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

A. Hydronic Piping:
   1. Conform to ASME B31.9, ASTM F708.
   2. Hangers for Pipe Sizes 1/2 to 1 1/2-inch: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Hot Pipe Sizes 2 to 4-inches: Carbon steel, adjustable, clevis.
   4. Hangers for Hot Pipe Sizes 6-inches and Over: Adjustable steel yoke, cast iron roll, double hanger.
   5. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   6. Multiple or Trapeze Hangers for Hot Pipe Sizes 6-inches and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
   7. Wall Support for Pipe Sizes to 3-inches: Cast iron hook.
   8. Wall Support for Pipe Sizes 4-inches and Over: Welded steel bracket and wrought steel clamp.
   9. Wall Support for Hot Pipe Sizes 6-inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast-iron roll.
   10. Vertical Support: Steel riser clamp.
   11. Floor Support for Hot Pipe Sizes to 4-inches: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   12. Floor Support for Hot Pipe Sizes 6-inches and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
   13. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

B. Refrigerant Piping:
   1. Conform to ASME B31.5, ASTM F708.
   2. Hangers for Pipe Sizes to 1-1/2-inch: Malleable iron, adjustable swivel, split ring.
   3. Hangers for Pipe Sizes 2-inches and Over: Carbon steel, adjustable, clevis.
   4. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
   5. Wall Support for Pipe Sizes to 3-inches: Cast iron hook.
   6. Vertical Support: Steel riser clamp.
   7. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
   8. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.2 ACCESSORIES

A. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

2.3 INSERTS

A. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

A. Metal Flashing: 26 gage stainless steel.
B. Metal Counterflashing: 22 gage 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 gage stainless steel or aluminum shell and base, mitered 3-inch cant, 1 1/2-inch thick insulation, factory installed wood nailer, 18-inches high, see architectural drawings for additional information.

2.6 SLEEVES

A. Sleeves for Pipes through Non-Fire Rated Floors: 18 gage galvanized steel.
B. Sleeves for Pipes through Non-Fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or 18 gage galvanized steel.
C. Sleeves for Pipes through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed.
D. Sleeves for Round Ductwork: Galvanized steel.
E. Sleeves for Rectangular Ductwork: Galvanized steel.
F. Firestopping Insulation: Glass fiber type, non-combustible.
G. Sealant: Acrylic.

2.7 MECHANICAL SLEEVE SEALS

A. Product Description: Modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between object and sleeve, connected with bolts and pressure plates causing rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

2.8 FORMED STEEL CHANNEL

A. Product Description: Galvanized 12-gauge thick steel. With holes 1½-inches on center.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.2 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.

3.3 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.

3.4 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.

3.5 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.

3.6 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 1)	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. Note 1: 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 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 15510 - Hydronic Piping.
D. Section 15535 – Refrigerant Piping and Specialties.

1.3 REFERENCES
A. ASME A13.1 - Scheme for the Identification of Piping Systems.

1.4 SUBMITTALS
A. Submit under provisions of 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.

PART 3 – EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Install plastic nameplates with corrosive resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
B. Install tags with corrosion resistant stainless-steel chain.
C. Install plastic pipe markers in accordance with manufacturer's instructions.
D. Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in line pumps, may be identified with tags. Do not identify cabinet/suspended unit heaters, unit ventilators, etc.
E. Identify control panels and major control components outside panels with plastic nameplates.
F. Identify valves in main and branch piping with tags (ie: HWS, HWR, BWS, BWR, HW, CW, etc).
G. Identify air terminal units with numbered tags.
H. Tag automatic controls, instruments, and relays. Key to control schematic.
I. Identify piping, concealed or exposed, with plastic pipe markers. Use tags on piping 3/4 inch diameter and smaller. Identify service, flow direction. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
J. Identify ductwork with plastic tape markers. Identify type of service 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.
K. Identify calibrated balancing valves with tags indicating model number, flow rate, service and setting.

3.3 VALVE CHART AND SCHEDULE

A. Provide valve chart and schedule in aluminum frame with clear plastic shield. Install in location directed by Owner.

END OF SECTION

SECTION 15195

TESTING OF HVAC PIPING

PART 1 – GENERAL

1.1 WORK INCLUDED
A. Refrigerant piping.

1.2 RELATED SECTIONS
A. 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 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 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. 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 15880 – Heat Pump Heat Recovery System.
C. Section 15890 – Ductwork.

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 SUSPENDED EQUIPMENT

A. Heat Pump Units.
   1. Resiliently hang fans and fan coil units with Type G spring/elastomer-in-series isolators.
   2. Connect ductwork with Type Q flexible duct connections at inlet and discharge. Connect heat pump coil piping with Type P flexible piping connectors.
   3. Provide flexible electrical connections.

3.4 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.

3.5 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.

3.6 EQUIPMENT SCHEDULE

A. Equipment to be installed on isolators:
   1. Air cooled condensing units.
   2. Ceiling heat pump units.

3.7 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 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, non-combustible.
      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 excluding Mechanical Rooms)
   1. Jacket: ASTM C921, one-piece molded type fitting covers and sheet material, off-white color.
      a. Minimum service temperature: -40 degrees F.
      b. Maximum service temperature: 150 degrees F.
      c. Moisture vapor transmission: ASTM E96; 0.002 perm-inches.
      d. Maximum Flame Spread: ASTM E84; 25.
      e. Maximum Smoke Developed: ASTM E84; 50.
      f. Thickness: 10 mil.
      g. Connections: Brush on welding adhesive.

B. Aluminum Jacket: ASTM B209 (All exterior refrigerant piping serving air cooled condenser).
   1. Thickness: 0.016-inch sheet.
   2. Finish: Embossed.
   3. Joining: Longitudinal slip joints and 2-inch laps.
   4. Fittings: 0.016-inch thick die shaped fitting covers with factory attached protective liner.
   5. Metal Jacket Bands: 3/8-inch-wide; 0.010-inch thick stainless steel.

C. Water Based Armaflex Finish: ASTM 84 (all exterior refrigerant piping service air cooled condenser)
   1. Color: Standard white.
   2. Composition: Pigmented Acrylic Latex.
   3. Flammability: Non-flammable; water based.
   4. Application: Brass or roller.

PART 3 – EXECUTION

3.1 INSULATION

A. Examination:
   1. Verify that piping has been tested before applying insulation materials.
   2. Verify that surfaces are clean, foreign material removed and dry. Flux to be removed from copper piping.

B. Installation:
   1. Install materials in accordance with manufacturer's instructions.
   2. On exposed piping, locate insulation and cover seams in least visible locations.
   3. All insulation to have a vapor barrier jacket (ASJ) with factory applied self-sealing longitudinal laps and butt strips.
   4. Support all piping with insulation protection saddles.
   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			
		1/2 To 1”	1-1/4 To 2”	2 ½ ” To 4”	5” & Larger
A. Mechanical Systems					
Heating Water (HWS&R)	A	1”	1”	2”	2”
Refrigerant Suction, Liquid and Hot Gas	B	1”	1”	1-1/2”	--- (Exterior Piping Shall Include Aluminum Jacket)
Condensate Drain Pipes (if installed in copper or steel pipe)	A	½”	½”	½”	½”

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 low and medium pressure rectangular supply and return ductwork	1”	C
Relief and transfer ducts	1”	C
Exhaust ducts	1”	C
Outdoor air intake ductwork/plenums	2”	B
All concealed round low and medium pressure rectangular supply and return ducts	1-1/2”	A

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.

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 15540 – HVAC Pumps.
F. 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 2012 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-inches 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.

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. Pipe equipment and condensate drains to nearest floor/roof drain. Run pipe close to equipment bases to avoid tripping hazards.

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.
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 15540

HVAC PUMPS

PART 1 – GENERAL

1.1 WORK INCLUDED
A. In line circulators.

1.2 RELATED SECTIONS
A. Section 15260 - Piping Insulation.
B. Section 15510 - Hydronic Piping.
C. Division 17 – Building Automation System.

1.3 REFERENCES
A. ANSI/UL 778 - Motor Operated Water Pumps.
B. NFPA 70 - National Electrical Code.

1.4 PERFORMANCE REQUIREMENTS
A. Ensure pumps operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.

1.5 SUBMITTALS
A. Submit under provisions of Division 1 General Requirements.
B. Product Data: Provide certified pump curves showing performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable. Include electrical characteristics and connection requirements.

1.6 OPERATION AND MAINTENANCE DATA
A. Submit under provisions of Division 1 General Requirements.
B. Operation and Maintenance Data: Include installation instructions, assembly views, lubrication instructions, and replacement parts list.

1.7 REGULATORY REQUIREMENTS
A. Products Requiring Electrical Connection: Listed and classified by UL.

1.8 EXTRA MATERIALS
A. Furnish under provisions of Division 1 General Requirements.
B. Provide one set of mechanical seals for each pump.

1.9 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.

PART 2 – PRODUCTS

2.1 MANUFACTURERS
A. Bell & Gossett, ITT
B. No substitutions.

2.2 IN-LINE CIRCULATORS
A. Type: Horizontal shaft, single stage, direct connected, with resiliently mounted motor for in line mounting, oil lubricated, for 175 psig maximum working pressure.
B. Casing: Cast iron, with flanged pump connections.
C. Impeller: Cast bronze, keyed to shaft.
D. Bearings: Two, grease lubricated ball.

E. Shaft: Alloy steel with aluminum bronze sleeve, integral thrust collar.
F. Seal: Carbon rotating against a stationary ceramic seat, EPT fitted, 250 degrees F maximum continuous operating temperature.
G. Drive: Close coupled.
H. Motor: High efficiency – non-overloading.
I. Pump shall be factory tested per Hydraulic Institute Standards.
J. Paint pump with minimum one coat of high grade enamel.

2.3 MANUFACTURER'S FIELD SERVICES

A. Pump manufacturer shall furnish a factory trained service engineer without additional charge to start the units. Pump manufacturer shall maintain service capabilities to more than 100 miles from the jobsite.
B. The manufacturer shall furnish complete submittal wiring diagrams as applicable for field maintenance and service.

2.4 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.

PART 3 – EXECUTION

3.1 PREPARATION

A. Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Provide access space around pumps for service. Provide no less than minimum as recommended by manufacturer.
C. Decrease from line size with long radius reducing elbows or reducers. Support piping adjacent to pump such that no weight is carried on pump casings. For close coupled or base mounted pumps, provide supports under elbows on pump suction and discharge line sizes 4 inches and over.
D. Provide line sized shut off gate valve and end suction diffuser on pump suction, and line sized combination pump discharge triple duty valve on pump discharge. See pump details on the drawings for all trim.
E. Provide air cock and drain connection on horizontal pump casings.
F. Provide drains for bases and seals, piped to and discharging into floor drains.
G. Check, align, and certify alignment of pumps prior to start up.
H. Lubricate pumps before start up.

END OF SECTION

SECTION 15790

AIR COILS

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Electric coils.

1.2 RELATED SECTIONS
A. Section 15880 – Heat Pump Heat Recovery System.
B. Section 15890 - Ductwork: Installation of duct coils.
C. Section 16180 - Equipment Wiring Systems: Electrical characteristics and wiring connections.

1.3 REFERENCES
A. ARI 410 - Forced Circulation Air Cooling and Air Heating Coils.
B. SMACNA - HVAC Duct Construction Standards, Metal and Flexible.
C. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW
A. Division 1 General Requirements - Submittals: Procedures for submittals.
B. Product Data: Provide coil and frame configurations, dimensions, materials, rows, connections, and rough in dimensions.
C. Shop Drawings: Indicate coil and frame configurations, dimensions, materials, rows, connections, and rough in dimensions.

1.5 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

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. Transport, handle, store, and protect products in accordance with Division 1 Sections.
B. Protect coil fins from crushing and bending by leaving in shipping cases until installation, and by storing indoors.
C. Protect coils from entry of dirt and debris with pipe caps or plugs.

1.8 WARRANTY
A. Provide five-year manufacturer warranty.

PART 2 – PRODUCTS

2.1 ELECTRIC COILS
A. Manufacturers:
   1. Brash.
   2. Trane.
   3. Markel.
B. Assembly: UL listed and labelled, with terminal control box and hinged cover, splice box, coil, casing, and controls.
C. Coil: Exposed helical coil of nickel chrome resistance wire with refractory ceramic support bushings.
D. Casing: Die formed channel frame of 16 gage galvanized steel with 3/8-inch mounting holes on 3-inch centers. Provide tube supports for coils longer than 36 inches.

E. Controls: Automatic reset thermal cut out, built in magnetic contactors, control circuit transformer and fuse, manual reset thermal cut out, air flow proving device, fused disconnect.
F. Electrical Characteristics:
   1. See Drawings.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturers written instructions.
B. Install in ducts and casings in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible.
   1. Support coil sections independent on steel channel or double angle frames and secure to casings.
   2. Provide frames for maximum three coil sections.
   3. Provide airtight seal between coil and duct or casing.
   4. Refer to Section 15890.
C. Protect coils to prevent damage to fins and flanges. Comb out bent fins.
D. Electric Duct Coils: Wire in accordance with NFPA 70. Refer to Section 16180.

END OF SECTION

SECTION 15836

TERMINAL HEAT TRANSFER UNITS

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Horizontal and vertical pipe enclosures.
B. Hydronic Finned Tube Radiation Covers.

1.2 RELATED SECTIONS
A. Section 15510 - Hydronic Piping.

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 2012 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-gauge 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 HYDRONIC FINNED TUBE RADIATION COVERS

A. Manufacturers:
   1. Trane Co.
   2. Sterling Heating Equipment.
   3. Vulcan Radiator Corp.
B. Enclosures: 18-gauge-inch steel pedestal mounted or wall mounted with easily jointed components. Support rigidly, on floor or wall mounted brackets at least 3 feet on center maximum.
C. Finish: Factory applied baked enamel of color as selected by Architect.
D. Access Doors: For otherwise inaccessible valves, provide factory-made permanently hinged access doors, 6 x 9-inch minimum size, integral with cabinet.
E. Contractor to field verify length, height, style, etc.

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 Finned Tube Radiation Covers.
   1. Install in accordance with manufacturer's instructions.
   2. Run cover continuously unless otherwise indicated (wall-to-wall).
   3. 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 existing fins.
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 15837

ELECTRIC TERMINAL HEAT TRANSFER UNITS

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Electric wall heater.

1.2 RELATED SECTIONS
A. Section 16180 - Equipment Wiring Systems: Electrical characteristics and wiring connections. Installation of room thermostats. Electrical supply to units.

1.3 REFERENCES
A. NFPA 70 - National Electrical Code.

1.4 SUBMITTALS FOR REVIEW
A. Product Data: Provide typical catalog of information including arrangements.
B. Shop Drawings:
   1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
   2. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
   3. Indicate mechanical and electrical service locations and requirements.
C. Submit under provisions of Division 1 General Requirements.
D. Indicate capacity and dimensions of manufactured products and assemblies required for this project. Indicate electrical service with electrical characteristics and connection requirements, and duct connections.
E. Submit manufacturer's installation instructions. Indicate assembly, support details, connection requirements, and include start-up instructions.
F. Contractor shall review all shop drawings prior to submitting them for Architect/ Engineer's review. Contractor shall stamp each shop drawing to certify that he 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. International Mechanical Code 2015.

1.7 WARRANTY
A. Equipment manufacturer shall provide one (1) year warranty (parts and labor) on their equipment. Installing Contractor will provide one (1) year warranty on all parts and labor associated with the installation of the equipment. See Division 1 Sections for other requirements.

1.8 DELIVERY, STORAGE AND HANDLING
A. Store and protect products under provisions of Division 1 General Requirements.
B. Deliver and store material in shipping containers with labeling in place.

C. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building, it must be stored off the ground a minimum of six inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or 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.

1.9 PROJECT RECORD DOCUMENTS

A. Submit record documents under provisions of Division 1 General Requirements.

1.10 OPERATION AND MAINTENANCE DATA

A. Submit operation and maintenance data under provisions of Division 1 General Requirements.
B. Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data and parts listings.

1.11 EXTRA METERIALS

A. Provide three (3) sets of attic stock filters for each wall heater.

PART 2 – PRODUCTS

2.1 ELECTRIC WALL UNIT HEATERS

A. Acceptable Manufacturers:
   1. Berko – Model FRC.
   2. Reddi.
   3. Markel.
   4. Q-Mark.
B. General: The heating equipment shall include an electric, automatic fan forced electric air heater. The heater shall be designed for wall recess or surface mounting. Heaters shall be UL listed.
C. Heater Assembly: The heater assembly which fits into the back box shall consist of a fan panel upon which is mounted all of the operational parts of the heater.
D. Heating Element: The heating element shall be of the non-glowing design consisting of a special resistance wire enclosed in a steel sheath to which steel plate fins are copper brazed. It shall be warranted for 5 years.
E. Fan and Motor: Fan shall be five-bladed aluminum. Fan motor shall be totally enclosed.
F. Fan Delay Switch: Fan control shall be of bi-metallic, snap-action type and shall activate fan after heating element reaches operating temperature. The fan shall continue to operate after the thermostat is satisfied and until the heating element is cool.
G. Thermostat: The tamper-proof thermostat shall be of the bi-metallic snap-action type with enclosed contacts. It shall be completely concealed behind the front cover to become tamper proof.
H. Thermal Cutout: A thermal cutout shall be built into the system to shut off the heater in the event of overheating.
I. Disconnect Switch: A double-pole, single throw disconnect switch shall be mounted on the back box for positive disconnect of power supply. It will be completely concealed behind the front grille panel.
J. Low Voltage Relays: 24-volt and 120-volt low voltage relays shall be available as optional equipment to control 208, 240 or 277-volt heaters in conjunction with central energy control systems. The built-in thermostat can then be used as one of the thermostats in an automatic night set back operation.
K. Back Box: The back box shall be designed for duty as a recessed rough-in box in either masonry frame installations and is also used with the surface mounting frame in surface mounted installations. The back box shall be 20-gauge galvanized steel and shall contain knockouts through which power leads are brought.

L. Front Panel: The front panel shall be of the bar grille type and shall be constructed of 16-gauge cold-rolled steel, welded into uniform grille to direct the warmed air toward the floor. The front grille shall be surrounded by a decorative satin-finish aluminum “Picture” frame.
M. Three Piece Design: The heater shall be made up of a backbox, a heater assembly and front panel.

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that surfaces are ready to receive work and opening dimensions are as indicated on shop drawings.
B. Verify that required utilities are available, in proper location and ready for use.
C. Beginning of installation means installer accepts existing surfaces.

3.2 INSTALLATION

A. Electric Wall Heater
   1. Install in accordance with manufacturer’s instructions.
   2. Install a construction filter during construction. Install a permanent filter after building has been accepted as substantially complete.
   3. Protect finished surfaces during construction.
   4. Provide and install remote thermostat with guard.

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.

END OF SECTION

SECTION 15880

HEAT PUMP HEAT RECOVERY SYSTEM

PART 1 – GENERAL

1.1 SYSTEM DESCRIPTION
A. The variable capacity, heat pump heat recovery air conditioning system. The systems shall be simultaneous cooling and heating split system heat pumps.
B. The system shall consist of outdoor unit(s), Branch Circuit Controller, multiple indoor units and Direct Digital Controls.
C. Each indoor unit shall be independently controlled.

1.2 QUALITY ASSURANCE
A. The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.
B. All wiring shall be in accordance with the National Electrical Code (N.E.C.).
C. The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).
D. A full charge of refrigerant for the condensing unit only shall be provided in the condensing unit.

1.3 RELATED SECTIONS
A. Section 15242 – Vibration Isolation.
B. Section 15535 – Refrigerant Piping and Specialties.
C. Section 15890 – Ductwork.
D. Division 17 – Building Automation System.

1.4 SUBMITTALS
A. Submit under provisions of the Division 1 General Requirements.
B. Submittals shall be provided and shall include: Single-Line Diagrams; Dimensional, Electrical, and Capacity data; Piping and Electrical Connection Drawings.
C. Include manufacturer installation instructions.
D. Contractor shall review all shop drawings prior to submitting them for Architect/Engineer's review. Contractor shall stamp each shop drawing to certify that he has reviewed it. Engineer will not check any shop drawings that Contractor has not stamped with his review certification.

1.5 QUALITY ASSURANCE
A. Manufacturers Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

1.6 OPERATION AND MAINTENANCE DATA
A. Include instructions for lubrication, motor and drive replacement, spare parts list and wiring diagrams under provisions of the General Requirements for inclusion into close-out documents.

1.7 DELIVERY, STORAGE AND HANDLING
A. Deliver, store, protect and handle products to site under provisions of Division 1 General Requirements.
B. Contractor shall store all materials shipped to the site in a protected area. If material is stored outside of the building it must be stored off the ground a minimum of 6 inches set on 6 x 6 planks and/or wood pallets. All material must be completely covered with waterproof tarps or visqueen. All duct openings will have the ends closed to keep out dirt and other debris. No equipment will be allowed to be stored on the site unless it is sitting on wood planks and completely protected with weatherproof covers.

1.8 WARRANTY
A. Equipment manufacturer shall provide a two (2) year warranty (parts and labor) on their equipment. Installing Contractor will provide one (1) year warranty on all parts and labor associated with the installation of the equipment. See the General Requirements for other requirements.
B. Provide seven-year warranty (parts) for compressor only.

1.9 EXTRA MATERIALS

A. Provide three sets of filters per unit.

PART 2 – PRODUCTS

2.1 APPROVED MANUFACTURERS

A. Carrier.
B. Daikin.
C. Lennox.
D. LG.
E. Mitsubishi.
F. Panasonic.
G. Trane.

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: 14F DB to 122F DB
    2. Heating: -13F WB to 61F WB

2.3 EQUIPMENT MANUFACTURER TO PROVIDE CERTIFIED DOCUMENTATION FOR APPROVAL BY ENGINEER OF UNIT TESTED HEATING CAPACITY AT -13F.(DESIGN CONDITION)

A. Refrigerant Lines:
    1. All refrigerant lines from the air-source unit to the control valve box and to the fan / refrigerant coil units shall be insulated in accordance with insulation specifications.
    2. Provide pre-insulated line sets constructed of ACR copper for piping between control box and fan units or hard pipe and insulation in accordance to specifications, manufacturer's recommendations, and local codes.
    3. Provide hard copper pipe in accordance to specifications, manufacturer's recommendations, and local codes to control boxes from compressor units.
    4. The outdoor unit shall be capable of operating with up to 3280 equivalent length feet of interconnecting liquid line refrigerant pipe in the network.
    5. The outdoor unit shall be capable of operating with up to 656 actual feet or 738 equivalent length feet of liquid line refrigerant pipe spanning between outdoor unit and furthest indoor unit.

2.4 AIR-SOURCE HEAT RECOVERY CONDENSING UNIT

A. Description: Air-source module with cabinet, compressors, controller, heat exchangers, pipe connections, condensate drain pipe connections, and refrigerant pipe connections.
B. Sound: Each compressor module shall have a sound level no higher than 60 dBA.

C. Defrost Operation
   1. The outdoor unit(s) shall be capable of auto defrost operation to melt accumulated frost off the outdoor unit heat exchanger. The defrost cycle control shall be based on outdoor ambient temperatures and outdoor unit heat exchanger temperatures.
      a. Continuous heating-defrost.
         1) During first two defrost cycles the unit shall allow heating mode indoor unit fans to stay “on” in low speed continuing to heat.
         2) Complete Defrost
            a) The third defrost cycle shall switch all outdoor units to defrost mode to fully melt and clear frost, snow or ice accumulations off the outdoor coil while turning “off” heating mode indoor unit fans to maintain efficient performance.
D. Cabinet and Frame: Welded steel, braced for rigidity, and supporting compressors and other mechanical equipment and fittings.
   1. Doors and Access Panels: Galvanized steel with polyurethane gaskets, hinges, and concealed fastening devices.
   2. Finish of Exterior Surfaces: Baked-on, textured vinyl enamel; or powder coat.
   3. Base: Welded tubular steel, with adjustable legs and vibration isolation pads.
   4. Unit Frames: Condensing unit frame quantity shall match what is shown on drawings.
   5. Unit Capacity: Condensing unit tonnage shall match what is shown in schedule.
E. Oil Management
   1. The system shall have a Hi-POR (High Pressure Oil Return) to ensure a consistent film of oil on all moving parts at low speed. Oil is returned to compressor through a separate oil injection pipe.
      a. The system shall be provided with a centrifugal oil separator designed to extract oil from the oil/refrigerant gas stream leaving the compressor and return the extracted oil to the compressor oil sump.
      b. The system shall have an oil level sensor in the compressor to provide direct oil level sensing.
      c. The system shall only initiate an oil return cycle if the oil level is too low.
F. Refrigeration System:
   1. Compressors: ALL Inverter-driven, Hermetic scroll; internal motor overload protection, crankcase heater, manual-reset high-pressure switch, and phase failure/reversal.
   2. There shall be an accumulator with refrigerant level sensors and controls.
   3. The Compressor shall use a factory charge of Polyvinyl Ether (PVE) oil.
   4. Air-Source Heat Exchanger Coil:
      a. Construction: The outdoor unit shall have a factory-built coil comprised of aluminum fins mechanical bonded on copper tubing.
      b. Maximum pressure rating: Min. 551 psig
      c. Cabinet shall have coil guard.
      d. The unit shall have a 3-row heat exchanger.
G. Electrical:
   1. Power supply: 208 volt/3-phase/ 60 Hz or 480 volts / 3-phase / 60 Hz. See drawings.

2.5 HEAT RECOVERY UNIT (HRU)

A. HR unit shall be designed and manufactured by the same manufacturer of VRF indoor units and Air source units.
B. HR unit casing shall be made with galvanized steel.
C. HR unit shall require 208-230V/1-phase/60Hz power supply.
D. HR Unit shall be an intermediate refrigerant control device between the water source unit and the indoor units to control the systems simultaneous cooling and heating operation.
E. HR unit shall be engineered to work with a have a three pipe VRF system comprising of:
   1. High Pressure Vapor Pipe
   2. Low Pressure Vapor Pipe
   3. Liquid Pipe
F. HR unit shall be designed to be piped in series with the use of Y-branch or header fittings.

G. Each port shall be capable of operating in cooling or heating independently regardless of the operating mode of any other port on the HR unit or in the system.
H. Each port shall be capable of connecting from 2, 3 or 4 indoor units to a maximum nominal capacity of 54MBh.
I. Maximum nominal capacity per HR unit shall not exceed 16 tons.
J. HR unit shall be internally piped, wired, assembled and run tested at the factory.
K. HR unit shall be designed for installation in a conditioned environment.
L. HR unit shall have a liquid bypass valve.
M. HR unit shall have (2) two-position solenoid valves per port.
N. HR unit shall have a balancing valve to control the pressure between the high pressure and low-pressure pipe during mode switching.
O. HR unit shall have an electronic expansion valve for 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 67º FWB, 80º FDB for the indoor unit and 95□FDB, 75□FWB for the outdoor unit.
B. Indoor Unit: The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.
C. Unit Cabinet:
   1. The cabinet shall be space saving ceiling-recessed cassette.
   2. The cabinet panel shall have provisions for a field installed filtered outside air intake.
   3. Branch ducting shall be allowed from cabinet.
   4. Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.
D. Fan:
   1. The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.
   2. The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.
   3. The indoor fan shall consist of four (4) speeds, Low, Mid1, Mid2, and High, two of which may be selected by the room controller.
   4. The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.
   5. The auto air swing vanes shall be capable of automatically swinging up and down for uniform air distribution.
E. Filter:
   1. Return air shall be filtered by means of a long-life washable permanent filter.

F. Coil:
   1. The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing.
   2. The tubing shall have inner grooves for high efficiency heat exchange.
   3. All tube joints shall be brazed with phos-copper or silver alloy.
   4. The coils shall be pressure tested at the factory.
   5. A condensate pan and drain shall be provided under the coil.
   6. The condensate lift mechanism shall be able to raise drain water 33 inches above the condensate pan.
   7. Both refrigerant lines to the indoor units shall be insulated.

G. Electrical:
   1. The unit electrical power shall be 208/230 volts, 1 phase, 60 hertz.
   2. The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz).

H. Controls:
   1. This unit shall use controls provided by the manufacturer to perform functions necessary to operate the system. Please refer to 2.8 of this guide specification for details on controllers and other control options.

2.7 INDOOR UNIT (Ceiling-concealed DUCTED)

A. General:
   1. The unit shall be a ceiling concealed ducted indoor fan coil design that mounts above the ceiling with a 2-position, field adjustable return and a fixed horizontal discharge supply 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 67º F WB, 80º F WB for the indoor unit and 95º F WB, 75º F 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, and an auto restart function. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

C. Unit Cabinet:
   1. The unit shall be space saving, ceiling concealed, ducted.
   2. The cabinet panel shall have provisions for a field installed filtered outside air intake.

D. Fan:
   1. The indoor unit fan shall be an assembly with one or two Sirocco fan(s) direct driven by a single motor.
   2. The indoor fan shall be statically and dynamically balanced and run on a motor with permanently lubricated bearings.
   3. The indoor fan shall consist of four (4) speeds, High, Mid1, Mid2, and Low, 2 of which are selectable on the room controller.
   4. The indoor unit shall have a ducted air outlet system and ducted return air system.

E. Filter:
   1. Return air shall be filtered by means of a standard factory installed return air filter.
   2. Optional return filter box (rear or bottom placement) with high-efficiency filter shall be available for all indoor units.

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 shall be gravity drained from the fan coil.
   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) or 207-253 volts (230V/60Hz).

H. Controls:
   1. This unit shall use controls provided by unit manufacturer to perform functions necessary to operate the system. Please refer to 2.8 of this guide specification for details on controllers and other control options.

2.8 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.

PART 3 – EXECUTION

3.1 INSTALLATION OF UNITS

A. General
   1. Install air conditioning unit in accordance with manufacturer's installation instructions. Install unit plumb and level, firmly anchored in location indicated, and maintain manufacturer's recommended clearances.

B. Electrical Wiring
   1. Install and connect electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturers electrical connection diagram submittal to electrical contractor.

C. Piping Connections
   1. Install and connect devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturers piping connection diagram submittal to piping contractor.
   2. Provide isolation valves for each unit.

D. Drain Water Piping
   1. Connect drains to air conditioning unit. Provide pitch and trap as manufacturer's instructions and local codes require.

E. Examination
   1. Verify that proper power supply is available.

F. Installation
   1. Install in accordance with manufacturer's instructions.
   2. Install in accordance with NFPA 90A.
   3. Mount condensing units on 18” high platform curb or concrete base. See Section 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 Installing Contractor shall provide training for the Owner's staff. Training shall consist of two parts. Part One is a classroom situation which describes the equipment's operation, maintenance and repair requirements. Part Two will be on-site (hands-on) training which will show the location of all devices and the operation and maintenance of all controls, devices, etc.

END OF SECTION

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
C. Louvers.

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 1/2" blade spacing with 0-degree fixed deflection blades. Blades shall be parallel to the long dimension of the grille or register.
B. Construction shall be of steel or aluminum as scheduled with a 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.

2.5 HEAVY DUTY BAR RETURN GRILLES

A. Type: Steel bar grilles, ½-inch blade spacing, 38-degree deflection.
B. Frame: 1¼-inch margin with countersunk screw mounting.
C. Fabrication: Steel bars with 14-gauge blades and 16-gauge borders with factory aluminum colored baked enamel finish as selected by the Architect.

2.6 LOUVERS

A. Manufacturers:
   1. American Warming.
   2. DowCo.
   3. Greenheck.
   4. Ruskin Mfg.
   5. Vent Products.
B. Type: 4-inch-deep, drainable with blades on 37.5-degree slope with a drain gutter in each blade and downspouts in frame jambs and mullions, heavy channel frame, birdscreen with ½-inch square mesh for exhaust and ¾-inch for intake.
C. Fabrication: 12-gauge thick extruded aluminum, welded assembly, with factory anodized finish, color to be selected by the Architect. Design shall incorporate structural supports required to withstand a wind load of 20 lbs. per sq. ft.
D. Design Basis Performance (based on 60” x 10” DowCo DWE-04):
   1. Maximum face velocity of free area: 750 fpm.

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.
F. Backpaint louver frames with bituminous paint before installation.
G. Secure louvers to wall openings with exposed stainless-steel fasteners 12 in. on center.
H. Caulk louver frames watertight. Entire installation shall be watertight under all weather conditions.

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 Illinois 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. BOCA - National Building Code (1996).
13. NEC - National Electrical Code.
14. IBC - International Building Code.
15. IEC - International Electrical Code.
16. 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.
C. Engineer inspections include one above ceiling review and report before ceiling conceal work, one substantial review report and one final review report. All additional review reports required due to incomplete or non-acceptance of substantial or final conditions will require the contractor to pay the engineer $650.00 per additional inspection review and report.

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. Contractor shall review and coordinate all shop drawings prior to submitting them for Architects/ Engineer's review. Contractor shall stamp each shop drawing to certify that all MEP related contractors have coordinated and reviewed it. Engineer will not check any shop drawings that Contractor has not stamped with his review certification. Shop drawings will be reviewed once. If a second or third review is required, the contractor will pay the engineer $500.00 per review.
6. Prior to ordering any switchboard, distribution panels, panelboards, or transformers, the contractor shall submit dimension drawings showing the switchboard will fit in the location shown on the drawings. In the event of conflicts, the contractor shall request a written clarification from the Architect/Engineer.

B. Coordination and Installation Drawings:
1. In addition to the preparation and submittal of Shop Drawings and product data for manufactured electrical equipment and materials, prepare and maintain in current status, a complete set of detailed, completely circuited, and dimensioned electrical coordination and record drawings for electrical work included under the Contract.
2. Coordination and installation drawings shall be made at the Contractor's expense on basic floor plan background. Electronic copies of the electrical drawings may be purchased from the Engineer for $250.00 a copy.
3. Coordination and installation drawings shall be CAD drawings compatible with AutoCAD Version 2006 on the same size and with the same border lines and title blocks as the Architect/ Engineer's Drawings, with the Contractor's name added.
4. Coordinate electrical work with the work of all other trades affecting the electrical work and in preparing the coordination drawings; coordinate the work of other trades in order to avoid possible installation conflicts, which includes but is not limited to mechanical equipment and architectural design elements. In the event of conflicts, interferences or discrepancies that are discovered during the coordination phase of the project, the contractor shall request a written clarification from the Architect/Engineer. If conflicts, interferences or discrepancies arise after the coordination phase of the project and no written clarification was requested, then the work shall be removed, replaced, modified or otherwise corrected at no additional cost to the owner.
5. Record drawings shall indicate the electrical installation exactly as constructed and shall be periodically revised to reflect all changes, including those required by the Architect/Engineer, those which are or have been found necessary in the field and those which may be suggested by the Contractor and accepted by the Architect/Engineer. Drawings shall be revised when considered necessary by the Architect/Engineer or the Contractor in order to facilitate proper coordination.
6. If, in the opinion of the Architect/Engineer, the drawings are in acceptable condition after each has been finally revised, they may be submitted as the field record drawings.
7. Electrical contractor shall verify total connected load/HP with mechanical contractor prior to the installation of conduit and wiring of any mechanical or plumbing equipment. If any work is installed prior to verifying the load/HP of the mechanical or plumbing equipment, the contractor shall remove, replace, modify or otherwise correct the work at no additional cost to the Owner. Make any changes to overcurrent devices or feeder size per the local authority having jurisdiction.

8. Coordination and installation drawings shall be made under the direction and supervision of the Contractor and shall show all electrical work including conduit, wiring, electrical equipment and devices, lighting fixture locations and elevations, points where conduit enters or leaves structural slabs and walls, junction boxes, conduit supports and inserts. The complete electrical distribution system from source or sources up to and including each branch circuit panelboard shall be shown and dimensioned with feeders located on plan. Major equipment and apparatus shall be shown to scale and properly located. Drawings shall also show exact locations and depths of underground conduits and ducts and their terminations.
9. The Drawings shall include floor plan and reflected ceiling plan electrical layouts. Similar drawings of each trade shall be of the same scale in order to permit respective plans to be superimposed upon all others. Drawing shall be prepared and submitted for coordination and review.
10. Initial copy of all drawings shall be submitted for review. These submittals shall not be considered as shop drawings. Subsequent revised copies need not be issued to the Architect/Engineer unless so requested. It shall be clearly understood that these drawings are for installation coordination purposes only and cannot in any way alter the requirements of the Contract Documents. The Contract Documents, Specifications, and authorized revisions thereto, shall remain the only determinants of contract requirements.
11. Upon completion of the drawings and any revisions they shall be dated and certified by Contractor as having been fully coordinated. The work shown upon the completed drawings shall then be considered ready for construction.
12. Electrical work shall not begin until the drawings are certified and reviewed by the Architect/Engineer.
13. Drawings shall be made in accordance with a schedule prepared by the Contractor and arranged to coincide with actual construction in a manner to allow the construction to proceed without delay.
14. If, in the opinion of the Architect/Engineer, the drawings are in acceptable condition after all revisions, they may be submitted as the project “As-Built” drawings.
15. Provide “as-built” drawings.

C. Operation and Maintenance Data: Refer to the General Requirements and Division 26 Sections. Submit four copies of maintenance manuals in hardbound covers containing approved shop drawings and manufacturer’s repair manuals, guarantees, operating instructions, wiring diagram and part lists.

1.11 OPERATION AND MAINTENANCE INSTRUCTION

A. Provide operation and maintenance instruction for equipment and systems.
B. Allow for 40 manhours of instruction time for electrical distribution system, emergency system, fire alarm system, communication systems, etc.

1.12 OVERTIME WORK

A. All construction work shall be done on regular working hours and days, unless otherwise specified. If overtime work, other than specified, is required on the project, it shall be performed as indicated.
B. System shutdown shall occur during off business hours and shall be done on over-time basis.
C. The base bid shall include overtime work specified. No compensation shall be made for other work done on overtime basis, unless authorized.

1.13 ALTERNATES

A. Accepted alternates, if any, may affect portions of the Base Bid Work.
B. Acceptance of alternates shall include provisions necessary to alter, adjust or otherwise modify work affected by the alteration.
C. Shop drawings shall include alternate work and shall reflect changes necessitated to other work.

1.14 GUARANTEE

A. Electrical work shall be guaranteed for both materials and labor for a period of one year.
B. On the premises maintenance shall be provided at no cost to the purchaser for one year from the date of an operational and accepted installation unless damage is caused by misuse or abuse.
C. Guarantee all wiring and equipment to be free from inherent and mechanical defects due to workmanship and materials used for the period of one full year from date of operational and accepted installation. Replacement of all or part of the equipment and/or correction of such defects, including labor, shall be rendered without cost to the Owner with the guarantee period.
D. Manufacturer's equipment guarantees or warranties for periods of more than one year shall be included in the Operation and Maintenance Data.

1.15 WARRANTY

A. Warranty period shall be one year after final acceptance 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 EXCAVATING AND BACKFILLING

A. Excavating, bracing and shoring, testing disposition of excess, excavated material, provision of borrow, and placing of backfill shall be in accordance with Division 33 Utilities Excavating and Backfilling.

3.10 TEMPORARY UTILITIES AND HEAT

A. Contractor's attention is directed to Division 01, which sets forth respective responsibilities of all concerned with furnishings temporary water, electricity and heat for use during construction of all Project.

3.11 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.

3.12 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.

3.13 ACCESS PANELS

A. Provide access panels as required. The access panels shall comply with Division 8.

3.14 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.

3.15 MOUNTING HEIGHTS

A. Mounting heights of electrical items shall be as listed below, unless otherwise specified, or by the Architect/Engineer's field instructions. Dimensions are above finished floor, unless otherwise indicated. In areas where codes require different mounting heights, as in hazardous areas, comply with code requirements.

1.	General Receptacles	- 18" to C.L.
2.	Outdoor Receptacles	- 24" to C.L.
3.	General Tele and Data Outlets	- 18" to C.L.
4.	General Toggle Switches	- 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 ($\geq$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	$\geq$ 12" to C.L. $\leq$ 72" to C.L.
15.	Panelboard Overcurrent Devices	$\geq$ 12" to C.L. $\leq$ 72" to C.L.
16.	Grouped Utility Revenue Meters	$\geq$ 30" to C.L. $\leq$ 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 contractor's 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 cover plate 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. Liquid-tight flexible metal conduit.
D. Electrical metallic tubing.
E. 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 and Section 260500.
B. Design Requirements: Conduit Size per local electrical code.
C. Field Measurements: Verify that field measurements are as shown on Drawings.
D. Field Locations: Verify routing and termination locations of conduit prior to rough in.

E. Where conduit routing is shown on Drawings, it is in approximate locations unless dimensioned. Include conduit lengths within 10 ft of length where shown.
F. Where conduit destination is indicated and routing is not shown on Drawings, determine exact routing and lengths required.

1.9 DELIVERY, STORAGE, PROTECTION, AND HANDLING

A. Accept Products and inspect for damage.
B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
C. Protect PVC conduit from sunlight.
D. Conduit that shows corrosion within the guarantee period shall be replaced.

PART 2 – PRODUCTS

2.1 CONDUIT SCHEDULE

A.

Conduit Location	From 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
Hazardous Areas	IMC	IMC	HWG
Exposed Exterior	HWG	HWG	HWG
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: 1/2-inch (13 mm), unless otherwise specified.

2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:
   1. Anaconda.
   2. American Brass.
   3. Electri-Flex Company.
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

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. OZ/Gedney.
   3. Raco.
   4. Steel City.
   5. 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 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.

2.9 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.

2.10 CONDUIT SYSTEM FOR CORROSIVE ENVIRONMENTS

A. All PVC coated conduit, fittings, and accessories shall be supplied by the same manufacturer.
B. Acceptable Manufacturers:
   1. Plasti-Bond
   2. Perma-Cote
   3. KorKap
C. The PVC coated galvanized rigid steel conduit must be UL Listed. The PVC coating must have been investigated by UL as providing the primary corrosion protection for the rigid metal conduit. Ferrous fittings for general service locations must be UL Listed with PVC as the primary corrosion protection. Hazardous location fittings, prior to PVC coating must be UL listed. All PVC coated conduit, fittings, and accessories must be new, unused material. Applicable UL standards may include: UL 6 Standard for Safety, Rigid Metal Conduit, UL 514B Standard for Safety, Fittings for Conduit and Outlet Boxes.
D. The PVC coated galvanized rigid conduit must be ETL Verified to the Intertek ETL SEMKO High Temperature H2O PVC Coating Adhesion Test Procedure for 200 Hours. The PVC coated galvanized rigid conduit must bear the ETL Verified PVC-001 label to signify compliance to the adhesion performance standard.
E. The bond between the PVC coating and the conduit surface shall be greater than the tensile strength of the coating. This bond shall be verified by testing described in NEMA Standard RN-1, section 3.8.
F. The conduit shall be hot dip galvanized inside and out with hot galvanized threads.
G. A PVC sealing sleeve extending one pipe diameter or two-inches, whichever is less, shall be formed at every female fitting opening, except unions. The inside sealing sleeve diameter shall be matched to the outside diameter of the conduit.
H. The PVC coating on the outside of conduit couplings shall be 40 mils in thickness and have a series of raised longitudinal ribs to protect the coating from tool damage during installation.
I. Form 8 condulets, 1/2" through 2" diameters, shall have a tongue-in-groove, V-Seal gasket to effectively seal against the elements. The design shall be equipped with a positive placement feature to ease and assure proper installation. Certified results confirming seal performance at 15 psig (positive) and 25 in. of mercury (vacuum) for 72 hours shall be available.
J. Form 8 condulets shall be supplied with plastic encapsulated stainless-steel cover screws.

K. A urethane coating shall be uniformly and consistently applied to the interior of all conduit and fittings. This internal coating shall be a nominal 2-mil thickness. Conduit or fittings having pinholes or areas with thin or no coating shall be unacceptable.
L. The PVC exterior and urethane interior coatings applied to the conduit shall afford sufficient flexibility to permit field bending without cracking or flaking at temperatures above 30˚F.
M. All factory cut threads on conduit, elbows, nipples, and fittings shall be protected by application of a urethane coating.
N. Right angle beam clamps and U bolts shall be specially formed and sized to snugly fit the outside diameter of the PVC coated conduit. All U bolts will be supplied with plastic encapsulated nuts that cover the exposed portions of the threads.

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 pipe cutter; 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. 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.

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 16112

SURFACE RACEWAYS

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirements, apply to the work in this Section.
B. This Section is hereby made a part of all other sections of Division 16 as fully as if repeated in each therein.

1.2 SECTION INCLUDES
A. Surface metal raceways.
B. Multi outlet assemblies.
C. Wireways.

1.3 RELATED SECTIONS
A. Section 16140 - Wiring Devices: Receptacles.

1.4 REFERENCES
A. NECA (National Electrical Contractors Association) Standard of Installation.
B. NEMA WD 6 - Wiring Device Configurations.

1.5 SUBMITTALS
A. Submit under provisions of the General Requirements and Section and 16010.
B. Product Data: Provide for surface metal raceways, multi-outlet assemblies, wireways, finishes, and accessories.
C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
D. Project Record Documents: Record actual locations of surface raceway and record actual circuiting arrangements in project record documents.

1.6 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing Products specified in this Section with minimum three years' experience.

1.7 REGULATORY REQUIREMENTS
A. Conform to requirements of local electrical code, unless otherwise specified.
B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.8 COORDINATION
A. Coordinate under provisions of the General Requirements and Section 16010.
B. Field Meetings: Coordinate within pre-installation meeting.
C. Field Measurements: Verify that field measurements are as shown on Drawings.

PART 2 – PRODUCTS

2.1 SURFACE METAL RACEWAY
A. Manufacturers:
   1. Wiremold (Basis of Design)
   2. Mono-Systems
   3. Hubbell
   4. Pre-approved equal
B. Description: Steel channel with fitted cover, suitable for use as surface metal raceway.
C. Size: V700 (minimum)

D. Finish: Buff enamel
E. Fittings, Boxes, and Extension Rings: Furnish manufacturer's standard accessories.

2.2 MULTI-OUTLET ASSEMBLY

A. Manufacturers:
   1. Wiremold Series 4000
   2. Hubbell 4000 Series
   3. Pre-approved equal
B. Multi-outlet Assembly: Steel channel with fitted cover with pre-wired receptacles, suitable for use as multi-outlet assembly.
C. Size: As required.
D. Receptacles: NEMA WD 6, type 5 20R, single receptacle.
E. Receptacle Spacing: 30” O.C. unless otherwise indicated on drawings.
F. Receptacle Color: Ivory or orange as indicated on drawings.
G. Finish: Buff enamel.
H. Fittings: Furnish manufacturer's standard couplings, elbows, outlet and device boxes, and connectors.

2.3 WIREWAY

A. Manufacturers:
   1. Wiremold, or equal
B. Description: General purpose type wireway.
C. Knockouts: Manufacturer's standard.
D. Size: As required to accommodate number of wires.
E. Cover: Screw cover.
F. Connector: Flanged.
G. Fittings: Lay in type with removable top, bottom, and side; captive screws.
H. Finish: Rust inhibiting primer coating with gray enamel finish.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install Products in accordance with manufacturer's instructions.
B. Use flat head screws, clips, and straps to fasten raceway channel to surfaces. Mount plumb and level.
C. Use suitable insulating bushings and inserts at connections to outlets and corner fittings.
D. Wireway Supports: Provide steel channel.
E. Close ends of wireway and unused conduit openings.
F. Ground and bond raceway and wireway.

END OF SECTION

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.

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 torqueing requirements are not indicated, tighten connector and terminals to comply with tightening torques specified in UL Standards 486A and B.

T. Identify and color code wire and cable under provisions of Section 260553. Identify each conductor with its circuit number or other designation indicated. Wire color coding shall be as follows or as required by local codes:

Normal Power

120/208 Volts:	277/480 Volts:
Phase A – Black	Phase A – Brown
Phase B – Red	Phase B – Orange
Phase C – Blue	Phase C – Yellow
Neutral – White	Neutral – Gray
Ground – Green	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 sized 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

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. 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.

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 flush mounting outlets to make front flush with finished wall material.
C. 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. 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 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.

2.3 FIRE RATED POKE THROUGH DEVICES

A. Manufacturers
   1. Hubbell or approved equal.

B. Description: Must be flush with floor and utilize a 4” core. Must meet a 4-hour fire rating and must meet or exceed UL514A Scrub Water Requirements. Provide IG receptacle and IG wiring where poke-through is used for an IG outlet.

C. Poke Through Devices shall be required to have at least two 1” EMT trade size conduit stems to feed power, communication and audio-visual applications.

D. Hubbell part numbers or approved equal:
   1. SIPTFIT
   2. S1CFCXXX (CARPET FLANGE)
   3. S1TFCXXX (TILE FLANGE)
   4. Appropriate device sub plate part number SISPXXX

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that device types, traditional or designer, finishes, and colors are in conformance with the Architects direction.

B. Verify that outlet boxes are installed at proper height.

C. Verify that outlet boxes for light switches are on strike side of door.

D. Verify that wall openings are neatly cut and will be completely covered by wall plates.

E. Verify that outlet boxes for wall dimmers are adequately sized to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.

F. Verify that exterior, wet locations, and other locations required by authority having jurisdiction, are provided with GFI type devices.
G. 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 decorative plates on switch, receptacle, and blank outlets in finished areas.
J. Connect wiring devices by wrapping conductor around screw terminal.
K. Use jumbo size 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 (Basis of Design)
B. Hubbell
C. Sensor Switch
D. Watt Stopper

2.2 CEILING MOUNTED OCCUPANCY SENSOR

A. Leviton OSC10 – MOW.
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 ODS10 – IDI.
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 OSP20 – DO.
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.

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: 3/4 inch.
D. Length: 10 feet.

2.3 MECHANICAL CONNECTORS

A. Manufacturers:
   1. Appleton.
   2. OZ/Gedney.
   3. Thomas & Betts.
   4. Harger Lightning Protection, Inc.
   5. Thompson Lightning Protection, Inc.
   6. Independent Protection Co., Inc.
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 bonding to meet Regulatory Requirements.
D. Bond together metal components including supports, elevator rails, pipes, and ducts not attached to grounded structure.
E. Provide isolated grounding conductor for circuits as indicated.
F. 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.
G. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

H. Flexible Conduit Connections: Provide separate, insulated ground bonding-jumper conductor within each flexible conduit.
I. Bond together metal sides not attached to grounded structure; bond to ground.

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 liquid-tight 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.			
HOT WATER BOILER						
BUILDING WATER PUMP						

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 with baked enamel finish.

2.3 VIBRATION ISOLATION

A. Suspended vibration producing equipment shall have spring elements in the hanger rods or isolation pads under the equipment.

2.4 EQUIPMENT BASES

A. Provide 4" high concrete pads for floor mounted electrical equipment. The edge of the concrete pads shall have 1/4" chamfer. The pad dimensions shall be at least one inch greater on each side than the floor dimensions of the electrical equipment.

B. Concrete pads shall include steel reinforcing and necessary bolts, anchors, etc. Where concrete pad is set directly on concrete floor, dowels in floor to tie base to floor shall be provided.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation".
C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
D. Do not use ceiling system components for support.
E. Connections to vibration producing equipment shall be made with flexible conduit.
F. Obtain permission from Architect/Engineer before using spring steel clamps.
G. Obtain permission from Architect/Engineer before using powder actuated anchors.
H. Obtain permission from Architect/Engineer before drilling or cutting structural members.
I. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
J. Install surface mounted cabinets and panelboards with minimum of four anchors.
K. In wet and damp locations use steel channel supports to stand cabinets and panelboards one inch off wall.
L. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.
M. Support surface or pendant lighting fixtures:
1. From an outlet box by means of an interposed metal strap, where weight is less than 5 pounds.
2. From an outlet box by means of a hickey or other direct threaded connection, where weight is from 5 to 50 pounds.
3. Directly from structural slab, deck, or framing member, where weight exceeds 50 pounds.

N. 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.
O. Exposed parts of hangers and supports shall be painted with one coat of rust inhibiting primer.

P. Equipment shall not be held in place by its own dead weight. Provide base anchor fasteners in each case.
Q. 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.

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. Nonfusible 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. Eaton/Cutler-Hammer.
   2. GE.
   3. Siemens ITE.
   4. Square D.

2.2 FUSIBLE SWITCH ASSEMBLIES

A. Description: NEMA KS 1, Type HD (Heavy Duty) type, horsepower rated, with operable handle interlocked to prevent opening front cover with switch in ON position. Handle lockable in OFF position.
B. Fuse clips: Designed to accommodate NEMA FU1, Class R fuses only.

2.3 NONFUSIBLE SWITCH ASSEMBLIES

A. Description: NEMA KS 1, Type HD (Heavy Duty) type, horsepower rated, with externally operable handle interlocked to prevent opening front cover with switch in ON position.

2.4 ENCLOSURES

A. Description: Code gauge steel
B. Finish: Phosphate coated, primed and finished with high grade lacquer, manufacturers standard color.
C. Fabrication: NEMA KS 1.
   1. Indoor clean, dry locations: Type 1.
   2. Indoor dusty, dry locations: Type 12.
   3. Indoor wet locations: Type 4X.
   4. Outdoor locations: Type 3R.

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install in accordance with NECA "Standard of Installation."
B. Install fuses in fusible disconnect switches.
C. Apply adhesive tag on inside door of each fused switch indicating NEMA fuse class and size installed.
D. Apply Identification Tag.

3.2 CLEANING

A. Clean installed work under the provisions of 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.

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.

1.13 EXTRA MATERIALS

A. Submit extra materials under provisions of the General Requirements and Section 16010.
B. Furnish five of each panelboard key.

PART 2 – PRODUCTS

2.1 PANELBOARDS

A. Phase sequence and balance.
   1. Phase sequence: A-B-C, left to right.
   2. Load balance: Distribute loads for maximum 10 percent difference.
B. Each panelboard, and associated fused switches and circuit breakers, shall be of the same manufacturer.

C. Each panelboard lock shall be operable by the same key.
D. Panelboard Manufacturers: 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. Square D
   2. Cutler Hammer
   3. General Electric

2.2 DISTRIBUTION PANELBOARDS

A. Description: NEMA PB 1, circuit breaker or fusible switch type as shown on drawings. Provide contactors as indicated.
B. Panelboard Bus: 1000 amp per sq.in. Copper, ampere and voltage ratings as indicated. Provide copper ground bus in each panelboard.
C. Minimum Short Circuit Rating: Fully rated, 42,000 amperes rms symmetrical for 240-volt panelboards; 65,000 amperes rms symmetrical for 480-volt panelboards, or as indicated, or as required to be greater than the available short circuit current.
D. Molded Case Circuit Breakers: NEMA AB 1, circuit breakers with integral thermal and instantaneous magnetic trip in each pole. Provide circuit breakers UL listed as Type HACR for air conditioning equipment branch circuits. Quantity and ratings as indicated. Circuit breakers shall bolt directly onto bus, modular devices utilizing spring reinforcement jaws with pressure locked connections are not acceptable.
E. Controllers: NEMA ICS 2, AC general purpose Class A magnetic controller for induction motors rated in horsepower, with bimetal overload relay. Size and ratings as indicated. Provide unit mounted control power transformer and HAND-OFF-AUTO selector switch and GREEN indicating light in front cover.
F. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.
G. Enclosure: NEMA PB 1, Galvanized steel finished inside and outside with manufactures standard gray enamel, fully flanged, fastened with quarter-turn trim clamps. Type 1 or 12 or 3R as suitable for the location, 12-inches deep, 35-inches wide, minimum, or as required to accommodate the number of outgoing conduits.
H. Cabinet Front: Surface type, finished in manufacturer's standard gray enamel. Fasten doors 48-inches in height or less with concealed hinged door with flush catch lock. Fasten doors over 48-inches in height with three-point catch lock and vault type handle.

2.3 BRANCH CIRCUIT PANELBOARDS

A. Equipment:
   1. Furnish 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 galvanized steel frames to prevent vibration and damage from short circuits.
   4. Terminations shall be UL tested and listed and suitable for UL copper wire.
   5. Provide [1] continuous bus bar per phase. Each bus bar shall have sequentially phased branch circuit connectors for bolt-on branch circuit breakers. Bus bars shall be rated as indicated in drawings.
   6. Split solid 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.

2.4 ACCESSORIES

A. Contactor control relays.
B. Tork (or equal) time clocks.
C. Locking devices for breakers and/or operating handles.
D. Furnish nameplates for each device as indicated in drawings.
E. Provide Transient Voltage Surge Suppression system as specified.

PART 3 – EXECUTION

3.1 PREPARATION

A. Provide concrete equipment base for floor mounted equipment installation.
B. Verify field measurements.
C. Verify that required utilities are available, in proper location and ready for use.
D. Beginning of installation means installer accepts conditions.

3.2 INSTALLATION

A. Install panelboards in accordance with NEMA and NECA standards and as instructed by manufacturer.
B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
C. Support free-standing panelboards with structural channel framework.
D. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with lowest operating handle not lower than 18-inches above finished floor per NEC.
E. Provide filler plates for unused spaces in panelboards.
F. Provide typed circuit directory for each branch circuit panelboard under the provisions of Section 16195. Revise directory to reflect circuiting changes required to balance phase loads.
G. Provide engraved plastic nameplates under the provisions of Section 16195.
H. Provide 3¾-inch 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 16477

FUSES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS
A. The General Provisions of the Contract, including Conditions of the Contract and the General Requirement Specifications, apply to the work in this Section.
B. This Section is hereby made a part of all other sections of Division 16 as fully as if repeated in each therein.

1.2 SECTION INCLUDES
A. Fuses.

1.3 REFERENCES
A. Local Electric Code.
B. NEMA FU 1 - Low Voltage Cartridge Fuses.

1.4 SUBMITTALS
A. Submit under provisions of Division 01 and Section 16010.
B. Product Data: Provide data sheets showing electrical characteristics including time current curves.
C. Manufacturers Instructions: Indicate application conditions and limitations of use stipulated by Product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of Product.
D. Project Record Documents: Record actual fuse sizes in project record documents.
E. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.

1.5 QUALIFICATIONS
A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years experience.

1.6 REGULATORY REQUIREMENTS
A. Conform to requirements of local electrical code.
B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for the purpose specified and indicated.

1.7 COORDINATION
A. Coordinate under provisions of the General Requirements and Section 16010.

1.8 EXTRA MATERIALS
A. Provide two fuse pullers.
B. Provide spare fuses as specified.

PART 2 – PRODUCTS

2.1 FUSES
A. Dimensions and Performance: NEMA FU 1, Class as specified or indicated.
B. Voltage: Provide fuses with voltage rating suitable for circuit phase to phase voltage.
C. Interrupting Rating: 200,000 rms amperes.
D. Coordination: Provide fuses for properly coordinated system of overcurrent protection.

2.2 MOTOR AND DRY TYPE TRANSFORMER LOAD FUSES
A. Description: 600 amperes and smaller, 250 volts or less, Class RK5.
   1. Manufacturers (RK5):
      a. Bussmann Fusetron FRN-R
      b. Gould Shawmut.

B. Description: 601 amperes and larger, 250 volts or less, Class L.
   1. Manufacturers (L):
      a. Bussmann KRP-C
      b. Gould Shawmut
C. Description: 600 amperes and smaller, 600 volts or less, Class RK5.
   1. Manufacturers (RK5):
      a. Bussmann Fusetron FRS-R
      b. Gould Shawmut
   2. Manufacturers (J):
      a. Bussmann Low Peak LPJ
      b. Gould Shawmut
D. Description: 601 amperes and larger, 600 volts or less, Class L.
   1. Manufacturers (L):
      a. Bussmann KRP-C
      b. Gould Shawmut

2.3 LIGHTING AND HEATING LOAD FUSES

A. Description: 600 amperes and smaller, 250 volts or less, Class RK1, RK5.
   1. Manufacturers (RK5-time delay):
      a. Bussmann Fusetron FRN-R
      b. Gould Shawmut
   2. Manufacturers (J-time delay):
      a. Bussman LPJ
      b. Gould Shawmut
B. Description: 601 amperes and larger, 250 volts or less, Class L.
   1. Manufacturers (L-time delay):
      a. Bussmann KRP-C
      b. Gould Shawmut
   2. Manufacturers (L-non-time delay):
      a. Bussmann KTU
      b. Gould Shawmut
C. Description: 600 amperes and smaller, 600 volts or less, Class RK1, RK5.
   1. Manufacturers (RK1-time delay):
      a. Bussmann Low Peak LPS-RK
      b. Gould Shawmut
   2. Manufacturers (RK5-time delay):
      a. Bussmann Fusetron FRS-R
      b. Gould Shawmut
   3. Manufacturers (J-time delay):
      a. Bussmann LPJ
      b. Gould Shawmut
D. Description: 601 amperes and larger, 600 volts or less, Class L.
   1. Manufacturers (L-time delay):
      a. Bussmann KRP-C
      b. Gould Shawmut
   2. Manufacturers (L-non-time delay):
      a. Bussmann KTU
      b. Gould Shawmut

PART 3 – EXECUTION

3.1 INSTALLATION

A. Install fuses in accordance with manufacturer's instructions.
B. Install fuse with label oriented such that manufacturer, type, and size are easily read.
C. Do not install parallel sets of fuses for any single phase.
D. Replace fuses blown during construction and during testing.

END OF SECTION

SECTION 16481

ENCLOSED MOTOR CONTROLLERS

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. Manual motor starters.
B. Magnetic motor starters.
C. Combination magnetic motor starters.

1.3 RELATED SECTIONS

A. Section 16170 - Grounding and Bonding.
B. Section 16180 - Equipment Wiring Systems.
C. Section 16190 - Supporting Devices.
D. Section 16195 - Electrical Identification.
E. Section 16441 - Enclosed Switches.
F. Section 16477 - Fuses.

1.4 REFERENCES

A. NFPA 70 – National Electrical Code.
B. CSA C22 No 14, Industrial Control Equipment.
C. NEMA ICS 2, Industrial Control and Systems: Controllers, Contactors and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC.
D. UL 508, Industrial Control Equipment.

1.5 SUBMITTALS

A. Submit under provisions of the General Requirements and Section 16010.
B. Product Data: Provide catalog sheets showing voltage, controller size, ratings and size of switching and overcurrent protective devices, short circuit ratings, dimensions, and enclosure details.
C. Test Reports: Indicate field test and inspection procedures and test results.
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, installation, and starting of Product.
E. Project Record Documents: Record actual locations of controllers 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.

1.6 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years documented experience.

1.7 REGULATORY REQUIREMENTS

A. Conform to requirements of local electrical codes, unless otherwise specified.
B. Furnish products listed and classified by Underwriters Laboratories, Inc. as suitable for 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 controllers prior to rough in.

1.9 DELIVERY, STORAGE, PROTECTION, AND HANDLING

A. Deliver, store, protect, and handle products in accordance with recommended practices listed in manufacturer's Installation and Maintenance Manuals.
B. Deliver each combination starter in individual shipping cartons for ease of handling. Each starter shall be wrapped for protection.
C. Inspect and report concealed damage to carrier within specified time.
D. Store in a clean, dry space. Storage temperature shall be minus 30 to plus 65 degrees C. Maintain factory protection or cover to keep out dirt, water, construction debris, and traffic (heat enclosures to prevent condensation.)
E. Handle in accordance with NAED and manufacturer's written instruction to avoid damaging combination starters, installed device and finish.

1.10 OPERATION AND MAINTENANCE DATA

A. Manufacturer shall provide copies of installation, operation and maintenance procedures to Owner.
B. Submit operation and maintenance data based on factory and field testing, operation and maintenance of specified product.

1.11 QUALITY ASSURANCE (QUALIFICATIONS)

A. Manufacturer shall be specialized in the manufacture and assembly of combination starters for 10 years.
B. Combination starters shall be listed and/or classified by Underwriters Laboratories in accordance with standards listed in Article 1.03 of this specification.
C. Manufacturer's Certificate of ISO 9000 Compliance.
D. Installer's Certificate of ISO 9000 Compliance.

PART 2 – PRODUCTS

2.1 CONTROLLERS

A. Phase sequence and balance.
   1. Phase sequence: A-B-C, left to right, front to rear, top to bottom.
B. Each NEMA type controller and combination controller, shall be of the same manufacturer.
C. General operating voltage characteristics unless otherwise specified:
   1. Motors ½-horsepower and larger 460-volts, operating on 480-volt, 3-phase, 60 Hertz system.
   2. Motors 1/3-horsepower and smaller 115-volts, operating on 120-volt, 1-phase, 60 Hertz system.
D. Minimum 3-phase starter size: NEMA 1.
E. Manufacturers:
   1. ITE/Siemens
   2. GE
   3. No Substitutions.

2.2 MANUAL CONTROLLERS

A. Fractional Horsepower Manual Controller for motors: NEMA ICS 2, AC general purpose Class A manually operated, full voltage controller for fractional horsepower induction motors, with thermal overload unit, red pilot light, and toggle operator suitable for mounting in standard outlet box.
B. Manual Motor Controller: NEMA ICS 2, AC general purpose Class A manually operated, full voltage controller with auxiliary contacts, red pilot light, START-STOP push button switches, overload elements, and control power transformer.
C. Enclosure: NEMA ICS 6; Type 1, 12, or 3R as suitable for the location.

2.3 AUTOMATIC CONTROLLERS

A. Magnetic Motor Controllers: NEMA ICS 2, AC general purpose Class A automatically operated, full voltage controller with auxiliary contacts, green pilot light, ON-OFF-AUTO selector switch, overload elements, fusible lockable disconnect and control power transformer.
B. Reduced Voltage Controllers: NEMA ICS 2, AC general purpose Class A automatically operated, closed transition reduced voltage autotransformer type controller with 50%, 65%, and 80% tap settings, auxiliary contacts, green pilot light, ON-OFF-AUTO selector switch, overload elements, fusible lockable disconnect and control power transformer.
C. Reversing Controllers: NEMA ICS 2, AC general purpose Class A automatically operated, full voltage controller with auxiliary contacts, green pilot light, ON-OFF-AUTO selector switch, FORWARD-OFF-REVERSE selector switch, overload elements, fusible lockable disconnect, and control power transformer. Include electrical interlock and integral time delay transition between FORWARD and REVERSE rotation.
D. Two Speed Controllers: NEMA ICS 2, AC general purpose Class A automatically operated, full voltage dual single winding controller with auxiliary contacts, green pilot light, ON-OFF-AUTO selector switch, FAST-SLOW selector switch, overload elements, fusible lockable disconnect and control power transformer. Include integral time delay transition between FAST and SLOW speeds. Verify exact starter requirement with mechanical contractor.
E. Enclosure: NEMA ICS 6, Type 1 or 12 or 3R as suitable for the location.
F. Size: The starter shall be large enough to serve the motor being served.

2.4 PRODUCT FEATURES

A. Auxiliary Contacts: NEMA ICS 2, 2 normally open, 2 normally closed field convertible contacts in addition to seal in contact.
B. Cover Mounted Pilot Devices: NEMA ICS 2, heavy duty type.
C. Pilot Device Contacts: NEMA ICS 2, Form Z, rated A150.
D. Indicating Lights: LED type.
E. Selector Switches: Rotary type, on-off-auto.
F. Overload Relays: NEMA ICS; melting alloy, one per phase, wired on the line side of the holding coil.
G. Cover Mounted Overload Relay Reset: Recessed pushbutton type.
H. Relays: NEMA ICS 2.
I. Control Power Transformers: 120-volt secondary with capacity for starter coils, relays, pilot lights, etc. Provide fused primary and secondary, and bond unfused leg of secondary to enclosure.
J. Remote start-stop stations: Include green ON pilot light.

2.5 DISCONNECTS

A. Combination Controllers: Combine motor controllers with non-fusible switch or fusible switch disconnect within common enclosure.
B. Description: Refer to section 16441.

2.6 FUSES

A. Fuse: Class RK-1, dual element, time delay.
B. Description: Refer to section 16481.

2.7 WARNING SIGNS

A. Steel and enamel, painted as follows: WARNING! THIS MOTOR HAS AN AUTOMATIC CONTROL AND MAY START AT ANY TIME

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify the actual manufacture, size, and location of each motor provided to determine final connection, control, and overcurrent protection selection.

3.2 INSTALLATION

A. Perform Work in accordance with NECA Standard of Installation.
B. Install enclosed controllers where indicated, in accordance with manufacturer's instructions.
C. Install enclosed controllers plumb. Provide supports in accordance with Section 16190.
D. Select and install fuses in motor controller fusible switches to match installed motor characteristics. Verify time-current curves for proper selection.
E. Select and install overload heater elements in motor controllers to match installed motor characteristics.
F. Provide engraved plastic nameplates under the provisions of Section 16195.
G. Provide neatly typed label inside each motor controller door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.
H. Install warning signs at automatically controlled motors.

3.3 FIELD QUALITY CONTROL

A. Inspect and test each enclosed controller to NEMA ICS 2.
B. Clean starter enclosure to remove construction debris, dirt, shipping material.
C. Repaint scratched or marred exterior 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. 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 25□ C.
C. The operating temperature range shall be 0□ to + 25□C
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 cable TV, CCTV, card reader and sound system devices.

2.2 PLASTER COVER RINGS
A. Single gang for single device, double gang for two devices, etc.

2.3 COVER PLATES
A. Cover plates for cable TV, CCTV, card reader and sound systems shall be provided by its respective trade.

2.4 RACEWAYS
A. Per appropriate section with insulated throat bushings on all conduit runs and rubber 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 cable TV, CCTV, card reader and sound systems.

3.2 INSTALLATION
A. Furnish and install the trunk raceways, outlet box, and outlet box raceways as shown on drawings and specified.
B. Install trunk raceways to within six inches of backboards.
C. Stub outlet box raceways to cable support system provided by others within accessible ceiling cavity.
D. Minimum outlet box conduit sizes shall be 3/4 inch.
E. In each instance where two or more device boxes are generally located in the same vicinity and at the same mounting height, mount those devices in a common multi-gang barrier box appropriate for the device types.
F. Mark each conduit end for identification and destination of raceway.
G. Provide required sleeves in all walls and floors as required by low voltage system contractors.
H. Provide pull rope in each raceway.
I. Provide insulating bus wings and locknuts for all raceways.

J. There shall not be more than the equivalent of three 90-degree bends in any single run of conduit between boxes or fittings.
K. Bends shall be made so that the conduit will not be flattened or kinked and the internal diameter of the conduit will not be reduced.
L. The radius of the curve of the inner edge of any bend shall not be less than as indicated by the National Electrical Code and ANSI/TIA/EIA 569A Commercial Building Standard for Telecommunications Pathways and Spaces.
M. In no case shall any conduit be bent or any fabricated elbow be applied no less than the allowable bending radius as specified by the cable manufacturer of the installed conductor.
N. Provide blank cover plates for each unused outlet box.
O. Prior to and during installation of Tele-Power Pole System refer to system layout or approval drawings containing all elements of the system. Installer shall comply with detailed manufacturer's instruction sheets, which accompany system components, as well as complete system instruction sheets, whichever is applicable.
P. 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.
Q. All metal raceway shall be electrically continuous and bonded in accordance with the National Electric Code for proper grounding.
R. Raceway shall be securely supported at intervals not exceeding 5' [1.5m] or in accordance with manufacturer's installation sheets.

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 568B, 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 6E, 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, Comscope, 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.

C. Patch Panel
   1. Unshielded Twisted Pair (UTP) Patch Panel and Associated Items:
      a. 3 – 48 Port Patch Panels: rack mounted, 48-port cat-6E patch panel, with cable support bar and color-coded label strip, T568B wired in DMF room.
         1) Acceptable Manufacture: Siemon HD5-48, Panduit or equal.
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 manufacturers’ published torque-tightening values for equipment connectors.
   9. Do not damage cabling and shielding. Avoid excessive and sharp bends. Ensure manufacturer's recommended pulling tensions are not exceeded.
   10. Allow sufficient slack in cable to prevent premature deterioration of cable system components and to assist in the maintenance and servicing of cable and/or other building systems and components.
   11. Cable that is run above a suspended ceiling shall be supported by 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 SECTION INCLUDES
A. Control equipment.
B. Software.
C. Instrument and control elements.

1.3 RELATED SECTIONS
A. Section 17600 - Sequence of Operation for HVAC controls.

1.4 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.

1.5 SYSTEM DESCRIPTION
A. Provide hardware and software as required to fully integrate and support extension to existing JCI Building Automation System. 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.
B. Provide automatic temperature control field monitoring and control system using BACnet field programmable microprocessor-based units with communications to the existing Building Automation System.
C. 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.
D. Include computer software and hardware, operator input/output devices, control units, local area networks (LAN), sensors, control devices, actuators.
E. 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.
F. Furnish and install all power wiring and conduit necessary for the BAS control system for a complete operating system. Install per Division 16.
G. Include installation and calibration, supervision, adjustments, and fine tuning necessary for complete and fully operational system.
H. Replace existing UNT controller currently in Mechanical Room with new FEC controllers to integrate with Field Server and other new equipment.

1.6 SUBMITTALS FOR REVIEW
A. See Division 1 Requirements.
B. Product Data: Provide data for each system component and software module.
C. Shop Drawings:
   1. List connected data points, including connected control unit and input device.
   2. Indicate system graphics indicating monitored systems, data (connected and calculated) point addresses, and operator notations. Provide demonstration diskette containing graphics.
   3. Show system configuration with peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.

4. Indicate description and sequence of operation of operating, user, and application software.
5. Ensure terminology used in submittals conforms to ASME MC85.1.

1.7 SUBMITTALS FOR INFORMATION

A. See Division 1 Requirements.
B. Manufacturer's Instructions: Indicate manufacturer's installation instructions for all manufactured components.

1.8 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.

1.9 APPROVED INSTALLING CONTRACTORS, QUALITY ASSURANCE

A. General
   1. The Building Automation System Contractor shall be JCI, branch office; South Bend, IN. Contract Jim Davis @ (514) 876-7851 (Cell Phone) – 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.

1.10 REGULATORY REQUIREMENTS

A. Conform to the 2012 International Building Code (IBC).
B. Conform to the 2012 International Fuel Gas Code (IFGC).
C. Conform to the 2012 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 2009 ICC Electrical Code.
G. Conform to 2008 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 DDC SYSTEM CONTROLLERS

A. Approved Manufacturer: General Purpose Fully Programmable Controllers shall be JCI BACnet.
   1. The General Purpose Programmable Controller (PCA/PCG) by JCI shall be a fully user-programmable, digital controller that communicates via BACnet MS/TP protocol. There shall be no substitutions made as the owner has standardized on these.
      a. The PCG shall support BACnet Standard MS/TP Bus Protocol ASHRAE SSPC-135, Clause 9 on the controller network.
   2. The PCG shall employ a finite state control engine to eliminate unnecessary conflicts between control functions at crossover points in their operational sequences. Suppliers using non-state based DDC shall provide separate control strategy diagrams for all controlled functions in their submittals.
   3. The PCG shall be factory programmed with a continuous adaptive tuning algorithm that senses changes in the physical environment and continually adjusts loop tuning parameters appropriately. Controllers that require manual tuning of loops or perform automatic tuning on command only shall not be acceptable.
   4. The PCG shall be assembled in a plenum-rated plastic housing with flammability rated to UL94-5VB.
   5. The PCG shall include a removable base to allow pre-wiring without the controller.
   6. The PCG shall include troubleshooting LED indicators to identify the following conditions:
      a. Power On
      b. Power Off
      c. Download or Startup in progress, not ready for normal operation
      d. No Faults
      e. Device Fault
      f. Field Controller Bus - Normal Data Transmission
      g. Field Controller Bus - No Data Transmission
      h. Field Controller Bus - No Communication
      i. Sensor-Actuator Bus - Normal Data Transmission
      j. Sensor-Actuator Bus - No Data Transmission
      k. Sensor-Actuator Bus - No Communication

7. The PCG shall accommodate the direct wiring of analog and binary I/O field points.
8. The PCG shall support the following types of inputs and outputs:
    a. Universal Inputs - shall be configured to monitor any of the following:
        1) Analog Input, Voltage Mode
        2) Analog Input, Current Mode
        3) Analog Input, Resistive Mode
        4) Binary Input, Dry Contact Maintained Mode
    b. Binary Inputs - shall be configured to monitor either of the following:
        1) Dry Contact Maintained Mode
        2) Pulse Counter Mode
    c. Analog Outputs - shall be configured to output either of the following
        1) Analog Output, Voltage Mode
        2) Analog Output, current Mode
    d. Binary Outputs - shall output the following:
        1) 24 VAC Triac
    e. Configurable Outputs - shall be capable of the following:
        1) Analog Output, Voltage Mode
        2) Binary Output Mode
9. The PCG shall have the ability to reside on a Field Controller Bus (FC Bus).
    a. The FC Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard protocol SSPC-135, Clause 9.
    b. The FC Bus shall support communications between the PCGs and the Supervisory Controller.
    c. The FC Bus shall also support Expansion I/O (PCX) communications with the PCG and with the Supervisory Controller.
    d. The FC Bus shall operate at a maximum distance of 15,000 Ft. between the PCG and the furthest connected device.
10. The PCG shall have the ability to monitor and control a network of sensors and actuators over a Sensor-Actuator Bus (SA Bus).
    a. The SA Bus shall be a Master-Slave/Token-Passing (MS/TP) Bus supporting BACnet Standard Protocol SSPC-135, Clause 9.
    b. The SA Bus shall support up to 10 devices per trunk.
    c. The SA Bus shall operate at a maximum distance of 1,200 Ft. between the PCG and the furthest connected device.
11. The PCG shall have the capability to execute complex control sequences involving direct wired I/O points as well as input and output devices communicating over the FC Bus or the SA Bus.
12. The PCG shall support, but not be limited to, the following:
    a. Chilled water/central plant automation applications including but not limited to:
        1) The selection and sequencing of up to 8 chillers of different sizes.
        2) The selection and sequencing of up to 8 (each) primary and secondary chilled water pumps of varying pump capacities.
        3) The selection and sequencing of up to 8 condenser water pumps.
        4) The selection and sequencing of cooling towers and bypass valve, including single speed, multi-speed, and Vernier control.
        5) A proven and documented central cooling plant optimization program that incorporates custom equipment efficiency profiles, without rewriting software code, in order to meet the building load using the least amount of energy as calculated.
        6) The use of advanced control algorithms that apply equipment specific parameters, including operational limits and efficiency profiles, in order to determine equipment, start and runtime preferences.
        7) The identification of the most efficient equipment combination and automatic control of state and speed of all necessary equipment to balance runtime, optimize timing and sequencing and ensure the efficiency and stability of the central cooling plant.

8) The control definition for the chiller plant in a single FX-PCG, as supported by available memory and point Input / Output (I/O), or capable of being split across multiple FX-PCGs.

b. Heating central plant applications.
c. Built-up air handling units for special applications.
d. Terminal and packaged units and unit ventilators.
e. Special programs as required for systems control.

13. The PCG shall support a Local Controller Display (DIS) either as an integral part of the PCG or as a remote device communicating over the SA Bus. Local displays shall be provided when controllers are used in central plant or AHU applications but are not required on simple systems such as unit ventilators.
    a. The Display shall use a BACnet Standard SSPC-135, clause 9 Master-Slave/Token-Passing protocol.
    b. The Display shall allow the user to view monitored points without logging into the system.
    c. The Display shall allow the user to view and change set points, modes of operation, and parameters.
    d. The Display shall provide password protection with user adjustable password timeout.
    e. The Display shall be menu driven with separate paths for:
        1) Input / Output
        2) Parameter / Set point
        3) Overrides
    f. The Display shall use easy-to-read English text messages.
    g. The Display shall allow the user to select the points to be shown and in what order.
    h. The Display shall support a back lit Liquid Crystal Display (LCD) with adjustable contrast and brightens and automatic backlight brightening during user interaction.
    i. The display shall be a minimum of 4 lines and a minimum of 20 characters per line
    j. The Display shall have a keypad with no more than 6 keys.
    k. The Display shall be panel mountable.

2.2 ROOM SENSOR: PROVIDE JCI NS-BTXXXXX-2 (OR EQUAL)

A. Sensors shall be provided with +/- 1-degree temperature adjustment and override button.

2.3 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.
C. Provide straight screw driver latch (no keying) for all panels.

2.4 CONTROL VALVES: PROVIDE BELIMO B2/B3 CHARACTERIZED CONTROL VALVES AND BELIMO "F" SERIES BUTTERFLY VALVES OF APPROPRIATE SIZE AND TYPE (NO SUBSTITUTIONS PERMITTED). PROVIDE BELIMO LF/AF SPRING RETURN VALVE ACTUATORS OF APPROPRIATE SIZE AND TYPE (NO SUBSTITUTIONS PERMITTED)

A. Electronic, positive positioning, spring return, low voltage (24 VAC) actuators to be properly selected for the valve body and service.
B. Valve bodies to be 3-way mixing, 2-way normally open or normally closed to suit application. Bodies 2 inches and less to be 250 psig bronze, screwed connection, bronze seats, equal percentage plugs, stainless steel stems with Teflon packing. Over 2-inch bodies to be 125 psig iron, flanged connection with modified equal percent plug. Valve selection to be based on 3 psig drop across fully open valve.

C. The valves shall be sized by the control manufacturer and be provided with actuators of sufficient power for the duty intended. Valve body and actuator selection shall be sufficient to handle system pressure and shall close against the differential pressures to be encountered on the project.
D. Where required by the sequence of operation, valves shall be capable of being sequenced either with other valves or other actuated devices. Where such sequencing is required, the actual spring range, when adjusted for spring shift, shall be such that no overlapping occurs. In the event that spring shift causes an overlap, a pilot positioning operator shall be furnished.
E. Small Valves - 1/2 Inch through 2 Inch:
   1. Ball type.
   2. Valves shall be constructed with a two-piece cast brass body and screwed ends. Valves shall have removable packing gland with threaded cap for shaft seal. O-Ring type seals are unacceptable.
   3. Electric actuator shall be Belimo. Body rating shall be 400 psi at 50 degrees F. Body rating shall also meet or exceed ANSI B6.5 Class 250.
F. Valves - 2-1/2 Inches and Above:
   1. Ball or butterfly type.
   2. Valves shall be constructed with a cast iron body and have flanged connections. Valves shall have removable packing gland with threaded cap for shaft seal.
   3. Electric actuators shall be Belimo SY type actuators.
   4. Ball and butterfly valves need to achieve proper Cv. by use of reduced size and reducers or reduced port.
G. All control valves shall fail safe by spring return as follows:
   1. Heating: Fails open (N.O.).
   2. Cooling: Fails closed (N.C.)
   3. VAV Box Valves shall fail to open.
H. Electronic Operators:
   1. Acceptable Manufacturers:
      a. Belimo.
      b. No Substitutions.
   2. Valves shall spring return to normal position as indicated on freeze, fire, or temperature protection.
      a. 2” and smaller shall be SY Actuators and must be wired to controllers that are powered on the generator.
      b. 2-½” and larger shall be SY 24-volt Actuators and must be wired to controllers that are powered on the generator, they will not spring return they will fail to their current position.
   3. Select operator for full shut off at maximum pump differential pressure.

2.5 INTERIOR DAMPERS: PROVIDE JCI VD-1300 SERIES VOLUME CONTROL DAMPERS OF APPROPRIATE SIZE AND TYPE OR APPROVED EQUAL.

A. Acceptable Manufacturer:
   1. Johnson Controls, Inc.
   2. Ruskin.
   3. Pottorf.
B. Performance: Test in accordance with AMCA 500.
C. Frames: Galvanized steel welded or riveted with corner reinforcement.
D. Blades: Galvanized steel, maximum blade size 6 inches wide, 48 inches long, attached to minimum ½-inch shafts with set screws.
E. Blade Seals: Synthetic elastomeric or Neoprene mechanically attached, field replaceable.
F. Jamb Seals: Spring stainless steel.
G. Shaft Bearings: Graphite impregnated nylon sleeve, with thrust washers at bearings or lubricant free, stainless steel, single row, ground, flanged, radial, antifriction type with extended inner race.

H. Linkage Bearings: Graphite impregnated nylon.
I. Leakage: Less than 2 percent based on approach velocity of 2000 ft/min and 4 inches w.g.
J. Maximum Pressure Differential: 6-inches w.g.
K. Temperature Limits: -40 to 200 degrees F.

2.6 DAMPER OPERATORS: PROVIDE BELIMO DAMPER ACTUATORS OF APPROPRIATE SIZE (NO SUBSTITUTIONS PERMITTED)

A. Acceptable Manufacturers:
   1. Belimo (LF Series)
   2. No Substitutions.
B. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
C. Electric Operators: Actuators shall use a brushless DC motor and be protected from overload at all angles of rotation. Run time shall be constant and independent of torque. If required, 2 SPDT auxiliary switches shall be provided.
D. Number: Sufficient to achieve unrestricted movement throughout damper range. Provide one damper operator for maximum 25 sq. ft. damper section.

2.7 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:
      a. Accuracy: Plus-or-minus .3 C F at calibration point.
      b. Wire: Twisted, shielded pair cable.
      c. Insertion Elements in Ducts: Single point, 8 inches long; use where not affected by temperature stratification or where ducts are smaller than 9 sq. ft.
      d. Averaging Elements in Ducts: 17-foot-long; use where prone to temperature stratification or where ducts are larger than 9 sq. ft. length as required.
      e. Insertion Elements for heating system: Brass well with minimum insertion length of 2-1/2 inches. Stainless steel wells are required for all chiller systems.
      f. Room Sensors: Cover to be blank, with plus/minus 3-degree setpoint adjustable, and/or with override button at Owners choice.
      g. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
      h. Room Security Sensors: Stainless steel cover plate with insulated back and security screws.
   2. Static-Pressure Transmitter: Provide Veris PXPLX series of appropriate range or approved equal.
      a. Non-directional sensor with suitable range for expected input, and temperature compensated.
      b. Accuracy: 2 percent of full scale with repeatability of 0.5 percent.
      c. Output: 4 to 20 mA.
      d. Building Static-Pressure Range: 0 to 0.25-inch w.g.
      e. Duct Static-Pressure Range: 0 to 5-inches w.g.
   3. Pressure Transmitters: Provide Veris PWLX series of appropriate range with AA16A bypass valve assembly (No Substitutions Permitted)
      a. 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.
   1. Status inputs for Fans and Pumps: Current-sensing relay with current transformers, adjustable and set to 175 percent of rated motor current.

C. Carbon Dioxide Room Sensors: Provide JCI CD-W00-N0-1 series wall mounted CO2 sensor (No Substitutions Permitted).
D. Outside Air Humidity and Temperature Sensor: Provide JCI HE-68P3-0N000 series OA mounted humidity and temperature sensor (No Substitutions Permitted).
E. Outside Photocell: Provide Kele EM-24A2 series OA mounted photocell sensor or approved equal.

2.8 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. Relays in box (RIB's) are not acceptable.
   2. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application. Relays to be IDEC RR2P-UL AC24V with SR2P-06 base.
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.

2.9 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 series 500/700 raceway/wiremold.

2.10 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 pool area. Plastic are not acceptable.

C. Install software in control units and in operator workstation. Implement all features of programs to specified requirements and appropriate to sequence of operation. Refer to Section 17600.
D. Electrical material and installation shall be in accordance with appropriate requirements of Division 16.
E. Provide liquid tight flexible conduit for all BAS connections to equipment located in the Boiler Room and Mechanical Room.
F. Provide liquid tight flexible conduit for all equipment with vibration isolation.
G. 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.
H. BAS Raceway
    1. All wiring in rooms (Mechanical, Boiler, Mezzanine, Storage, Etc.) with no drop ceiling shall be installed in conduit. Wiremold or equal raceway shall be used in occupied spaces and below drop ceiling. Minimum control wiring conduit size ¾ inch.
    2. All conduits and raceways shall be installed level, plumb, at right angles to the building lines and shall follow the contours of the surface to which they are attached.
    3. Flexible Metal Conduit shall be used for vibration isolation and shall be limited to 3 feet in length when terminating to vibrating equipment. Flexible Metal Conduit may be used within partition walls. Flexible Metal Conduit shall be UL listed."
I. Provide setup time to configure Owner's smartphones for remote web access.

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.

3.4 TRAINING

A. Provide competent service engineer to instruct Owner's representative in operation of automatic control systems. Onsite training shall consist of 8 hours in two 4 hours increments. This time shall be for training only, not maintenance of system. Contractor shall prepare a time log sheet, obtaining owner's signature after training sessions and provide updates to owner after each session.

3.5 INPUT/OUTPUT SCHEDULES

A. See Specification Section 17600 "Sequence of Operation for HVAC controls".

END OF SECTION

SECTION 17600

SEQUENCE OF OPERATION

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Heat Recovery Heat Pump Control.
B. Existing Fin Tube Radiation Valve and Pump Control.
C. Electric Duct Coil 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 piece of equipment and each system. This is to include all pumps, boilers, chillers, air handling units, unit ventilators, fan coils, fan powered VAV boxes, cabinet/suspended unit heats, etc. Also "System" graphics showing air handling unit systems, heating/cooling system with pumps, boilers, and chiller plant with schematic piping diagram indicating all temperature, status and alarm conditions of all equipment. When the operator double clicks on pumps, boilers, 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. Heat Recovery Heat Pump System
   1. The VRF System shall be furnished with BACnet interface cards and complete control system for each unit.
   2. Install all loose controls furnished with the units. Wire space thermostats / sensors to the unit. Concealed accessible wiring may be run without conduit. Attach cable to the building structure using j-hooks or bridal rings. Cable to be run in a neat and workman like manor. Excessive sag will not be allowed.
   3. Wire and sequence outdoor air damper.
   4. Exposed wiring will be run in emt or wiremold.
   5. Run the BACnet bus wiring between units and to the new JACE.
   6. Map all pertinent points from the VRF system to the Enterprise Server. Provide graphic screens of quality to match those provided on the HS project. Graphic screens shall reside on the owner's server. The Schneider Electric Enterprise Server shall serve up the graphics. Provide trending of all pertinent points.
   7. Provide alarming via email and text message to the owner's designated personnel. Coordinate with Owner for emails and cell phone numbers.
   8. Provide scheduling per owner's instruction.
B. Existing Fin Tube Radiation Valve Control and Pump
   1. Extend control of four (4) existing control valves to system. Modulate valves based on Owner's Outdoor Air Reset Schedule (Adj.). Verify operation of valves and replace if non-operational.
   2. Sequence new pumps with Outdoor Air Reset Schedule.
C. Electric Duct Coil Control
   1. Duct sensor shall modulate electric SCR controller and heat pump unit to maintain adjustable discharge temperature.

END OF SECTION

SECTION 17800

TESTING, ADJUSTING AND BALANCING

PART 1 – GENERAL

1.1 SECTION INCLUDES
A. Testing, adjustment, and balancing of air systems.
B. Testing, adjustment, and balancing of hydronic systems.
C. 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

(Not Used.)

PART 3 – EXECUTION

3.1 EXAMINATION

A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
   1. Systems are started and operating in a safe and normal condition.
   2. Temperature control systems are installed complete and operable.
   3. Proper thermal overload protection is in place for electrical equipment.
   4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
   5. Duct systems are clean of debris.
   6. Fans are rotating correctly.
   7. Fire and volume dampers are in place and open.
   8. Air coil fins are cleaned and combed.
   9. Access doors are closed and duct end caps are in place.
   10. Air outlets are installed and connected.
   11. Duct system leakage is minimized.
   12. Hydronic systems are flushed, filled, and vented.
   13. Pumps are rotating correctly.
   14. Proper strainer baskets are clean and in place.
   15. 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.

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.

3.3 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.
C. Hydronic Systems: Adjust to within plus or minus 10 percent of design.
D. Balance to reduce/eliminate objectionable noise and note on report as required.

3.4 ADJUSTING

A. Ensure recorded data represents actual measured or observed conditions.
B. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
C. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
D. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
E. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

3.5 AIR SYSTEM PROCEDURE

A. Adjust air handling and distribution systems to provide required or design supply, return, exhaust fresh air quantities.
B. As a minimum, air system shall be prepared for testing in the following manner:
    1. Using pitot tube transverse, set main line dampers to deliver proper air volumes to zones.
    2. Using pitot tube transverse, set branch line dampers to deliver proper air volumes to air terminal outlets in each zone.
    3. Read CFM at each air terminal outlet and adjust to meet design requirements. Test and record items as listed in the following test procedures.
        a. Test and adjust fan RPM to design requirements.
        b. Test and record fan motor full amperes.
        c. Make pitot tube transverse of main air ducts and obtain design volume at fans.
        d. Test and record system static pressure at fan suction and discharge.
        e. Test and adjust system for design recirculated air volume.
        f. Test and adjust system for design outdoor air volume.
        g. Adjust main duct to proper design volume.
        h. Adjust zones to proper design volume supply and return/exhaust.
        i. Test and adjust each air terminal to within tolerance of 10 percent or as specified on the drawings.
    4. In cooperation with the control manufacturer's representative, who is responsible for setting adjustments of automatically operated dampers to operate as specified, indicated and/or noted, TAB agency shall check controls for proper operation and list controls requiring adjustment by control installer.
    5. Air terminal outlets shall be adjusted to minimize drafts. Adjust air patterns to match plans.
C. Adjust outside air automatic dampers, outside air, return air and exhaust dampers for design conditions.
D. Measure temperature conditions across outside air, return air and exhaust dampers to check leakage.
E. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling and at minimum air flow rate, full heating.
F. Measure building static pressure and adjust supply, return and exhaust air systems to provide required relationship between each to maintain approximately 0.02 inches positive static pressure near the building entries.

G. Test and Balancing Contractor shall be required to field measure and set the minimum outside air on ALL unit ventilators.
H. The Mechanical contractor shall provide and install replacement sheaves, belts, pulleys, etc. as required to meet final balancing requirements.

3.6 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing (Including but Not Limited to):
   Heat Pump Units
   Air Inlets and Outlets
B. Report Forms
   1. Title Page:
      a. Name of Testing, Adjusting, and Balancing Agency
      b. Address of Testing, Adjusting, and Balancing Agency
      c. Telephone number of Testing, Adjusting, and Balancing Agency
      d. Project name
      e. Project location
      f. Project Architect
      g. Project Engineer
      h. Project Contractor
      i. Project altitude
      j. Report date
   2. Summary Comments:
      a. Design versus final performance
      b. Notable characteristics of system
      c. Description of systems operation sequence
      d. Summary of outdoor and exhaust flows to indicate amount of building pressurization
      e. Nomenclature used throughout report
      f. Test conditions
   3. Instrument List:
      a. Instrument
      b. Manufacturer
      c. Model number
      d. Serial number
      e. Range
      f. Calibration date
   4. Electric Motors:
      a. Manufacturer
      b. Model/Frame
      c. HP/BHP
      d. Phase, voltage, amperage; nameplate, actual, no load
      e. RPM
      f. Service factor
      g. Starter size, rating, heater elements
      h. Sheave Make/Size/Bore
   5. V Belt Drive:
      a. Identification/location
      b. Required driven RPM
      c. Driven sheave, diameter and RPM
      d. Belt, size and quantity
      e. Motor sheave diameter and RPM
      f. Center to center distance, maximum, minimum, and actual

6. Cooling Coil Data:
   a. Identification/number
   b. Location
   c. Service
   d. Manufacturer
   e. Air flow, design and actual
   f. Entering air DB temperature, design and actual
   g. Entering air WB temperature, design and actual
   h. Leaving air DB temperature, design and actual
   i. Leaving air WB temperature, design and actual
   j. Air pressure drop, design and actual
7. Water Heating Coil Data:
   a. Identification/number
   b. Location
   c. Service
   d. Manufacturer
   e. Air flow, design and actual
   f. Water flow, design and actual
   g. Water pressure drop, design and actual
   h. Entering water temperature, design and actual
   i. Leaving water temperature, design and actual
   j. Entering air temperature, design and actual
   k. Leaving air temperature, design and actual
   l. Air pressure drop, design and actual
8. Air Moving Equipment
   a. Location
   b. Manufacturer
   c. Model number
   d. Serial number
   e. Arrangement/Class/Discharge
   f. Air flow, specified and actual
   g. Return air flow, specified and actual
   h. Outside air flow, specified and actual
   i. Total static pressure (total external), specified and actual
   j. Inlet pressure
   k. Discharge pressure
   l. Sheave Make/Size/Bore
   m. Number of Belts/Make/Size
   n. Fan RPM
9. Return Air/Outside Air Data:
   a. Identification/location
   b. Design air flow
   c. Actual air flow
   d. Design return air flow
   e. Actual return air flow
   f. Design outside air flow
   g. Actual outside air flow
   h. Return air temperature
   i. Outside air temperature
   j. Required mixed air temperature
   k. Actual mixed air temperature
   l. Design outside/return air ratio
   m. Actual outside/return air ratio

10. Duct Traverse:
    a. System zone/branch
    b. Duct size
    c. Area
    d. Design velocity
    e. Design air flow
    f. Test velocity
    g. Test air flow
    h. Duct static pressure
    i. Air temperature
    j. Air correction factor
11. Duct Leak Test:
    a. Description of ductwork under test
    b. Duct design operating pressure
    c. Duct design test static pressure
    d. Duct capacity, air flow
    e. Maximum allowable leakage duct capacity times leak factor
    f. Test apparatus
        1) Blower
        2) Orifice, tube size
        3) Orifice size
        4) Calibrated
    g. Test static pressure
    h. Test orifice differential pressure
    i. Leakage
12. Air Distribution Test Sheet:
    a. Air terminal number
    b. Room number/location
    c. Terminal type
    d. Terminal size
    e. Area factor
    f. Design velocity
    g. Design air flow
    h. Test (final) velocity
    i. Test (final) air flow
    j. Percent of design air flow

END OF SECTION