CONTRACT DOCUMENTS AND SPECIFICATIONS

FOR

CLINTON COUNTY GOVERNMENT DEWITT OFFICE ANNEX 2012 RENOVATIONS

IIW, P.C. ◆ ENGINEERS. ARCHITECTS. SURVEYORS.

IIW, P.C.
4155 Pennsylvania Avenue
Dubuque, IA 52002-2628

Voice: 563-556-2464
Fax: 563-556-7811
Web: www.iiwengr.com

IIW Project No.: 11176-01

SECTION 000101 – PROJECT TITLE PAGE

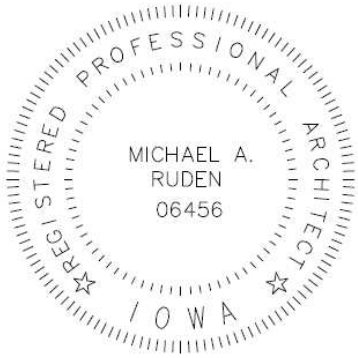
Clinton County Government
Dewitt Annex – 2012 Renovations

226 11th Street
Dewitt, Iowa

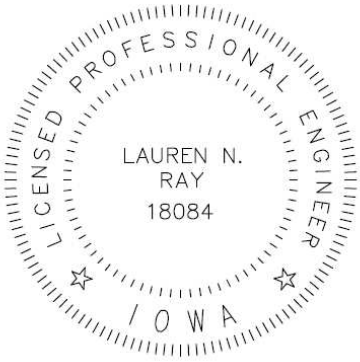
SECTION 000102 – CERTIFICATION PAGE

Clinton County Government
Dewitt Annex – 2012 Renovations

226 11th Street
Dewitt, Iowa

	I hereby certify that this document was prepared by me or under my direct personal supervision and that I am a Registered Architect under the laws of the State of Iowa. FOR IIW, P.C.
	Michael A. Ruden, AIA. Date License Number 6456 My license renewal date is June 30, 2013 Architectural Sections Identified in theTable of Contents

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly registered Engineer under the laws of the State of Iowa.

	Lauren N. Ray	Signing Date
	Iowa PE 18084	12/31/2013
	Iowa License No.	Renewal Date:
	Pages or sheets covered by this certification: Structural Sections Identified in the Table of Contents	

Clinton County Government
Dewitt Annex – 2012 Renovations

226 11th Street
Dewitt, Iowa

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly registered Engineer under the laws of the State of Iowa.

Timothy T Wendt, PE	Signing Date
Iowa PE 17732	12/12/2012
Iowa License No.	Renewal Date:

Pages or sheets covered by this certification:

Mechanical and Plumbing Sections Identified in the Table of Contents

I hereby certify that the portion of this technical submission described below was prepared by me or under my direct supervision and responsible charge. I am a duly registered Engineer under the laws of the State of Iowa.

Aaron R. Gudeyon, PE	Signing Date
Iowa PE 20834	12/31/2013
Iowa License No.	Renewal Date:

Pages or sheets covered by this certification:

Electrical Sections Identified in the Table of Contents

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SECTION 000110

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SECTION 001000

NOTICE TO BIDDERS
CLINTON COUNTY GOVERNMENT – DEWITT ANNEX

Time and Place for Filing Sealed Proposals. Sealed bids for the work comprising each improvement as stated below must be filed before 2:00 p.m. on August 3rd, 2012, in the Office of the County Auditor, Clinton County Administration Building, 1900 N 3rd St, Clinton, IA 52732.

Time and Place Sealed Proposals will be Opened and Considered. Sealed proposals will be opened and bids tabulated at 2:00 p.m. on August 3, 2012, at the Clinton County Administration Building, 1900 N 3rd St, Conference Room B, Clinton, IA, for consideration by the Clinton County Board of Supervisors (Board) at its meeting on Wednesday, August 8, 2012. The County of Clinton, Iowa, reserves the right to reject any and all bids.

Time for Commencement and Completion of Work. Work on the Building shall be commenced within ten (10) days after the Notice to Proceed has been issued and shall be completed by December 1, 2012. Bidder shall pay $1,000.00 per day liquidated damages for each day after the December 1, 2012, completion date until work is completed.

Bid Security. Each Bidder shall accompany its bid with a bid security as security that the successful bidder will enter into a contract for the work bid upon and will furnish after the award of contract a corporate surety bond, acceptable to the governmental entity, for the faithful performance of the contract, in an amount equal to one hundred percent (100%) of the amount of the contract. The bid security shall be in the amount of five percent (5%) of the amount of the contract and shall be in the form of a cashier's check or certified check drawn on a state-chartered or federally-charted bank, or a certified share draft drawn on a state-chartered or federally-chartered credit union, or the governmental entity may provide for a bidder's bond with corporate surety satisfactory to the governmental entity. The bid bond shall contain no conditions except as provided in this section.

Contract Documents. Copies of the Construction Bidding Documents may be obtained by contacting Clinton Printing Company, 1402 Roosevelt Street, Clinton, IA 52732, (563) 242-7895, on or after July 13, 2012. A deposit of $50.00 per set of documents or receipt of AGC, AMC, AMEC, MBI or NECA card is required. Deposits will be refunded upon return of the Construction Bidding Documents in good condition within ten (10) days after bid opening.

Copies of the Construction Bidding Documents may be viewed at the Office of the Clinton County Auditor, Clinton County Administration Building, 1900 N 3rd St, Clinton, IA 52732.

Project information will also be posted on the County's website at www.clintoncounty-ia.gov

Preference for Iowa Products and Labor. By virtue of statutory authority, preference will be given to products and provisions grown and coal produced within the State of Iowa, and to Iowa domestic labor, to the extent lawfully required under Iowa statutes. Equipment or products authorized to be purchased with federal funding awarded for this contract must be American-made to the maximum extent feasible, in accordance with Public Law 103-121, Sections 606 (a) and (b).

Sales Tax. The bidder should not include sales tax in its bid. A sales tax exemption certificate will be available for all material purchased for incorporation in the project.

General Nature of Public Improvement. The scope of the project includes an interior remodel; and the installation of electric, gas, and HVAC services. Exterior site work is limited to utilities.

To View the Building. Prospective Bidders may contact Corey R. Johnson, Manager, Clinton County Building Maintenance, Clinton County Administration Building, 1900 N. 3rd Street, Clinton, Iowa 52732; office phone #(563) 243-2160 or by email: cjohnson@clintoncounty-ia.gov.

Published in the Clinton Herald and DeWitt Observer on July 14, 2012.

END OF SECTION 001000

SECTION 002000

INSTRUCTIONS TO BIDDERS

DOCUMENTS

Copies of the Construction Bidding Documents may be obtained by contacting Clinton Printing Company, 1402 Roosevelt Street, Clinton, IA 52732, (563) 242-7895. A deposit of $50.00 per set of documents or receipt of AGC, AMC, AMEC, MBI or NECA card is required. Deposits will be refunded upon return of the Construction Bidding Documents in good condition within ten (10) days after the bid opening.

Copies of the Construction Bidding Documents may be viewed at the Office of the Auditor, Clinton County Administration Building, 1900 N 3rd St, Clinton, IA.

Project information will also be posted on the County's website at www.clintoncounty-ia.gov

The County requests non-bidders to return documents as soon as possible before bid opening.

EXAMINATION

Bidders shall use complete sets of Bidding Documents in preparing Bids. Examine the documents and the construction site to obtain first-hand knowledge of existing conditions. Extra compensation will not be given for conditions that can be determined by examining the documents and site.

Bidders are cautioned to be alert for the possibility of missing Project Manual pages. In all cases, pages are numbered consecutively within each section, and "END OF SECTION" identifies the final page of each section.

QUESTIONS AND INTERPRETATIONS

Submit questions about the Bidding Documents to the IIW, P.C. in writing. Replies will be issued to Document holders of record as Addenda to the Drawings and Specifications and will become part of the Bidding Documents. The Architect and Owner will not be responsible for oral clarification.

Failure to request clarification will not waive the responsibility of comprehension of the documents and performance of the work in accordance with the intent of the documents. Signing of the Agreement will be considered as implicitly denoting thorough comprehension of intent of the Bidding Documents.

PRODUCT OPTIONS

To obtain approval to use an unspecified product, deliver written requests to the Auditor at least seven (7) days before the bid date. Late requests will not be considered. Clearly describe and indicate the product for which approval is requested, including data, clearly marked necessary to demonstrate acceptability. Written request must indicate the section number, page number and line number of the Specification for the request of the product being made. If the product is acceptable, the Auditor will approve it in an Addendum issued to plan holders on record.

INSPECTION SITE

Each Bidder should visit the site(s) and/or building(s) of the proposed work and fully acquaint themselves with the existing conditions relating to the project and should inform themselves as to the facilities involved, the difficulties and the restrictions attending the performance of the Contract. The Bidder shall thoroughly examine and familiarize themselves with the specifications and all other Construction Documents. The Contractor by the execution of the Contract shall in no way be relieved of any obligation under it due to his failure to receive or examine any form or legal instrument or to visit the site and acquaint themselves with the conditions there existing and the County will be justified in rejecting any claim based on facts regarding which he should have been on notice as a result thereof.

PRE-BID INFORMATION

Prospective Bidders may contact Corey R. Johnson, Manager, Clinton County Building Maintenance, Clinton County Administration Building, 1900 N. 3rd Street, Clinton, Iowa 52732; office phone #(563) 243-2160 or by email: cjohnson@clintoncounty-ia.gov.

PREPARATION OF BIDS

a. All bids must be submitted on the Bid Proposal Forms (**BID FORMS 1A & 1B)** supplied by the County and bound in the Construction Documents Manual. Bid amounts shall be both written and printed in the space provided. In case of conflicts between figures, the written amount will prevail. All bids shall be subject to all requirements of the Construction Documents including INSTRUCTIONS TO BIDDERS. All Bids must be regular in every respect and no interlineations, excisions or special conditions shall be made or included in the Bid Form by the Bidder.

b. Bid Documents including the Bid Proposal Forms (**BID FORMS 1A & 1B)** and Bid Bond, shall be enclosed in a sealed envelope and clearly labeled with the project name, name of Bidder, and date and time of bid opening in order to guard against premature opening of the Bid.

c. The County may consider as irregular any Bid on which there is an alteration of or departure from the Bid Form(s) hereto attached and at its option may reject the same.

d. If the Contract is awarded, it will be awarded by the County to a responsible Bidder on the basis of the Bid most favorable to the County. The Contract will require the completion of work according to the Construction Documents.

e. Each Bidder shall include in his bid, in the appropriate spaces therefore, the proposed cost of performing said work in compliance with the Construction Documents including all items of labor, equipment, materials and overhead.

ALTERNATIVE BIDS

Bidders are referred to the Bid Proposal Schedule **(BID FORMS 1A)** executed by the Bidder and an acceptable surety; or a cashier's or certified check payable to the County Treasurer, Clinton County, Iowa, drawn on a bank of Iowa or a bank chartered under the laws of the United States, in the amount of five percent (5%) of the bid submitted as security that the Bidder will enter into a contract for doing the work and will give bond with proper securities for the faithful performance of the contract in the form attached to the specifications.

CORRECTIONS

Erasures or other changes in the Bid must be explained or noted over the signature of the Bidder.

TIME FOR RECEIVING BIDS

Bids received prior to the time of opening will be securely kept unopened. The officer whose duty it is to open them will decide when the specified time has arrived, and no Bid received thereafter will be considered.

OPENING OF BIDS

At the time and place fixed for the opening of Bids, the County will cause to be opened and publicly read aloud every Bid received within the time set for receiving Bids, irrespective of any irregularities, therein, Bidders and other persons properly interested may be present, in person or by representative.

WITHDRAWAL OF BIDS

Bids may be withdrawn on written request by the Bidder received prior to the time fixed for opening. The Bid Bond of any bidder withdrawing his Bid in accordance with the foregoing conditions will be returned promptly.

AWARD OF CONTRACTS: REJECTION OF BIDS

a. The Contract **(CONTRACT FORM 3)** shall be awarded to the lowest responsible Bidder complying with the conditions of the INVITATION FOR BIDS provided such Bid is reasonable and it is to the interest of the County to accept it. The County, however, reserves the right to reject any and all Bids and to waive any formality in bids received whenever such rejection or waiver is in the County's interest. The Bidder to whom the award is made shall be notified at the earliest possible date.

b. The County reserves the right to consider as unqualified to perform the Contract any Bidder who does not habitually perform with his own forces the major portions of the work involved in the completion of the project.

EXECUTION OF CONTRACT: PERFORMANCE, PAYMENT AND MAINTENANCE BOND

a. Subsequent to the award and within seven (7) days after the prescribed forms are presented for signature, the successful Bidder shall execute and deliver to the County a Contract in the form included **(CONTRACT FORM 4)** in the Construction Documents in such number of copies as the County may require.

b. Having satisfied all conditions of award as set forth elsewhere in these documents, the successful Bidder shall, within the period specified in Paragraph "a" above, furnish a Contractor's Performance, Payment and Maintenance Bond in the same form that included in the Construction Documents and shall bear the same date as, or a date subsequent to, the date of the Contract. The current power of attorney for the person who signs for any surety company shall be attached to such bond.

c. The failure of the successful Bidder to execute such Contract and to supply the required bond(s) within seven (7) days after the prescribed forms are presented for signature, or within such extended period as the County may grant, based upon reasons determined sufficient by the County, shall constitute a default, and the County may either award the Contract to the next best responsible Bidder or re-advertise for Bids, and may charge against the Bidder the difference between the amount for which a Contract for the work is subsequently executed, irrespective of whether the amount thus due exceeds the amount of the Bid Bond. If a more favorable bid is received by re-advertising, the defaulting Bidder shall have no claim against the County for a refund.

AMERICAN-MADE EQUIPMENT & PRODUCTS

By virtue of statutory authority, preference will be given to products and provisions grown and coal produced within the State of Iowa, and to Iowa domestic labor, to the extent lawfully required under Iowa statutes. Equipment or products authorized to be purchased with federal funding awarded for this contract must be

American-made to the maximum extent feasible, in accordance with Public Law 103-121, Sections 606 (a) and (b).

NONDISCRIMINATION

In carrying out the project, the Contractor shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, national origin, age or disability. All businesses, including minority owned, female owned, or small businesses are encouraged to participate.

END OF SECTION 002000

SECTION 004100 **BID FORM 1A**

BID PROPOSAL SCHEDULE

CLINTON COUNTY GOVERNMENT
DEWITT ANNEX – 2012 RENOVATIONS

LUMP SUM BID:

BIDDER agrees to complete the Work in accordance with the Contract Documents for the following:

TOTAL BASE BID LUMP SUM PRICE:

_____
(use words)

$_____
(figures)

ALTERNATE BID: As outlined in Section 012300 Alternates

(Bidder Note: Cross out the word "add" or "deduct" that does not apply)

Alternate No. 1:
Add/Deduct_____ ($_____)
(use words) (figures)

END OF SECTION 004100

SECTION 004200 **BID FORM 1B**

BID PROPOSAL FORM

CLINTON COUNTY GOVERNMENT
DEWITT ANNEX – 2012 RENOVATIONS

The bidder hereby certifies that they are the only person or persons interested in this proposal as principals; that an examination has been made of the plans, specifications, and contract form, including the special provision contained herein, and of the site of the work, and the bidder understands that the quantities of work shown herein are approximate only and are subject to increase or decrease; and further understand that all quantities of work, whether increased or decreased, are to be performed at the unit price as stipulated herein; the bidder proposes to furnish all necessary machinery, equipment, tools, labor and other means of construction, and to furnish all materials specified in the manner and time prescribed and to do the work at the prices herein set out.

Accompanying this proposal in a separate envelope is a cashier's or certified check payable to the County Treasurer, Clinton County, Iowa, drawn on a bank in Iowa or a bank chartered under the laws of the United States, in the amount of five percent (5%) of the bid submitted; or a bid bond in the penal sum of five percent (5%) of the bid submitted executed by the bidder and an acceptable Corporate Surety. It is understood that this proposal guarantee will be retained in the event the formal contract or bond is not executed, if award is made to the undersigned.

The bidder further agrees to execute a formal contract and bond, if required by the contract documents, within seven (7) days of the award of the contract by the County, and that they will commence work on or about ten (10) days after the date of the contract, and will complete the work within the specified contract period or pay the liquidated damages stipulated in the contract documents.

The bidder acknowledges receipt of the following addendum:

_____ Dated: _____
_____ Dated: _____
_____ Dated: _____
_____ Dated: _____

PRINCIPAL:

_____
Contractor

_____
Address

Individual ( ) Partnership ( ) Corporation ( )

_____
City

By: _____
Signature

_____
State Zip

_____
Title

_____
Date

SECTION 004300 **BID FORM 2**

BID BOND

CLINTON COUNTY GOVERNMENT
DEWITT ANNEX – 2012 RENOVATIONS

KNOWN ALL MEN BY THESE PRESENTS, that we _____ as Principal (Contractor), and _____, as Surety, are held and firmly bound unto the unto the County of Clinton, Iowa (County), in the penal sum of _____ _____ in lawful money of the United States, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents. The condition of this obligation is such that whereas the Principal has submitted the accompanying bid, dated _____ day of _____, 2012, for the Clinton County Government Dewitt Annex – 2012 Renovations.

NOW, THEREFORE, if the Principal shall not withdraw said bid within the period specified therein during the opening of same, or if no period specified, within thirty (30) days after said opening, and shall within the period specified therefore, if no period be specified, within seven (7) days after the prescribed forms are presented to him for signature, enter into a written contract with the Municipality, in accordance with the bid as accepted, and give bond with good and sufficient surety or sureties, as may be required for the faithful performance and proper fulfillment of such contract, then the above obligation shall be void and of no effect, otherwise to remain in full force and virtue.

By virtue of statutory authority, the full amount of this bid bond shall be forfeited to the Municipality in liquidations of damages sustained in the event that the afore described bidder, Principal, fails to execute the contract and provide the bond as provided in the specifications or by law.

IN WITNESS WHEREOF, the above bounden parties have executed this instrument under their several seals this _____ day of _____, 2012, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative pursuant to authority of its governing body.

PRINCIPAL:	**SURETY:**
_____	_____
Contractor	Surety Company
By: _____	By: _____
Signature	Signature
_____	_____
Title	Title
_____	_____
Date	Date

SECTION 004400

BID PROPOSAL SUBMITTAL CHECKLIST

CLINTON COUNTY GOVERNMENT
DEWITT ANNEX – 2012 RENOVATIONS

Checking your bid submittal, before filing, against the following checklist will assist preventing minor errors or omissions, which could result in disqualifications of your bid because of technicalities.

1. Bid Proposal must be submitted on forms provided:

   BID PROPOSAL SCHEDULE
   Bid Form 1A

   BID PROPOSAL FORM
   Bid Form 1B

2. Acknowledge receipt of all addendum(s) on Bid Proposal (Bid Form 1B).

3. Bid Proposal (Bid Form 1B) must be SIGNED by an authorized agent.

5. Bid Proposal must be accompanied by a BID BOND in an amount not less than ten percent (5%) of the bid submitted or Certified check made payable to the "County of Clinton" in an amount not less than ten percent (5%) of the bid submitted.

   Bid Bond, if used, must be SIGNED by both the bidder and the Surety or Surety's Agent. Signature of Surety's Agent must be supported by accompanying Power of Attorney.

6. Bid Proposals must be submitted in a SEALED envelope, which shall be addressed as follows:

   Office of County Auditor
   Clinton County Administration Building
   1900 N. 3rd Street
   Clinton, Iowa, 52732

   and shall be clearly labeled as follows:

   Clinton County Government Dewitt Annex – 2012 Renovations

9. Sufficient time should be allowed for mailed bids to be delivered by normal Postal operation. Late bids will not be considered.

10. Bid must not be qualified in any way or contain any reservations not made optional in the Bid Form provided to bidders.

This SPECIAL NOTICE is issued as a reminder against common irregularities in bids, and is not a Contract Document.

END OF SECTION 004400

SECTION 005100

CLINTON COUNTY GOVERNMENT
DEWITT ANNEX – 2012 RENOVATIONS

CONSTRUCTION SCHEDULE AND LIQUIDATED DAMAGES

Work herein provided for shall be commenced within 10 days after the Notice to Proceed has been issued and shall be completed as follows: December 1, 2012.

For each calendar day that any work shall remain uncompleted beyond the specified completion date, $1,000.00 per calendar day will be assessed, not as a penalty but as predetermined and agreed liquidated damages. The Contractor will be separately invoiced for this amount, and final payment will be withheld until payment has been made of this invoice.

The assessment of liquidated damages shall not constitute a waiver of the County's right to collect any additional damages which the County may sustain by failure of the Contractor to carry out the terms of his contract.

An extension of the contract period may be granted by the County for any of the following reasons:

1. Additional work resulting from a modification of the plans.

2. Delays caused by the County.

3. Other reasons beyond the control of the Contractor, which in the County's opinion, would justify such extension.

END OF SECTION 005100

SECTION 005200 **CONTRACT FORM 3**

COUNTY OF CLINTON, IOWA
PUBLIC IMPROVEMENT CONTRACT

CLINTON COUNTY GOVERNMENT
DEWITT ANNEX – 2012 RENOVATIONS

THIS IMPROVEMENT CONTRACT (the Contract), made in triplicate, dated for reference purposes the _____ day of _____, 2012, between the County of Clinton, Iowa, by the Clinton County Board of Supervisors (County) and (Insert Contractors Name) of the County of (Insert Contractors Address City, State).

For and in consideration of the mutual covenants herein contained, the parties hereto agree as follows:

CONTRACTOR AGREES:

1. To furnish all material and equipment and to perform all labor necessary for the Clinton County Government Dewitt Annex- 2012 Renovations (the Project).

2. Contract Documents shall mean and include the following: All ordinances and resolutions heretofore adopted by the County having to do with the Project; the Notice to Bidders; the Contractor's Proposal; and the Plans, Specifications, and General Requirements as adopted by the County for the Project.

3. All materials used by the Contractor in the Project shall be the best of their several kinds and shall be put in place to the satisfaction of the County.

4. The Contractor shall remove any materials rejected by the County as defective or improper, or any of said work condemned as unsuitable or defective, and the same shall be replaced or done anew to the satisfaction of the County at the cost and expense of the Contractor.

5. Five percent (5%) of the Contract price shall be retained by the County for a period of thirty (30) days after final completion and acceptance of the Project by the County to pay any claim that may be filed within said time for labor and materials done and furnished in connection with the performance of this Contract and for a longer period if such claims are not adjusted within that time, as provided in Iowa Code Chapter 573. The County shall also retain additional sums to protect itself against any claim that has been filed against it for damages to persons or property arising through the prosecution of the work and such sums shall be held by the County until such claims have been settled, adjudicated or otherwise disposed of.

6. The Contractor has read and understands the specifications including General Requirements and has examined and understands the plans herein referred to and

agrees not to plead misunderstanding or deception because of estimates of quantity, character, location or other conditions surrounding the same.

7. In addition to the guarantee provided for in the specifications, the Contractor shall also make good any other defect in any part of the Project due to improper construction notwithstanding the fact that said Project may have been accepted and fully paid for by the County, and the Contractor's bond shall be security therefore.

8. The Contractor shall fully complete the Project under this Contract shall be completed as follows: December 1, 2012.

9. To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the County from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Contract, provided that such claim, damages, loss or expense is attributable to bodily injury, sickness, disease or death, or injury to or destruction of property (other than the Project itself) including loss of use resulting there from, but only to the extent caused in whole or in part by negligent acts or omissions of the Contractor, the Contractor's subcontractor, or anyone directly or indirectly employed by the Contractor or the Contractor's subcontractor or anyone for whose acts the Contractor or the Contractor's subcontractor may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder.

THE COUNTY AGREES:

Upon the completion of the Contract, and the acceptance of the Project by the Clinton County Board of Supervisors, the County agrees to pay the Contractor as full compensation for the complete performance of this Contract, the amount determined for the total number of units completed at the unit prices stated in the Contractor's Proposal and less any liquidated damages provided for in the Contract Documents. The number of units stated in the plans and specifications is approximate only and the final payment shall be made by the work covered by the Contract.

CONTRACT AMOUNT $ _____ (Insert Contract Amount)

FURTHER CONDITIONS

The Contractor hereby represents and guarantees that it has not, nor has any other person for or in its behalf, directly or indirectly, entered into any arrangement or agreement with any other bidder, or with any public officer, whereby it has paid or is to pay any other bidder or public officer any sum of money or anything of value whatever in order to obtain this Contract; and it has not, nor has another person for or in its behalf directly or indirectly, entered into any agreement or arrangement with any other person, firm, corporation or association which tends to or does lessen or destroy free competition in the letting of this Contract and agrees that in case it hereafter be established that such representations or guarantees, or any of them are false, it will forfeit and pay not less than ten percent (10%) of the Contract price but in no event be less than the amount specified as liquidated damages to the County.

The surety on the bond furnished for this Contract, shall in addition to all other provisions, be obligated to the extent provided for by Iowa Code § 573.6, relating to this Contract, which provisions apply to said bond.

The Contractor agrees, and its bond shall be surety therefore, that it will keep and maintain the Project in good repair for a period of five (5) year(s) after acceptance of the same by the County and its bond shall be security therefore.

The County of Clinton and the Contractor agree to comply with all applicable standards, orders, or regulations issued pursuant to the Clean Air Act of 1970 (42 U.S.C. 1958 (H) et. seq.) and the Federal Water Pollution Act (33 U.S.C. 1368 et. seq.) as amended, Executive Order 11738, and Environmental Protection Agency regulations (40 CFR, Part 15). Contractor shall comply with Section 103 and 107 of the Contract Work Hours and Safety Standards Act (40 USC 327-330) and Department of Labor Regulations (29 CFR, Part 5).

The County of Clinton and the Contractor agree that Davis-Bacon Federal prevailing predetermined wage rates and related labor requirements and regulations **will not apply** to work under the contract.

The County of Clinton and the Contractor agree that equipment or products authorized to be purchased with federal funding awarded for this contract must be American-made to the maximum extent feasible, in accordance with Public Law 103-121, Sections 606 (a) and (b).

COUNTY OF CLINTON, IOWA

By _____

PRINCIPAL:

_____
Contractor

By: _____
Signature

_____
Title

SECTION 005300 **CONTRACT FORM 4**

COUNTY OF CLINTON, IOWA
PERFORMANCE, PAYMENT AND MAINTENANCE BOND

KNOWN ALL MEN BY THESE PRESENTS: That (Insert Contractors Name) as Principal (Contractor) and _____ as Surety are held firmly bound unto the County of Clinton, Iowa (County), in the penal sum of $ _____ (Insert Contract Amount) the same being 100% of the total price of the Contract for the Project herein referred to, lawful money of the United States of America, well and truly to be paid to said County of Clinton, and to all other parties who, under the provisions of the laws of Iowa, are intended to be protected and secured hereby for which payment we bind ourselves, our heirs, executors, successors and assigns, jointly and severally by these presents.

Dated at Clinton, Iowa, this _____ day of _____, 2012, and duly attested and sealed.

WHEREAS, the said Contractor by a Contract dated (Insert Contract Date: Month XX, 2012), incorporated herein by reference, has agreed with said County of Clinton to perform all labor and furnish all materials required to be performed and furnished for the Clinton County Government Dewitt Annex- 2012 Renovations (the Project) according to the Contract and Construction Documents prepared therefore.

It is expressly understood and agreed by the Contractor and Surety bond that the following provisions are a part of this Bond and are binding upon said Contractor and Surety, to-wit:

1. PERFORMANCE BOND: The Contractor shall well and faithfully observe, perform, fulfill and abide by each and every covenant, condition and part of said Contract and Contract Documents, by reference made a part hereof, for the Project, and shall indemnify and save harmless the County from all outlay and expense incurred by the County by reason of the Contractor's default of failure to perform as required. The Contractor shall also be responsible for the default or failure to perform as required under the Contract and Contract Documents by all its subcontractors, suppliers, agents, or employees furnishing materials or providing labor in the performance of the Contract.

2. PAYMENT BOND: The Contractor and the Surety shall pay all just claims submitted by persons, firms, subcontractors, and corporations furnishing materials for or performing labor in the performance of the Contract on account of which this Bond is given, including but not limited to claims for all amounts due for labor, materials, lubricants, oil, gasoline, repairs on machinery, equipment and tools, consumed or used by the Contractor or any subcontractor, wherein the same are not satisfied out of the portion of the contract price which the County is required to retain until completion of the improvement, but the Contractor and Surety shall not

be liable to said persons, firms, or corporations unless the claims of said claimants against said portion of the contract price shall have been established as provided by law. The Contractor and Surety hereby bind themselves to the obligations and conditions set forth in Chapter 573, Code of Iowa, which by this reference is made a part hereof as though fully set out herein.

3. MAINTENANCE BOND: The Contractor and the Surety hereby agree, at their own expense:

   A. To remedy any and all defects that may develop in or result from work to be performed under the Contract within the period of Two (2) year(s) from the date of acceptance of the work under the Contract by the Board of Supervisors of the County of Clinton, Iowa, by reason of defects in workmanship or materials used in construction of said work;

   B. To keep all work in continuous good repair; and

   C. To pay the County the reasonable costs of monitoring and inspection to assure that any defects are remedied, and to repay the County all outlay and expense incurred as a result of Contractor's and Surety's failure to remedy any defect as required by this section.

Contractor's and Surety's agreement herein made extends to defects in workmanship or materials not discovered or known to the County at the time such work was accepted.

NOW, THEREFORE, the condition of this obligation is such that if the said Contractor shall perform all of the work contemplated by the Contract in a workmanlike manner and in strict compliance with the plans and specifications, and will pay all claims for labor and materials used in connection with said Project, to indemnify the said County for all damages, costs and expense incurred by reason of damages to persons or property arising through the performance of said Contract, and will reimburse the County for any outlay of money which it may be required to make in order to complete said Contract according to the Construction Documents and will maintain in good repair said Project for the period specified in the Contract where this bond is obligated for maintenance, and will faithfully comply with all of the provisions of Section 573 of the Code of Iowa, then this obligation shall be null and void, otherwise it shall remain in full force and effect.

All the conditions of this bond must be fully complied with before the Contractor or the Surety will be released.

The Contract, Contractor's Proposal, and Construction Documents shall be considered as a part of this Bond just as if their terms were repeated herein.

Dated at Clinton, Iowa this _____ day of _____, 2012.

COUNTY OF CLINTON, IOWA

By: _____

PRINCIPAL:

_____
Contractor

By: _____
Signature

_____
Title

SURETY:

_____
Surety Company

By: _____
Signature

_____
Title

_____
City, State, Zip Code

_____
Telephone

_____
Attorney In-Fact

SECTION 005400

COUNTY OF CLINTON, IOWA
SALES AND USE TAX EXEMPTION CERTIFICATE

The County of Clinton, as a designated exempt entity awarding construction contracts on or after January 1, 2003, may issue special exemption certificates to contractors and subcontractors, allowing them to purchase, or withdraw from inventory, materials for the contract free from sales tax pursuant to Iowa Code Sections: 422.42 (15) & (16), and 422.47 (5). This special exemption certificate may also allow a manufacturer of building materials to consume materials in the performance of a construction contract without owing tax on the fabricated cost of those materials. If the Jurisdiction, at its option, decides to utilize this exemption option, it will so state by special provision and publication in the Notice of Hearing and Letting.

1. Upon award of contract, the Jurisdiction will register the contract, Contractor, and each subcontractor with the Iowa Department of Revenue and Finance; and distribute tax exemption certificates and authorization letters to the Contractor and each subcontractor duly approved by the Jurisdiction in accordance with Section 1030, 1.10, B. These documents allow the Contractor and subcontractors to purchase materials for the contract free from sales tax. The Contractor and subcontractors may make copies of the tax exemption certificate and provide a copy to each supplier providing construction material. These tax exemption certificates and authorization letters are applicable only for the work under the contract.

2. At the time the Contractor requests permission to sublet in accordance with said Section 1030, 1.10, B, the Contractor shall provide a listing to the Jurisdiction identifying all subcontractors, including the Federal Employer Identification Number (FEIN) for the Contractor and all subcontractors, as well as the name, address, telephone number, and a representative of the organization which will perform the work, a description of the work to be sublet, and the associated cost.

3. The Contractor and each subcontractor shall comply with said Iowa Code Sales Tax requirements, shall keep records identifying the materials and supplies purchased and verify that the were used on the contract, and shall pay tax on any materials purchased tax-free and not used on the contract.

PROJECT INFORMATION REQUIREMENTS FOR STATE OF IOWA SALES TAX EXEMPTION CERTIFICATES FOR CONTRACTORS & SUBCONTRACTORS

Please complete this form in its entirety and submit along with the executed Construction Contracts, Bonds and Certificate of Insurance. Upon receipt, the County of Clinton will work with the Iowa Department of Revenue to issue Sales Tax Exemption Certificates to the approved contractor(s) to allow for the purchase or inventory withdrawal of materials for the specified Construction Project free from State of Iowa Sales Tax.

Construction Project Name:	Clinton County Government Dewitt Annex – 2012 Renovations

Project Description:	Renovations of existing building for use as County of Clinton government agencies.

Start Date (Bid letting date):	August 3, 2012

Completion Date:	December 1, 2012

1. General Prime Contractor:	
Contact Name:	
Complete Address: (Include PO Box and Street Information)	
City, State, Zip Code	
Telephone Number:	
Federal I.D. Number: (or Include Social Security Number)	
Work Type to be Completed:	

2. Subcontractor:	
Complete Address: (Include PO Box and Street Information)	
City, State, Zip Code	
Telephone Number:	
Federal I.D. Number: (or Include Social Security Number)	
Work Type to be Completed:	

3. Subcontractor:	
Complete Address: (Include PO Box and Street Information)	
City, State, Zip Code	
Telephone Number:	
Federal I.D. Number: (or Include Social Security Number)	
Work Type to be Completed:	

4.	Subcontractor:	
	Complete Address: (Include PO Box and Street Information)	
	City, State, Zip Code	
	Telephone Number:	
	Federal I.D. Number: (or Include Social Security Number)	
	Work Type to be Completed:	

5.	Subcontractor:	
	Complete Address: (Include PO Box and Street Information)	
	City, State, Zip Code	
	Telephone Number:	
	Federal I.D. Number: (or Include Social Security Number)	
	Work Type to be Completed:	

6.	Subcontractor:	
	Complete Address: (Include PO Box and Street Information)	
	City, State, Zip Code	
	Telephone Number:	
	Federal I.D. Number: (or Include Social Security Number)	
	Work Type to be Completed:	

7.	Subcontractor:	
	Complete Address: (Include PO Box and Street Information)	
	City, State, Zip Code	
	Telephone Number:	
	Federal I.D. Number: (or Include Social Security Number)	
	Work Type to be Completed:	

SPECIAL PROVISIONS

An out-of-State contractor, before commencing a contract in excess of $5,000.00, shall, pursuant to Iowa Code 91C.7(2), file a bond with the Division of Labor Services of the Department of Employment Services. The Surety Bond shall be executed by a Surety Company authorized to do business in the State of Iowa, and the bond shall be continuous in nature until canceled by the Surety with not less than 30 days written notice to the contractor and to the Division of Labor Services of the Department of Employment Services indicating the Surety's desire to cancel the bond. The bond shall be in the sum of the greater of the following amounts:

a. $1,000.00
b. 5% of the contract price

Release of the bond shall be conditioned upon the payment of all taxes, including contributions due under the unemployment compensation insurance system, penalties, interest, and related fees, which may accrue to the State of Iowa or its subdivision on account of the execution and performance of the contract. If any time during the term of the bond the Department of Revenue and Finance determines that the amount of the bond is not sufficient to cover the tax liabilities accruing to the State of Iowa or its subdivision, the Department will require the bond to be increased by an amount the Department deems sufficient to cover the tax liabilities accrued and to accrue under the contract, as provided under Iowa Code 91C.7(2).

If it is determined that this subsection may cause denial of Federal Funds which would otherwise be available, or would otherwise be inconsistent with requirements of Federal law, this section shall be suspended, but only the extent necessary to prevent denial of the funds or to eliminate the inconsistency with Federal requirements.

END OF SECTION 005400

SECTION 005500

INSURANCE SCHEDULE B

INSURANCE REQUIREMENTS FOR ARTISAN CONTRACTORS OR GENERAL CONTRACTORS TO THE COUNTY OF CLINTON

1. All policies of insurance required hereunder shall be with an insurer authorized to do business in Iowa. All insurers shall have a rating of A or better in the current A.M. Best Rating Guide.

2. All Certificates of Insurance shall be endorsed to provide a thirty (30) day notice of cancellation to the County of Clinton, except for a ten (10) day notice for non-payment, if cancellation is prior to the expiration date.

3. Contractor shall furnish a signed Certificate of Insurance to the County of Clinton, Iowa for the coverage required in Exhibit I. Such Certificates shall include copies of the following endorsements:

   a) Commercial General Liability policy is primary and non-contributing
   b) Commercial General Liability additional insured endorsement-See Exhibit I
   c) Governmental Immunities Endorsement

   _____ shall also be required to provide Certificates of Insurance for all subcontractors and all sub-sub contractors who perform work or services pursuant to the provisions of this contract. Said certificates shall meet the insurance requirements as required of _____.

4. Each certificate shall be submitted to the County of Clinton.

5. Failure to provide minimum coverage shall not be deemed a waiver of these requirements by the County of Clinton. Failure to obtain or maintain the required insurance shall be considered a material breach of this agreement.

6. Contractor shall be required to carry the following minimum coverage/limits or greater if required by law or other legal agreement; as per Exhibit I.

   This coverage shall be written on an occurrence, not claims made form. Form CG 25 03 03 97 “Designated Construction Project (s) General Aggregate Limit” shall be included. All deviations or exclusions from the standard ISO commercial general liability form CG 001 shall be clearly identified.

   Governmental Immunity endorsement identical or equivalent to form attached.

INSURANCE SCHEDULE B (Continued)

INSURANCE REQUIREMENTS FOR ARTISAN CONTRACTORS OR GENERAL CONTRACTORS TO THE COUNTY OF CLINTON

Additional Insured Requirement – See Exhibit I.

The County of Clinton, including all its elected and appointed officials, all its employees and volunteers, all its boards, commissions and/or authorities and their board members, employees and volunteers shall be named as an additional insured on General Liability Policies for all classes of contractors.

Class A, B, and C Contractors shall include coverage for The County of Clinton as an additional insured including ongoing and completed operations coverage equivalent to: ISO CG 20 10 07 04 *and CG 20 37 07 04.**

*ISO CG 20 10 0704 "Additional Insured-Owners, Lessees or Contractors – Scheduled Person or Organization"

**ISO CG 20 37 0704 "Additional Insured – Owners, Lessees or Contractors – Completed Operations"

Completion Checklist

Class A Contractors, Class B Contractors and Class C Contractors

- ☐ Certificate of Liability Insurance
- ☐ Designated Construction Project(s) General Aggregate Limit CG 25 03 03 97
- ☐ Additional Insured CG 20 10 07 04
- ☐ Additional Insured CG 20 37 07 04
- ☐ Governmental Immunities Endorsement

INSURANCE SCHEDULE B (Continued)

EXHIBIT I - Contractors Insurance Requirements

Contractors shall provide The County of Clinton with a current Certificate of Insurance for this specific project, which is in conformity with this Exhibit and the Contract. The requirements below are the minimum allowable.

CLASS A: General Contractors, Contractors, Trade Contractors, Subcontractors, Sub Sub Contractors, who perform the following work:

Concrete	**Paving & Surfacing**
Demolition	**Plumbing Systems**
Earthwork	**Reinforcement**
Electrical	**Roofing & Sheet Metal**
HVAC	**Site Utilities**
Masonry	**Special Construction**
Miscellaneous Steel	**Structural Steel & Decking**

General Liability (Occurrence Form Only)

Commercial General Liability

General Aggregate Limit	$2,000,000
Products-Completed Operations Aggregate Limit	$1,000,000
Personal and Advertising Injury Limit	$1,000,000
Each Occurrence Limit	$1,000,000
Fire Damage Limit (any one occurrence)	$ 50,000
Medical Payments	$ 5,000

Additional Insured - The County of Clinton, including all its elected and appointed officials, all its employees and volunteers, all its boards, commissions and/or authorities and their board members, employees and volunteers shall be named as additional insured including ongoing operations CG 20 10 07 04 or equivalent, and completed operations CG 20 37 07 04 or equivalent.

Automobile $1,000,000 (Combined Single Limit)

Standard Workers Compensation – with waiver of subrogation to County of Clinton

Statutory for Coverage A

Employers Liability:

Each Accident	$ 100,000
Each Employee - Disease	$ 100,000
Policy Limit - Disease	$ 500,000

Umbrella	$3,000,000

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

DESIGNATED CONSTRUCTION PROJECT(S) GENERAL AGGREGATE LIMIT

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Designated Construction Projects:

(If no entry appears above, information required to complete this endorsement will be shown in the Declarations as applicable to this endorsement.)

A. For all sums which the insured becomes legally obligated to pay as damages caused by "occurrences" under COVERAGE A (SECTION I), and for all medical expenses caused by accidents under COVRAGE C (SECTION I), which can be attributed only to ongoing operations at a single designated construction project show in the Schedule above:

1. A separate Designated Construction Project General Aggregate Limit applies to each designated construction project, and that limit is equal to the amount of the General Aggregate Limit shown in the Declarations.

2. The Designated Construction Project General Aggregate Limit is the most we will pay for the sum of all damages under COVERAGE A, except damages because of "bodily injury" or "property damage" included in the "products-completed operations hazard", and for medical expenses under COVERAGE C regardless of the number of:

   a. Insureds;

   b. Claims made or "suits" brought; or

   c. Persons or organizations making claims or bringing "suits".

3. Any payments made under COVERAGE A for damages or under COVERAGE C for medical expenses shall reduce the Designated Construction Project General Aggregate Limit for that designated construction project. Such payments shall not reduce the General Aggregate Limit shown in the Declarations nor shall they reduce any other Designated Construction Project General Aggregate Limit for any other designated construction project shown in the Schedule above.

4. The limits shown in the Declarations for Each Occurrence, Fire Damage and Medical Expense continue to apply. However, instead of being subject to the General Aggregate Limit shown in the Declarations, such limits will be subject to the applicable Designated Construction Project General Aggregate Limit.

B. For all sums which the insured becomes legally obligated to pay as damages caused by "occurrences" under COVERAGE A (SECTION I), and for all medical expenses caused by accidents under COVERAGE C (SECTION I), which cannot be attributed only to ongoing operations at a single designated construction project shown in the Schedule above:

1. Any payments made under COVERAGE A for damages or under COVERAGE C for medical expenses shall reduce the amount available under the General Aggregate Limit or the Products-Completed Operations Aggregate Limit, whichever is applicable; and

2. Such payments shall not reduce any Designated Construction Project General Aggregate Limit.

C. When coverage for liability arising out of the "products-completed operations hazard" is provided, any payments for damages because of "bodily injury" or "property damage" included in the "products-completed operations hazard" will reduce the Products-Completed Operations Aggregate Limit, and not reduce the General Aggregate Limit nor the Designated Construction Project General Aggregate Limit.

D. If the applicable designated construction project has been abandoned, delayed, or abandoned and then restarted, or if the authorized contracting parties deviate from plans, blueprints, designs, specifications or timetables, the project will still be deemed to be the same construction project.

E. The provisions of Limits of Insurance (SECTION III) not otherwise modified by this endorsement shall continue to apply as stipulated.

 Copyright, Insurance Services Offices, Inc., 1996

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES OR CONTRACTORS – SCHEDULED PERSON OR ORGANIZATION

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name of Additional Insured Person(s) Or Organization(s):	Location(s) of Covered Operations
The County of Clinton, including all its elected and appointed officials, all its employees and volunteers, all its boards, commissions and/or authorities and their board members, employees and volunteers.	
Information required to complete this Schedule, if not shown above, will be show in the Declarations.	

A. Section II – Who is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury", "property damage" or "personal and advertising injury" caused, in whole or in part, by:

1. Your acts or omissions; or

2. The acts or omissions of those acting on your behalf;

in the performance of your ongoing operations for the additional insurer(s) at the location(s) designated above.

B. With respect to the insurance afforded to these additional insureds, the following additional exclusions apply:

This insurance does not apply to "bodily injury" or "property damage" occurring after:

1. All work, including materials, parts or equipment furnished in connection with such work, on the project (other than service, maintenance or repairs) to be performed by or on behalf of the additional insurer(s) at the location of the covered operations has been completed; or

2. That portion of "your work" out of which the injury or damage arises has been put to its intended use by any person or organization other than another contractor or subcontractor engaged in performing operations for a principal as a part of the same project.

 @ ISO Properties, Inc., 2004

THIS ENDORSEMENT CHANGES THE POLICY. PLEASE READ IT CAREFULLY.

ADDITIONAL INSURED – OWNERS, LESSEES, OR CONTRACTORS – COMPLETED OPERATIONS

This endorsement modifies insurance provided under the following:

COMMERCIAL GENERAL LIABILITY COVERAGE PART

SCHEDULE

Name of Additional Insured Person(s) Or Organization(s):	Location and Description of Completed Operations
The County of Clinton, including all its elected and appointed officials, all its employees and volunteers, all its boards, commissions and/or authorities and their board members, employees and volunteers.	
Information required to complete this Schedule, if not shown above, will be show in the Declarations.	

C. Section II – Who is An Insured is amended to include as an additional insured the person(s) or organization(s) shown in the Schedule, but only with respect to liability for "bodily injury" or "property damage" caused, in whole or in part, by "your work" at the location designated and described in the schedule of this endorsement performed for that additional insured and included in the "products-completed operations hazard".

 @ ISO Properties, Inc., 2004

COUNTY OF CLINTON, IOWA
GOVERNMENTAL IMMUNITIES ENDORSEMENT

1. Nonwaiver of Governmental Immunity. The insurance carrier expressly agrees and states that the purchase of this policy and the including of the County of Clinton, Iowa as an Additional Insured does not waive any of the defenses of governmental immunity available to the County of Clinton, Iowa under Code of Iowa Section 670.4 as it is now exists and as it may be amended from time to time.

2. Claims Coverage. The insurance carrier further agrees that this policy of insurance shall cover only those claims not subject to the defense of governmental immunity under the Code of Iowa Section 670.4 as it now exists and as it may be amended from time to time. Those claims not subject to Code of Iowa Section 670.4 shall be covered by the terms and conditions of this insurance policy.

3. Assertion of Government Immunity. The County of Clinton, Iowa shall be responsible for asserting any defense of governmental immunity, and may do so at any time and shall do so upon the timely written request of the insurance carrier.

4. Non-Denial of Coverage. The insurance carrier shall not deny coverage under this policy and the insurance carrier shall not deny any of the rights and benefits accruing to the County of Clinton, Iowa under this policy for reasons of governmental immunity unless and until a court of competent jurisdiction has ruled in favor of the defense(s) of governmental immunity asserted by the County of Clinton, Iowa.

No Other Change in Policy. The above preservation of governmental immunities shall not otherwise change or alter the coverage available under the policy.

END OF SECTION 005500

IIW, P.C.

4155 Pennsylvania Avenue
Dubuque, IA 52002-2628
(563) 556-2464 | (800) 556-4491 (Voice)
(563) 556-7811 (Fax)
www.iiwengr.com

1638 Thomas
Hazel Green, WI 53811
(608) 748-4308 (Voice)
(563) 556-7811 (Fax)

127 A West 76th St.
Davenport, IA 52806
(563) 823-0192 (Voice)
(563) 823-0195 (Fax)

Submittal Form

Project Description: Clinton County Government
Dewitt Annex – 2012 Renovations

IIW Project #: 11176-01

Attention: Mark Fassbinder

Date:

- ☐ 1st Submittal
- ☐ Resubmittal #1
- ☐ Resubmittal #2

From:

Contractor Company Name

Street Address

City State Zip Code

Contact Name

Phone No. Fax No.

MATERIAL SUBMITTED: (List all specification sections separately in a multiple submittal)

No. of Copies:	____	Spec. Section No.:	_____	Description:	_____	Drawing No.'s.:	_____
No. of Copies:	____	Spec. Section No.:	_____	Description:	_____	Drawing No.'s.:	_____
No. of Copies:	____	Spec. Section No.:	_____	Description:	_____	Drawing No.'s.:	_____
No. of Copies:	____	Spec. Section No.:	_____	Description:	_____	Drawing No.'s.:	_____
No. of Copies:	____	Spec. Section No.:	_____	Description:	_____	Drawing No.'s.:	_____
No. of Copies:	____	Spec. Section No.:	_____	Description:	_____	Drawing No.'s.:	_____

Contractor's Comments: _____

I have reviewed, stamped and signed the shop drawing for compliance with the Contract Documents. I will verify all critical dimensions in the field.

Signed: _____ **Date**: _____

Contractor's Project No.: _____
(For Contractor's Use)

IIW, P.C.

4155 Pennsylvania Avenue
Dubuque, IA 52002-2628
(563) 556-2464 | (800) 556-4491 (Voice)
(563) 556-7811 (Fax) **www.iiwengr.com**

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(563) 556-7811 (Fax)

127 A West 76th St.
Davenport, IA 52806
(563) 823-0192 (Voice)
(563) 823-0195 (Fax)

Request for Interpretation Form

Project Description: Clinton County Government
Dewitt Annex – 2012 Renovations
Dewitt, Iowa

IIW Project #: 11176-01
Attention: Mark Fassbinder
RFI Number:
Date Issued:
Date Response Required:
Forwarded To:
Date Responded:

From:

Contractor Company Name

Street Address

City State Zip Code

Contact Name

Phone No. Fax No.

Specification No.: Page No.:

Check one: □ RFI □ Design Modification □ Proposed VE

Check one: □ Standard Specification □ Supplemental Specification □ Special Provision

REQUEST:

PROPOSED SOLUTION (If applicable):

By: **Signature:** **Date:**

RESPONSE:

By: **Signature:** **Date:**

After reviewing the response, does the Contractor anticipate:

That a change order will be required? □ Yes □ No / That there will be an increase in the cost of the project? □ Yes □ No

SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 PROJECT INFORMATION

A. Project Identification: Clinton County Government Dewitt Annex- 2012 Renovations.

1. Project Location: 266 11th Street, Dewitt, IA 52742.

B. Owner: Clinton County

1. Owner's Representative: Brian Schmitt, Clinton County Supervisor

C. Architect: IIW P.C., 4155 Pennsylvania Avenue, Dubuque, IA 52002.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. The Work of Project is defined by the Contract Documents and consists of the following:

1. The project consists of interior remodel for Clinton County Sherriff department. Building exterior renovations include the relocation of an existing window for an aluminum framing system, and infill of certain existing windows. Interior construction includes metal and wood stud and gypsum board painted walls, CMU walls, hollow metal and wood doors with hollow metal frames, gypsum board ceilings, carpet tile, vinyl floor tile, porcelain tile, solid surface, plastic laminate and casework. Work also includes demolition of existing walls, portions of existing floor plumbing systems, as well as modifications to existing HVAC and electrical systems.

B. Type of Contract:

1. Project will be constructed under a single prime contract.

1.4 ACCESS TO SITE

A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of Project site to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine construction operations to areas indicated on the documents for building demolition and new construction..

C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weather tight condition throughout construction period. Repair damage caused by construction operations.

1.5 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the Table of Contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates.
2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

    a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

1.6 MISCELLANEOUS PROVISIONS

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A schedule of alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1

Base Bid: Provide all wiring in conduit per 260533. MC cable only allowed for light fixture whips.

Alternate: Allow the use of MC cabling for individual circuits and switch legs installed concealed within walls where allowed by NEC and the Authority Having Jurisdiction. EC shall provide a description noting exactly where MC cabling will be used as part of this alternate with their bid.

END OF SECTION 012300

SECTION 012500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for substitutions.

B. Related Requirements:

1. Division 01 Section "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.
2. Divisions 02 through 33 Sections for specific requirements and limitations for substitutions.

1.3 DEFINITIONS

A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

A. Substitution Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Substitution Request Form: Use attached substitution request form at the end of this section..
2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:

a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.

b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, which will be necessary to accommodate proposed substitution.
c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
e. Samples, where applicable or requested.
f. Certificates and qualification data, where applicable or requested.
g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
i. Research reports evidencing compliance with building code in effect for the Project.
j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
k. Cost information, including a proposal of change, if any, in the Contract Sum.
l. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.

3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor through Construction Manager of acceptance or rejection of proposed substitution within fifteen days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.6 PROCEDURES

A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than fifteen days prior to time required for preparation and review of related submittals.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
b. Requested substitution provides sustainable design characteristics that specified product provided.
c. Substitution request is fully documented and properly submitted.
d. Requested substitution will not adversely affect Contractor's construction schedule.
e. Requested substitution has received necessary approvals of authorities having jurisdiction.
f. Requested substitution is compatible with other portions of the Work.
g. Requested substitution has been coordinated with other portions of the Work.
h. Requested substitution provides specified warranty.
i. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

B. Substitutions for Convenience: Architect will consider requests for substitution if received within ten days prior to bid. Requests received after that time may be considered or rejected at discretion of Architect.

1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
b. Requested substitution does not require extensive revisions to the Contract Documents.

c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
d. Substitution request is fully documented and properly submitted.
e. Requested substitution will not adversely affect Contractor's construction schedule.
f. Requested substitution has received necessary approvals of authorities having jurisdiction.
g. Requested substitution is compatible with other portions of the Work.
h. Requested substitution has been coordinated with other portions of the Work.
i. Requested substitution provides specified warranty.
j. If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.

PART 3 - EXECUTION (Not Used)

END OF SECTION 012500

SUBSTITUTION REQUEST – FORM
(After the Bidding Phase)

==========

Project: Clinton County Government Dewitt Annex Substitution Request Number:_____

To:_____ From:_____ Date:_____

Re:_____ A/E Project Number:_____Contract For:_____

==========

Specification Title:_____

Description: _____

Section:_____ Page:___ Article/Paragraph:_____

==========

Proposed Substitution: _____

Manufacturer:_____ Address:_____

Phone:_____ Trade Name:_____ Model No.:_____

Installer:_____Address:_____ Phone:_____

History: ☐ New Product ☐ 2–5 years old ☐ 5-10 years old ☐ More than 10 years old

Differences between proposed substitution and specified product:_____

_____

☐ Point-by point comparative data attached – REQUIRED BY A/E

==========

Reason for not providing specified item:_____

_____

Similar Installation:

Project:_____ Architect:_____

Address:_____ Owner:_____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes, explain_____

==========

Savings to Owner for accepting substitution:_____ ($_____)

Proposed substitution changes Contract Time: ☐ No ☐ Yes [Add] [Deduct] _____ days.

Supporting Data Attached: ☐ Drawings ☐ Product Data ☐ Samples ☐ Tests ☐ Reports ☐_____

The Undersigned certifies:

- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Same warranty will be furnished for proposed substitution as for specified product.
- Same maintenance service and source of replacement parts, as applicable, is available.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- Proposed substitution does not affect dimensions and functional clearances.
- Payment will be made for changes to building design, including A/E design, detailing, and construction costs by the substitution.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

_____

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

Telephone: _____

Attachments: _____

_____

_____

_____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 013300.

☐ Substitution approved as noted - Make submittals in accordance with Specification Section 013300.

☐ Substitution rejected - Use specified materials.

☐ Substitution Request received too late - Use specified materials.

Signed by:_____ Date:_____

Additional Comments: ☐ Contractor ☐ Subcontractor ☐ Supplier ☐ Manufacturer ☐ A/E ☐ ____

END OF FORM

SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Requirements:
   1. Division 01 Section "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

1.3 DEFINITIONS

A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.

   1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:

      a. Application for Payment forms with continuation sheets.
      b. Submittal schedule.
      c. Items required to be indicated as separate activities in Contractor's construction schedule.

   2. Submit the schedule of values to Architect at earliest possible date, but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.

   1. Identification: Include the following Project identification on the schedule of values:

a. Project name and location.
b. Name of Architect.
c. Architect's project number.
d. Contractor's name and address.
e. Date of submittal.

2. Arrange schedule of values consistent with format of AIA Document G703.
3. Arrange the schedule of values in tabular form with separate columns to indicate the following for each item listed:

    a. Related Specification Section or Division.
    b. Description of the Work.
    c. Name of subcontractor.
    d. Name of manufacturer or fabricator.
    e. Name of supplier.
    f. Change Orders (numbers) that affect value.
    g. Dollar value of the following, as a percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

        1) Labor.
        2) Materials.
        3) Equipment.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.

    a. Differentiate between items stored on-site and items stored off-site. If required, include evidence of insurance.

7. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.

    a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the schedule of values or distributed as general overhead expense, at Contractor's option.

9. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment following the initial Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

   1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.

B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction work covered by each Application for Payment is the period indicated in the Agreement.

C. Payment Application Times: Submit Application for Payment to Architect by the 1st of the month. The period covered by each Application for Payment is one month, ending on the last day of the month.

D. Application for Payment Forms: Use AIA Document G702 and AIA Document G703 as form for Applications for Payment.

E. Application for Payment Forms: Use forms provided by Owner for Applications for Payment. Sample copies are included in Project Manual.

F. Application for Payment Forms: Use forms acceptable to Architect and Owner for Applications for Payment. Submit forms for approval with initial submittal of schedule of values.

G. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

   1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
   2. Include amounts for work completed following previous Application for Payment, whether or not payment has been received. Include only amounts for work completed at time of Application for Payment.
   3. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
   4. Indicate separate amounts for work being carried out under Owner-requested project acceleration.

H. Stored Materials: Include in Application for Payment amounts applied for materials or equipment purchased or fabricated and stored, but not yet installed. Differentiate between items stored on-site and items stored off-site.

   1. Provide certificate of insurance, evidence of transfer of title to Owner, and consent of surety to payment, for stored materials.
   2. Provide supporting documentation that verifies amount requested, such as paid invoices. Match amount requested with amounts indicated on documentation; do not include overhead and profit on stored materials.
   3. Provide summary documentation for stored materials indicating the following:

a. Value of materials previously stored and remaining stored as of date of previous Applications for Payment.
b. Value of previously stored materials put in place after date of previous Application for Payment and on or before date of current Application for Payment.
c. Value of materials stored since date of previous Application for Payment and remaining stored as of date of current Application for Payment.

I. Transmittal: Submit three signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.

1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

J. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.
2. When an application shows completion of an item, submit conditional final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
4. Submit final Application for Payment with or preceded by conditional final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
5. Waiver Forms: Submit executed waivers of lien on forms, acceptable to Owner.

K. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of values.
3. Contractor's construction schedule (preliminary if not final).
4. Products list (preliminary if not final).
5. Schedule of unit prices.
6. Submittal schedule (preliminary if not final).
7. List of Contractor's staff assignments.
8. List of Contractor's principal consultants.
9. Copies of building permits.
10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
11. Initial progress report.
12. Report of preconstruction conference.
13. Certificates of insurance and insurance policies.
14. Performance and payment bonds.
15. Data needed to acquire Owner's insurance.

L. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificate(s) of Substantial Completion issued previously for Owner occupancy of designated portions of the Work.

M. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final liquidated damages settlement statement.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900

SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. General coordination procedures.
2. Coordination drawings.
3. Requests for Information (RFIs).
4. Project meetings.

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility are assigned to a specific contractor.

C. Related Requirements:
1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's construction schedule.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

A. RFI: Request from Owner, Architect, or Contractor seeking informationfrom each other during construction.

1.4 GENERAL COORDINATION PROCEDURES

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.

3. Make adequate provisions to accommodate items scheduled for later installation.
4.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's construction schedule.
2. Preparation of the schedule of values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Pre-installation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.

1.5 COORDINATION DRAWINGS

A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.

1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:

a. Use applicable Drawings as a basis for preparation of coordination drawings. Prepare sections, elevations, and details as needed to describe relationship of various systems and components.
b. Coordinate the addition of trade-specific information to the coordination drawings by multiple contractors in a sequence that best provides for coordination of the information and resolution of conflicts between installed components before submitting for review.
c. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
d. Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
e. Show location and size of access doors required for access to concealed dampers, valves, and other controls.
f. Indicate required installation sequences.

g. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

B. Coordination Drawing Organization: Organize coordination drawings as follows:

1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid. Supplement plan drawings with section drawings where required to adequately represent the Work.
2. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.

3. Review: Architect will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility. If Architect determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Architect will so inform Contractor, who shall make changes as directed and resubmit.
4. Coordination Drawing Prints: Prepare coordination drawing prints according to requirements in Division 01 Section "Submittal Procedures."

1.6 REQUESTS FOR INFORMATION (RFIs)

A. General: Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form included.

1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:

1. Project name.
2. Project number.
3. Date.
4. Name of Contractor.
5. Name of Architect.
6. RFI number, numbered sequentially.
7. RFI subject.
8. Specification Section number and title and related paragraphs, as appropriate.
9. Drawing number and detail references, as appropriate.
10. Field dimensions and conditions, as appropriate.
11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.

12. Contractor's signature.
13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

    a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.

C. RFI Forms: Form included.

1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.

1. The following Contractor-generated RFIs will be returned without action:

    a. Requests for approval of submittals.
    b. Requests for approval of substitutions.
    c. Requests for approval of Contractor's means and methods.
    d. Requests for coordination information already indicated in the Contract Documents.
    e. Requests for adjustments in the Contract Time or the Contract Sum.
    f. Requests for interpretation of Architect's actions on submittals.
    g. Incomplete RFIs or inaccurately prepared RFIs.

2. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."

    a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within ten days of receipt of the RFI response.

E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly. Use CSI Log Form 13.2B or Software log with not less than the following:

1. Project name.
2. Name and address of Contractor.
3. Name and address of Architect.
4. RFI number including RFIs that were returned without action or withdrawn.
5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.

F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, Owner's Representative, and Architect, within seven days of the meeting.

B. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 15 days after execution of the Agreement.

1. Conduct the conference to review responsibilities and personnel assignments.
2. Attendees: Authorized representatives of Owner, Owner's Representative, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Discuss items of significance that could affect progress, including the following:

a. Tentative construction schedule.
b. Phasing.
c. Critical work sequencing and long-lead items.
d. Designation of key personnel and their duties.
e. Lines of communications.
f. Procedures for processing field decisions and Change Orders.
g. Procedures for RFIs.
h. Procedures for testing and inspecting.
i. Procedures for processing Applications for Payment.
j. Distribution of the Contract Documents.
k. Submittal procedures.
l. Sustainable design requirements.
m. Preparation of record documents.
n. Use of the premises and existing building.
o. Work restrictions.
p. Working hours.
q. Owner's occupancy requirements.
r. Responsibility for temporary facilities and controls.
s. Procedures for moisture and mold control.
t. Procedures for disruptions and shutdowns.
u. Construction waste management and recycling.
v. Parking availability.
w. Office, work, and storage areas.
x. Equipment deliveries and priorities.
y. First aid.

z. Security.
aa. Progress cleaning.

4. Minutes: Architect will record and distribute meeting minutes to General Contractor for distribution.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect, and Owner's Representative of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:

a. Contract Documents.
b. Options.
c. Related RFIs.
d. Related Change Orders.
e. Purchases.
f. Deliveries.
g. Submittals.
h. Review of mockups.
i. Possible conflicts.
j. Compatibility requirements.
k. Time schedules.
l. Weather limitations.
m. Manufacturer's written instructions.
n. Warranty requirements.
o. Compatibility of materials.
p. Acceptability of substrates.
q. Temporary facilities and controls.
r. Space and access limitations.
s. Regulations of authorities having jurisdiction.
t. Testing and inspecting requirements.
u. Installation procedures.
v. Coordination with other work.
w. Required performance results.
x. Protection of adjacent work.
y. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.
5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

D. Owner Progress Meetings: Conduct Owner progress meetings at biweekly intervals.

1. Coordinate dates of meetings with preparation of payment requests.
2. Attendees: Contractor, Owner, Owner’s Representative,and Architect. each subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
3. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

    a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

        1) Review schedule for next period.

    b. Review present and future needs of each entity present, including the following:

        1) Interface requirements.
        2) Sequence of operations.
        3) Status of submittals.
        4) Deliveries.
        5) Off-site fabrication.
        6) Access.
        7) Site utilization.
        8) Temporary facilities and controls.
        9) Progress cleaning.
        10) Quality and work standards.
        11) Status of correction of deficient items.
        12) Field observations.
        13) Status of RFIs.
        14) Status of proposal requests.
        15) Pending changes.
        16) Status of Change Orders.
        17) Pending claims and disputes.
        18) Documentation of information for payment requests.

4. Minutes: General Contractor will record and distribute the meeting minutes to each party present and to parties requiring information.

    a. Schedule Updating: Revise Contractor's construction schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Requirements:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the schedule of values.
2. Division 01 Section "Construction Progress Documentation" for submitting schedules and reports, including Contractor's construction schedule.
3. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
4. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."

B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 ACTION SUBMITTALS

A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making

corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
2. Initial Submittal: Submit concurrently with startup construction schedule. Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.

    a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.

4. Format: Arrange the following information in a tabular format:

    a. Scheduled date for first submittal.
    b. Specification Section number and title.
    c. Submittal category: Action; informational.
    d. Name of subcontractor.
    e. Description of the Work covered.
    f. Scheduled date for Architect's final release or approval.
    g. Scheduled date of fabrication.
    h. Scheduled dates for purchasing.
    i. Scheduled dates for installation.
    j. Activity or event number.

1.5 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

A. General: At Contractor’s written request, copies of Architect’s CAD files will be provided to Contractor for Contractor’s use in connection with Project, subject to the following conditions:

1. Electronic Files: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals. The delivery and preparation of documents on electronic media will be an Additional Service paid for by the Contractor. The cost of this Additional Service will be computed in a manner that compensates IIW, P.C. for the cost of preparing the document in the format requested by the outside party and delivering it to the party. The files on the disk will be provided “as is” without warranty of any kind, either expressed or implied. IIW, P.C. does not warrant, guarantee, or make any representations regarding the use, or the results of the use of the files in terms of correctness, accuracy, reliability, or otherwise. The requesting contractor shall also complete the Electronic Media Transfer Agreement as prepared by IIW, P.C. upon request from contractor.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.

    a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 10 calendar days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
3. Resubmittal Review: Allow 10 calendar days for review of each resubmittal.

D. Paper Submittals: Place a permanent label or title block on each submittal item for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.
2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
3. Include the following information for processing and recording action taken:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of subcontractor.
    g. Name of supplier.
    h. Name of manufacturer.
    i. Submittal number or other unique identifier, including revision identifier.

        1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

    j. Number and title of appropriate Specification Section.
    k. Drawing number and detail references, as appropriate.
    l. Location(s) where product is to be installed, as appropriate.
    m. Other necessary identification.

4. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form provided. Architect will return without review or discard submittals received from sources other than Contractor.

    a. Transmittal Form for Paper Submittals: Use attached form.

E. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:

1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.

    a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).

3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software acceptable to Owner**,** containing the following information:

    a. Project name.
    b. Date.
    c. Name and address of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Name of firm or entity that prepared submittal.
    g. Names of subcontractor, manufacturer, and supplier.
    h. Category and type of submittal.
    i. Submittal purpose and description.
    j. Specification Section number and title.
    k. Specification paragraph number or drawing designation and generic name for each of multiple items.
    l. Drawing number and detail references, as appropriate.
    m. Location(s) where product is to be installed, as appropriate.
    n. Related physical samples submitted directly.
    o. Indication of full or partial submittal.
    p. Transmittal number, numbered consecutively.
    q. Submittal and transmittal distribution record.
    r. Other necessary identification.
    s. Remarks.

F. Options: Identify options requiring selection by Architect.

G. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested

by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal.

H. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.

I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

J. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

1. Submit electronic submittals via email as PDF electronic files.

   a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.

2. Action Submittals: Submit six paper copies of each submittal unless otherwise indicated. Architect will retain one copy and return all others.
3. Informational Submittals: Submit six paper copies of each submittal unless otherwise indicated. Architect will retain one copy and return all others.
4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:

a. Manufacturer's catalog cuts.
b. Manufacturer's product specifications.
c. Standard color charts.
d. Statement of compliance with specified referenced standards.
e. Testing by recognized testing agency.
f. Application of testing agency labels and seals.
g. Notation of coordination requirements.
h. Availability and delivery time information.

4. For equipment, include the following in addition to the above, as applicable:

a. Wiring diagrams showing factory-installed wiring.
b. Printed performance curves.
c. Operational range diagrams.
d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.

5. Submit Product Data before or concurrent with Samples.
6. Submit Product Data in the following format:

a. PDF electronic file.
b. Six paper copies of Product Data unless otherwise indicated. Architect will retain one copy and return all others.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:

a. Identification of products.
b. Schedules.
c. Compliance with specified standards.
d. Notation of coordination requirements.
e. Notation of dimensions established by field measurement.
f. Relationship and attachment to adjoining construction clearly indicated.
g. Seal and signature of professional engineer if specified.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches, but no larger than 24 by 36 inches.
3. Submit Shop Drawings in the following format:

a. PDF electronic file.
b. Six opaque (bond) copies of each submittal. Architect will retain one copy and return all others.
c. Six opaque copies of each submittal. Architect will retain one copy and return all others.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:

    a. Generic description of Sample.
    b. Product name and name of manufacturer.
    c. Sample source.
    d. Number and title of applicable Specification Section.
    e. Specification paragraph number and generic name of each item.

3. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

    a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

E. Coordination Drawing Submittals: Comply with requirements specified in Division 01 Section "Project Management and Coordination."

F. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

G. Application for Payment and Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."

H. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Division 01 Section "Quality Requirements."

I. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Division 01 Section "Closeout Procedures."

J. Maintenance Data: Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.

L. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

M. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

N. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

O. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

P. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

Q. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

R. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

S. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

T. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

U. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.

V. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Project Closeout and Maintenance Material Submittals: See requirements in Division 01 Section "Closeout Procedures."

C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.

B. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

C. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.

D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.

E. Submittals not required by the Contract Documents may be returned by the Architect without action.

END OF SECTION 013300

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Requirements:

1. Divisions 02 through 33 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

C. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.

D. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

E. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.

F. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

G. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

H. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).

I. Experienced: When used with an entity or individual, "experienced" means having successfully completed a minimum of five previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

D. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

1.6 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
7. Identification of product and Specification Section.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.7 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

C. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar in material, design, and extent to those indicated for this Project.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according

to ASTM E 329; and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect through Construction Manager], with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

1.8 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.

3. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities required to verify that the Work complies with requirements, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.
4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

E. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

F. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
2. Determine the location from which test samples will be taken and in which in-situ tests are conducted.
3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.
4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.
6. Do not perform any duties of Contractor.

G. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.
4. Facilities for storage and field curing of test samples.
5. Delivery of samples to testing agencies.
6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
7. Security and protection for samples and for testing and inspecting equipment at Project site.

H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Division 01 Section "Execution."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.

H. "Provide": Furnish and install, complete and ready for the intended use.

I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Requirements:

1. Division 01 Section "Summary" for work restrictions and limitations on utility interruptions.

1.3 USE CHARGES

A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, occupants of Project, testing agencies, and authorities having jurisdiction.

B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

A. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire-prevention program.

B. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.

1. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.

2. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged Work.
3. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.

1.5 QUALITY ASSURANCE

A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

2.2 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

C. Water Service: Connect to Owner's existing water service facilities. Clean and maintain water service facilities in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with requirements of authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.

1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.

a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.

2. Maintain dust partitions during the Work. Use vacuum collection attachments on dust-producing equipment. Isolate limited work within occupied areas using portable dust-containment devices.
3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:
1. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Parking: Use designated areas of Owner's existing parking areas for construction personnel.

C. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.

    a. Provide temporary, directional signs for construction personnel and visitors.

3. Maintain and touchup signs so they are legible at all times.

D. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction. Comply with progress cleaning requirements in Division 01 Section "Execution."

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.

B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 01 Section "Summary."

C. Site Enclosure Fence: Before construction operations begin furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: As required to enclose entire Project site or portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

D. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each work day.

E. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

F. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weathertight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is incomplete, insulate temporary enclosures.

3.5 MOISTURE AND MOLD CONTROL

A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.

B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:

1. Protect porous materials from water damage.
2. Protect stored and installed material from flowing or standing water.
3. Keep porous and organic materials from coming into prolonged contact with concrete.
4. Remove standing water from decks.
5. Keep deck openings covered or dammed.

C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:

1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
2. Keep interior spaces reasonably clean and protected from water damage.
3. Periodically collect and remove waste containing cellulose or other organic matter.
4. Discard or replace water-damaged material.
5. Do not install material that is wet.
6. Discard, replace, or clean stored or installed material that begins to grow mold.
7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.

D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:

1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
2. Use permanent HVAC system to control humidity.
3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.

3.6 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.

B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Substantial Completion.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. Remove temporary roads and paved areas not intended for or acceptable for integration into permanent construction. Where area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
3. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000

SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:

1. Construction layout.
2. Field engineering and surveying.
3. Installation of the Work.
4. Cutting and patching.
5. Coordination of Owner-installed products.
6. Progress cleaning.
7. Starting and adjusting.
8. Protection of installed construction.
9. Correction of the Work.

B. Related Requirements:

1. Division 01 Section "Summary" for limits on use of Project site.
2. Division 01 Section "Submittal Procedures" for submitting surveys.
3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
4. Division 02 Section "Selective Structure Demolition" for demolition and removal of selected portions of the building.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.

B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.4 INFORMATIONAL SUBMITTALS

A. Landfill Receipts: Submit copy of receipts issued by a landfill facility, licensed to accept hazardous materials, for hazardous waste disposal.

1.5 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.

B. Cutting and Patching: Comply with requirements for and limitations on cutting and patching of construction elements.

1. Structural Elements: When cutting and patching structural elements, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural elements during cutting and patching. Do not cut and patch structural elements in a manner that could change their load-carrying capacity or increase deflection

2. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety. Operational elements include the following:

a. Primary operational systems and equipment.
b. Fire separation assemblies.
c. Air or smoke barriers.
d. Fire-suppression systems.
e. Mechanical systems piping and ducts.
f. Control systems.
g. Communication systems.
h. Fire-detection and -alarm systems.
i. Conveying systems.
j. Electrical wiring systems.
k. Operating systems of special construction.

3. Other Construction Elements: Do not cut and patch other construction elements or components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety. Other construction elements include but are not limited to the following:

a. Water, moisture, or vapor barriers.
b. Membranes and flashings.
c. Exterior curtain-wall construction.
d. Sprayed fire-resistive material.
e. Equipment supports.
f. Piping, ductwork, vessels, and equipment.
g. Noise- and vibration-control elements and systems.

4. Visual Elements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch exposed construction in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

C. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

D. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of products and equipment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; underground electrical services, and other utilities.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

B. Examination and Acceptance of Conditions: Before proceeding with each component of the Work, examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
3. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to local utility Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before

fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

D. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents caused by differing field conditions outside the control of Contractor, submit a request for information to Architect according to requirements in Division 01 Section "Project Management and Coordination."

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Construction Manager promptly.

3.4 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.

F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

H. Attachment: Provide blocking and attachment plates and anchors and fasteners of adequate size and number to securely anchor each component in place, accurately located and aligned with other portions of the Work. Where size and type of attachments are not indicated, verify size and type required for load conditions.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.5 CUTTING AND PATCHING

A. Cutting and Patching, General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during installation or cutting and patching operations, by methods and with materials so as not to void existing warranties.

C. Temporary Support: Provide temporary support of work to be cut.

D. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

E. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching according to requirements in Division 01 Section "Summary."

F. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots neatly to minimum size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

G. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other work. Patch with durable seams that are as invisible as practicable. Provide materials and comply with installation requirements specified in other Sections, where applicable.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.

a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

a. Where patching occurs in a painted surface, prepare substrate and apply primer and intermediate paint coats appropriate for substrate over the patch, and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition and ensures thermal and moisture integrity of building enclosure.

H. Cleaning: Clean areas and spaces where cutting and patching are performed. Remove paint, mortar, oils, putty, and similar materials from adjacent finished surfaces.

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction personnel.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction personnel at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction personnel if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.

1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

    a. Use containers intended for holding waste materials of type to be stored.

4. Coordinate progress cleaning for joint-use areas where Contractor and other contractors are working concurrently.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

G. Waste Disposal: Do not bury or burn waste materials on-site. Do not wash waste materials down sewers or into waterways. Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.

I. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

3.8 STARTING AND ADJUSTING

A. Coordinate startup and adjusting of equipment and operating components with requirements in Division 01 Section "General Commissioning Requirements."

B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.

D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Manufacturer's Field Service: Comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 017300

SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. This Section includes procedural requirements for cutting and patching.

1.3 DEFINITIONS

A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.

B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 SUBMITTALS

A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.5 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that result in increased maintenance or decreased operational life or safety. Operating elements include the following:

1. Primary operational systems and equipment.
2. Fire-suppression systems.
3. Mechanical systems piping and ducts.
4. Control systems.
5. Communication systems.
6. Conveying systems.
7. Electrical wiring systems.
8. Operating systems of special construction in Division 13 Sections.

C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity that results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety. Miscellaneous elements include the following:

1. Water, moisture, or vapor barriers.
2. Membranes and flashings.
3. Exterior curtain-wall construction.
4. Equipment supports.
5. Piping, ductwork, vessels, and equipment.
6. Noise- and vibration-control elements and systems.

D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.

1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.

1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
4. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
6. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

    a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    b. Restore damaged pipe covering to its original condition.

3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

    a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

4. Ceilings: Patch, repair, or re-hang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final completion procedures.
3. Warranties.
4. Final cleaning.
5. Repair of the Work.

B. Related Requirements:

1. Division 01 Section "Execution" for progress cleaning of Project site.
2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Division 01 Section "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
4. Divisions 02 through 33 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 ACTION SUBMITTALS

A. Product Data: For cleaning agents.

B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

C. Certified List of Incomplete Items: Final submittal at Final Completion.

1.4 CLOSEOUT SUBMITTALS

A. Certificates of Release: From authorities having jurisdiction.

B. Certificate of Insurance: For continuing coverage.

C. Field Report: For pest control inspection.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

1.6 SUBSTANTIAL COMPLETION PROCEDURES

A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

B. Submittals Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Certificates of Release: Obtain and submit releases from authorities having jurisdiction permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
3. Submit closeout submittals specified in individual Divisions 02 through 33 Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit maintenance material submittals specified in individual Divisions 02 through 33 Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number where applicable.

    a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section. Obtain Architect's signature for receipt of submittals.

5. Submit test/adjust/balance records.
6. Submit sustainable design submittals required in Division 01 sustainable design requirements Section and in individual Division 02 through 33 Sections.
7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.

C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.

1. Advise Owner of pending insurance changeover requirements.
2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
3. Complete startup and testing of systems and equipment.
4. Perform preventive maintenance on equipment used prior to Substantial Completion.

5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Division 01 Section "Demonstration and Training."
6. Advise Owner of changeover in heat and other utilities.
7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
9. Complete final cleaning requirements, including touchup painting.
10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.7 FINAL COMPLETION PROCEDURES

A. Submittals Prior to Final Completion: Before requesting final inspection for determining final completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report.

B. Inspection: Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.8 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order, starting with exterior areas first.
2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Architect.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in the following format:

    a. MS Excel electronic file. Architect will return annotated file.

1.9 SUBMITTAL OF PROJECT WARRANTIES

A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.

B. Partial Occupancy: Submit properly executed warranties within 15days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.

C. Organize warranty documents into an orderly sequence based on the table of contents of Project Manual.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.

D. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a designated portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Remove snow and ice to provide safe access to building.
    f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    h. Sweep concrete floors broom clean in unoccupied spaces.
    i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
    j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Polish mirrors and glass, taking care not to scratch surfaces.
    k. Remove labels that are not permanent.

l. Wipe surfaces of mechanical and electrical equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
o. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.

1) Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.

p. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
q. Leave Project clean and ready for occupancy.

C. Pest Control: Comply with pest control requirements in Division 01 Section "Temporary Facilities and Controls." Prepare written report.

D. Construction Waste Disposal: Comply with waste disposal requirements in Division 01 Section "Temporary Facilities and Controls."

3.2 REPAIR OF THE WORK

A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.

B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.

1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.

a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.

3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Product maintenance manuals.
5. Systems and equipment maintenance manuals.

B. Related Requirements:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Divisions 02 through 33 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 CLOSEOUT SUBMITTALS

A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.

1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.

B. Format: Submit operations and maintenance manuals in the following format:

1. Three paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.
3. Manual contents.

B. Title Page: Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name and contact information for Contractor.
6. Name and contact information for Construction Manager.

7. Name and contact information for Architect.
8. Name and contact information for Commissioning Authority.
9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
10. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.

1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.

1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.

   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components

of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.

    a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
    b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:

1. Type of emergency.
2. Emergency instructions.
3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

1. Fire.
2. Flood.
3. Gas leak.
4. Water leak.
5. Power failure.
6. Water outage.
7. System, subsystem, or equipment failure.
8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.

D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
2. Performance and design criteria if Contractor has delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number. Use designations for products indicated on Contract Documents.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
6. Normal shutdown instructions.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Product Information: Include the following, as applicable:

1. Product name and model number.
2. Manufacturer's name.
3. Color, pattern, and texture.
4. Material and chemical composition.
5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:

1. Inspection procedures.
2. Types of cleaning agents to be used and methods of cleaning.
3. List of cleaning agents and methods of cleaning detrimental to product.
4. Schedule for routine cleaning and maintenance.
5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:

1. Standard maintenance instructions and bulletins.
2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
3. Identification and nomenclature of parts and components.
4. List of items recommended to be stocked as spare parts.

D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training video recording, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.

1. Do not use original project record documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared record Drawings in Division 01 Section "Project Record Documents."

G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823

SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for project record documents, including the following:

1. Record Drawings.
2. Record Specifications.
3. Record Product Data.
4. Miscellaneous record submittals.

B. Related Requirements:

1. Division 01 Section "Execution" for final property survey.
2. Division 01 Section "Closeout Procedures" for general closeout procedures.
3. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
4. Divisions 02 through 33 Sections for specific requirements for project record documents of the Work in those Sections.

1.3 CLOSEOUT SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up record prints.
2. Number of Copies: Submit copies of record Drawings as follows:

a. Initial Submittal:

1) Submit one paper-copy set(s) of marked-up record prints.
2) Submit PDF electronic files of scanned record prints and one of file prints.
3) Submit record digital data files and one set(s) of plots.
4) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.

b. Final Submittal:

1) Submit three paper-copy set(s) of marked-up record prints.

2) Submit PDF electronic files of scanned record prints and three set(s) of prints.
3) Print each drawing, whether or not changes and additional information were recorded.

c. Final Submittal:

1) Submit one paper-copy set(s) of marked-up record prints.
2) Submit record digital data files and three set(s) of record digital data file plots.
3) Plot each drawing file, whether or not changes and additional information were recorded.

B. Record Specifications: Submit one paper copy of Project's Specifications, including addenda and contract modifications.

C. Record Product Data: Submit one paper copy of each submittal.

1. Where record Product Data are required as part of operation and maintenance manuals, additional submittal is not required.

D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit one paper copy of each submittal.

E. Reports: Submit written report indicating items incorporated into project record documents concurrent with progress of the Work, including revisions, concealed conditions, field changes, product selections, and other notations incorporated.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an acceptable drawing technique.
c. Record data as soon as possible after obtaining it.
d. Record and check the markup before enclosing concealed installations.
e. Cross-reference record prints to corresponding archive photographic documentation.

2. Content: Types of items requiring marking include, but are not limited to, the following:

   a. Dimensional changes to Drawings.
   b. Revisions to details shown on Drawings.
   c. Depths of foundations below first floor.
   d. Locations and depths of underground utilities.
   e. Revisions to routing of piping and conduits.
   f. Revisions to electrical circuitry.
   g. Actual equipment locations.
   h. Duct size and routing.
   i. Locations of concealed internal utilities.
   j. Changes made by Change Order or Construction Change Directive.
   k. Changes made following Architect's written orders.
   l. Details not on the original Contract Drawings.
   m. Field records for variable and concealed conditions.
   n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

2.2 RECORD SPECIFICATIONS

A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.

   1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
   2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
   3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
   4. For each principal product, indicate whether record Product Data has been submitted in operation and maintenance manuals instead of submitted as record Product Data.
   5. Note related Change Orders, record Product Data, and record Drawings where applicable.

B. Format: Submit record Specifications as paper copy.

2.3 RECORD PRODUCT DATA

A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.

1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
3. Note related Change Orders, Record Specifications, and record Drawings where applicable.

B. Format: Submit record Product Data as paper copy.

1. Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data.

2.4 MISCELLANEOUS RECORD SUBMITTALS

A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

B. Format: Submit miscellaneous record submittals as paper copy.

1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

PART 3 - EXECUTION

3.1 RECORDING AND MAINTENANCE

A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.

B. Maintenance of Record Documents and Samples: Store record documents and Samples in the field office apart from the Contract Documents used for construction. Do not use project record documents for construction purposes. Maintain record documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to project record documents for Architect's and Construction Manager's reference during normal working hours.

END OF SECTION 017839

SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused or recycled.

B. Related Requirements:

1. Division 01 Section "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Division 01 Section "Execution" for cutting and patching procedures.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Existing items of construction that are not to be permanently removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

A. Pre-Demolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property , for environmental protection , for dust control and , for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.

D. Inventory: Submit a list of items to be removed and salvaged and deliver to Owner prior to start of demolition.

E. Pre-Demolition Photographs or Video: Submit before Work begins.

F. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

G. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

B. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.9 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. Hazardous materials will be removed by Owner before start of the Work.
2. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

E. Storage or sale of removed items or materials on-site is not permitted.

F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1.10 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties. Notify warrantor before proceeding.

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

PART 2 - PRODUCTS

2.1 PEFORMANCE REQUIREMENTS

A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

B. Standards: Comply with ANSI/ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of measured drawings, preconstruction photographs, or preconstruction videotapes.

1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect furniture, furnishings, and equipment that have not been removed.
5. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."

C. Temporary Shoring: Provide and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes

to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.

3.3 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
2. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
3. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
4. Maintain adequate ventilation when using cutting torches.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
7. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
8. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.4 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

3.5 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.6 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Slabs-on-grade.

1.3 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1. Indicate amounts of mixing water to be withheld for later addition at Project site.

C. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.

1. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Steel reinforcement and accessories.
4. Curing compounds.

5. Bonding agents.
6. Adhesives.
7. Vapor retarders.
8. Semi-rigid joint filler.
9. Joint-filler strips.
10. Repair materials.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.

C. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

D. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel

wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I/II , . Supplement with the following:

   a. Fly Ash: ASTM C 618, Class F or C.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Water: ASTM C 94/C 94M and potable.

2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.5 VAPOR RETARDERS

A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Products: Subject to compliance with requirements, provide the following :
   a. Stego Industries, LLC; Stego Wrap 15 mil Class A .

2.6 LIQUID FLOOR TREATMENTS

A. Penetrating Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.

1. Products: Subject to compliance with requirements, provide one of the following:

a. ChemMasters; Chemisil Plus.
b. ChemTec Int'l; ChemTec One.
c. Conspec by Dayton Superior; Intraseal.
d. Curecrete Distribution Inc.; Ashford Formula.
e. Dayton Superior Corporation; Day-Chem Sure Hard (J-17).
f. Edoco by Dayton Superior; Titan Hard.
g. Euclid Chemical Company (The), an RPM company; Euco Diamond Hard.
h. Kaufman Products, Inc.; SureHard.
i. L&M Construction Chemicals, Inc.; Seal Hard.
j. Meadows, W. R., Inc.; LIQUI-HARD.
k. Metalcrete Industries; Floorsaver.
l. Nox-Crete Products Group; Duro-Nox.
m. Symons by Dayton Superior; Buff Hard.
n. US SPEC, Division of US Mix Products Company; US SPEC Industraseal.
o. Vexcon Chemicals, Inc.; Vexcon StarSeal PS Clear.

2.7 CURING MATERIALS

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Water: Potable.

C. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.

1. Products: Subject to compliance with requirements, provide the following provide one of the following available products that may be incorporated into the Work include, but are not limited to, the following:

a. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
b. BASF Construction Chemicals - Building Systems; Kure 200.
c. ChemMasters; Safe-Cure Clear.
d. Conspec by Dayton Superior; W.B. Resin Cure.
e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
f. Edoco by Dayton Superior; Res X Cure WB.
g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
h. Kaufman Products, Inc.; Thinfilm 420.
i. Lambert Corporation; AQUA KURE - CLEAR.
j. L&M Construction Chemicals, Inc.; L&M Cure R.
k. Meadows, W. R., Inc.; 1100-CLEAR.

l. Nox-Crete Products Group; Resin Cure E.
m. Right Pointe; Clear Water Resin.
n. SpecChem, LLC; Spec Rez Clear.
o. Symons by Dayton Superior; Resi-Chem Clear.
p. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.8 RELATED MATERIALS

A. Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.

B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

2.9 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested according to ASTM C 109/C 109M.

2.10 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.
2. Ground Granulated Blast-Furnace Slag: 50 percent.
3. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15] 0.30 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Slump Limit: 5 inches.
3. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.12 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.

C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:

1. Class A, 1/8 inch for smooth-formed finished surfaces.

D. Construct forms tight enough to prevent loss of concrete mortar.

E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Do not use rust-stained steel form-facing material.

F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

H. Do not chamfer exterior corners and edges of permanently exposed concrete.

I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

3.3 REMOVING AND REUSING FORMS

A. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

B. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 VAPOR RETARDERS

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

3.5 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.

D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.

2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.7 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

C. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.

1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

D. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

E. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

F. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.8 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft. long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch.

3.9 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.10 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:

   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
   c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

3. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.11 JOINT FILLING

A. Prepare, clean, and install joint filler according to manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least six month(s). Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.

C. Install semi rigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.12 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

D. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

E. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.13 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:

C. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.

2. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Compression Test Specimens: ASTM C 31/C 31M.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
    a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
8. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
9. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

10. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION 033000

SECTION 035416 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes hydraulic-cement-based, polymer-modified, self-leveling underlayment for application below interior floor coverings.

B. Related Sections:

1. Division 09 Sections for localized patching and leveling compounds applied with floor coverings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: Signed by manufacturers of underlayment and floor-covering systems certifying that products are compatible.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

B. Product Compatibility: Manufacturers of underlayment and floor-covering systems certify in writing that products are compatible.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store materials to comply with manufacturer's written instructions to prevent deterioration from moisture or other detrimental effects.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.

1. Place hydraulic-cement-based underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

1.8 COORDINATION

A. Coordinate application of underlayment with requirements of floor-covering products and adhesives, specified in Division 09 Sections, to ensure compatibility of products.

PART 2 - PRODUCTS

2.1 HYDRAULIC-CEMENT-BASED UNDERLAYMENTS

A. Underlayment: Hydraulic-cement-based, polymer-modified, self-leveling product that can be applied in minimum uniform thickness of 1/4 inch and that can be feathered at edges to match adjacent floor elevations.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Ardex; K-15 Self-Leveling Underlayment Concrete.
b. BASF Construction Chemicals, Inc.; Chemrex Self-Leveling Underlayment
c. CGM, Incorporated; PRO S.L.U. Self-Leveling Underlayment.
d. L&M Construction Chemicals, Inc.; Levelex.
e. Maxxon Corporation; Level-Right.
f. Metalcrete Industries; Flowpave.
g. Teck Specialties; Teck 2800.
h. USG Corporation; Levelrock SLC 300
i. US SPEC, Division of US Mix Products Company; US SPEC Self-Leveling Underlayment.

2. Cement Binder: ASTM C 150, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
3. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.
4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.

B. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch; or coarse sand as recommended by underlayment manufacturer.

1. Provide aggregate when recommended in writing by underlayment manufacturer for underlayment thickness required.

C. Water: Potable and at a temperature of not more than 70 deg F .

D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.

1. Primer shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D.
2. Primer shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for conditions affecting performance.

1. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Prepare and clean substrate according to manufacturer's written instructions.

1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
2. Fill substrate voids to prevent underlayment from leaking.

B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.

1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft.in 24 hours.

C. Nonporous Substrates: For ceramic tile, quarry tile, and terrazzo substrates, remove waxes, sealants, and other contaminants that might impair underlayment bond, and prepare surfaces according to manufacturer's written instructions.

D. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION

A. General: Mix and apply underlayment components according to manufacturer's written instructions.

1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
2. Coordinate application of components to provide optimum underlayment-to-substrate and intercoat adhesion.
3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.

B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Apply underlayment to produce uniform, level surface.

1. Apply a final layer without aggregate to product surface.
2. Feather edges to match adjacent floor elevations.

D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.

E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.

F. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION

A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035416

SECTION 042000 - UNIT MASONRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry joint reinforcement.
5. Ties and anchors.
6. Miscellaneous masonry accessories.

B. Related Sections:

1. Division 03 Section "Cast-in-Place Concrete" for installing dovetail slots for masonry anchors.

1.3 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths at 28 days.

1. Determine net-area compressive strength of masonry from average net-area compressive strengths of masonry units and mortar types (unit-strength method) according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.
2. Determine net-area compressive strength of masonry by testing masonry prisms according to ASTM C 1314.

1.5 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

1. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C 140 for compressive strength.
2. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength.
3. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.
4. Prism Test: For each type of construction required, according to ASTM C 1314.

1.6 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement."

1.7 INFORMATIONAL SUBMITTALS

A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.

1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.

B. Qualification Data: For testing agency.

C. Material Certificates: For each type and size of the following:

1. Masonry units.

   a. Include data on material properties.
   b. For masonry units, include data and calculations establishing average net-area compressive strength of units.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

E. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

F. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.8 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.10 PROJECT CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls and hold cover securely in place.

B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.

B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners unless otherwise indicated.

B. CMUs: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2800 psi.
2. Density Classification: Normal weight.
3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.

2.3 MASONRY LINTELS

A. General: Provide the following:

B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

E. Aggregate for Grout: ASTM C 404.

F. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Euclid Chemical Company (The); Accelguard 80.
b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

G. Water: Potable.

2.5 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60.

B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.

1. Interior Walls: Hot-dip galvanized, carbon steel.

2. Wire Size for Side Rods: 0.148-inch diameter.
3. Wire Size for Cross Rods: 0.148-inch diameter.
4. Wire Size for Veneer Ties: 0.148-inch diameter.
5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.6 MISCELLANEOUS ANCHORS

A. Unit Type Inserts in Concrete: Cast-iron or malleable-iron wedge-type inserts.

B. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch, galvanized steel sheet.

C. Anchor Bolts: Headed steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

D. Post-installed Anchors: Torque-controlled expansion anchors.

1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5 unless otherwise indicated.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Pre-molded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

B. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

2.8 MASONRY CLEANERS

A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Diedrich Technologies, Inc.
b. EaCo Chem, Inc.

c. ProSoCo, Inc.

2.9 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.

B. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry, use Type S.

C. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.
3. Provide grout with a minimum compressive strength of 2000 psi.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Comply with tolerances in ACI 530.1/ASCE 6/TMS 602 and the following:

1. For noticeable vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, nor 1/2 inch maximum.
3. For noticeable horizontal lines, such as exposed lintels, sills, parapets, and reveals, do not vary from level by more than 1/4 inch in 20 feet, nor 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

C. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

G. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow and CMUs as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 CONTROL AND EXPANSION JOINTS

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry as follows:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.

C. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod not less than 3/8 inch.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.8 LINTELS

A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.9 REINFORCED UNIT MASONRY INSTALLATION

A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

3.10 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.

B. Inspections: Level 1 special inspections according to the "International Building Code."

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.

E. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

F. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.

G. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.

3.11 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.

4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.12 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Structural steel.
2. Grout.

B. Related Sections:

1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
2. Division 05 Section "Steel Decking" for field installation of shear connectors through deck.
3. Division 05 Section "Metal Fabrications" for steel lintels and shelf angles not attached to structural-steel frame and miscellaneous steel fabrications not defined as structural steel.
4. Division 05 Section "Metal Stairs."
5. Division 09 painting Sections for surface-preparation and priming requirements.

1.3 DEFINITIONS

A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."

1.4 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of simple shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator to withstand loads indicated and comply with other information and restrictions indicated.

1. Select and complete connections using AISC 360.
2. Use ASD; data are given at service-load level.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
2. Include embedment drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
5. Identify members and connections of the seismic-load-resisting system.
6. Indicate locations and dimensions of protected zones.
7. Identify demand critical welds.
8. For structural-steel connections indicated to comply with design loads, include structural analysis data.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint qualified by testing, including the following:

1. Power source (constant current or constant voltage).

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer, fabricator and testing agency.

B. Welding certificates.

C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.

B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

C. In lieu of AISC Certification, fabricators and installers may submit a letter, including project list, to the architect prior to submitting a bid indicating that the fabricator/installer has been successfully engaged in work of similar complexity and type for a minimum of 10 years.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.

E. Comply with applicable provisions of the following specifications and documents:

1. AISC 303.
2. AISC 360.
3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.9 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A 992/A 992M.

B. Channels, Angles: ASTM A 36/A.

C. Plate and Bar: ASTM A 36/A 36M.

D. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.

E. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.

B. Headed Anchor Rods: ASTM F 1554, Grade 36, straight.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Plate Washers: ASTM A 36/A 36M carbon steel.
3. Washers: ASTM F 436 (ASTM F 436M), Type 1, hardened carbon steel.
4. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

C. Threaded Rods: ASTM A 36/A 36M.

1. Nuts: ASTM A 563 heavy-hex carbon steel.
2. Washers: ASTM F 436, Type 1, hardened carbon steel.
3. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.

2.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat, except where galvanized finish is specified.

B. Galvanizing Repair Paint: ASTM A 780.

2.4 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.5 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.

1. Cut, drill, or punch holes perpendicular to steel surfaces.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.6 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.7 SHOP PRIMING

A. Shop prime steel surfaces except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces to be high-strength bolted with slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces.

B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:

1. SSPC-SP 2, "Hand Tool Cleaning."

C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.8 GALVANIZING

A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.

1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
2. Galvanize lintels and shelf angles and all canopy framing.

2.9 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.

B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures when required by the special inspections, at testing agency's option:

1. Liquid Penetrant Inspection: ASTM E 165.
2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
3. Ultrasonic Inspection: ASTM E 164.
4. Radiographic Inspection: ASTM E 94.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.

1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

B. Base, Bearing, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.

C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.

2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.

B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.

1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures when required by the special inspections, at testing agency's option:

a. Liquid Penetrant Inspection: ASTM E 165.
b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
c. Ultrasonic Inspection: ASTM E 164.
d. Radiographic Inspection: ASTM E 94.

D. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

A. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

END OF SECTION 051200

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Framing with dimension lumber.
2. Wood blocking and nailers.

B. Related Requirements:

1. Division 06 Section "Sheathing."

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use and design values approved by the ALSC Board of Review.

B. Evaluation Reports: For the following, from ICC-ES:

1. Wood-preservative-treated wood.
2. Power-driven fasteners.
3. Expansion anchors.
4. Metal framing anchors.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship" for the following:

1. Dimension lumber framing.
2. Miscellaneous lumber.

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. For exposed lumber indicated to receive a stained or natural finish, mark grade stamp on end or back of each piece or omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 19 percent, unless otherwise indicated.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX) for sill plates.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat all rough carpentry unless otherwise indicated.

1. Wood nailers, curbs, blocking, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: Standard, Stud, or No. 3 grade.

1. Application: All interior partitions**.**
2. Species:

a. Hem-fir (north); NLGA.
b. Mixed southern pine; SPIB.
c. Spruce-pine-fir; NLGA.
d. Hem-fir; WCLIB, or WWPA.

e. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
f. Northern species; NLGA.
g. Eastern softwoods; NeLMA.
h. Western woods; WCLIB or WWPA.

B. Load-Bearing Partitions: Construction or No. 2 grade.

1. Application: Exterior walls.
2. Species:

a. Hem-fir (north); NLGA.
b. Southern pine; SPIB.
c. Douglas fir-larch; WCLIB or WWPA.
d. Mixed southern pine; SPIB.
e. Spruce-pine-fir; NLGA.
f. Douglas fir-south; WWPA.
g. Hem-fir; WCLIB or WWPA.
h. Douglas fir-larch (north); NLGA.
i. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.

B. For items of dimension lumber size, provide Standard, Stud, or No. 3 grade lumber of the following species:

1. Hem-fir (north); NLGA.
2. Mixed southern pine; SPIB.
3. Spruce-pine-fir; NLGA.
4. Douglas fir larch (north); NLGA.
5. Hem-fir; WCLIB or WWPA.
6. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.
7. Western woods; WCLIB or WWPA.
8. Northern species; NLGA.
9. Eastern softwoods; NeLMA.

C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.

2.6 METAL FRAMING ANCHORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide the following:

1. Simpson Strong-Tie Co., Inc.

C. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer that meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

D. Galvanized-Steel Sheet: Hot-dip, zinc-coated steel sheet complying with ASTM A 653/A 653M, G60 coating designation.

1. Use for interior locations unless otherwise indicated.

E. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.

F. Rafter & Roof Joist Tie-Downs: Bent strap tie for fastening rafters or roof trusses to wall studs below, 1-1/2 inches wide by 0.050 inch thick. Tie fastens to side of rafter or truss, face of top plates, and side of stud below.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

D. Install sill sealer gasket to form continuous seal between sill plates and foundation walls.

E. Do not splice structural members between supports unless otherwise indicated.

F. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16 inches o.c.

G. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

H. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

I. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.
3. Table R602.3(1), "Fastener Schedule for Structural Members," and Table R602.3(2), "Alternate Attachments," in ICC's International Residential Code for One- and Two-Family Dwellings.

J. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

3.2 WOOD BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 WALL AND PARTITION FRAMING INSTALLATION

A. General: Provide single bottom plate and double top plates using members of 2-inch nominal thickness whose widths equal that of studs, except single top plate may be used for non-load-bearing partitions and for load-bearing partitions where framing members bearing on partition are located directly over studs. Fasten plates to supporting construction unless otherwise indicated.

1. For exterior walls, provide 2-by-6-inch nominal size wood studs spaced 16 inches o.c. unless otherwise indicated.
2. For interior partitions and walls, provide 2-by-4-inch nominal size wood studs spaced 16 inches o.c. unless otherwise indicated.
3. Provide continuous horizontal blocking at mid-height of partitions more than 96 inches high, using members of 2-inch nominal thickness and of same width as wall or partitions.

B. Construct corners and intersections with three or more studs, except that two studs may be used for interior non-load-bearing partitions.

C. Frame openings with multiple studs and headers. Provide nailed header members of thickness equal to width of studs. Support headers on jamb studs.

1. For load-bearing exterior walls, provide double-jamb studs for openings 60 inches and less in width, and triple-jamb studs for wider openings. Provide headers of depth indicated or, if not indicated, according to Table R502.5(1) or Table R502.5(2), as applicable, in ICC's International Residential Code for One- and Two-Family Dwellings.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet **or** sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Glass-fiber blanket insulation.
2. Vapor retarders.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

PART 2 - PRODUCTS

2.1 GLASS-FIBER BLANKET INSULATION

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CertainTeed Corporation.
2. Guardian Building Products, Inc.
3. Johns Manville.
4. Knauf Insulation.
5. Owens Corning.

B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

C. Sustainability Requirements: Provide glass-fiber blanket insulation as follows:

1. Free of Formaldehyde: Insulation manufactured with 100 percent acrylic binders and no formaldehyde.
2. Low Emitting: Insulation tested according to ASTM D 5116 and shown to emit less than 0.05-ppm formaldehyde.

2.2 VAPOR RETARDERS

A. Polyethylene Vapor Retarders: ASTM D 4397, 6 mils thick, with maximum permeance rating of 0.13 perm.

B. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by vapor-retarder manufacturer for sealing joints and penetrations in vapor retarder.

C. Vapor-Retarder Fasteners: Pancake-head, self-tapping steel drill screws; with fender washers.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

B. Glass-Fiber Insulation: Install in cavities formed by framing members according to the following requirements:

1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
3. Maintain 3-inch clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
4. Install eave ventilation troughs between roof framing members in insulated attic spaces at vented eaves.
5. For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.
6. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:

    a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
    b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.

3.4 INSTALLATION OF VAPOR RETARDERS

A. Place vapor retarders on side of construction indicated on Drawings. Extend vapor retarders to extremities of areas to protect from vapor transmission. Secure vapor retarders in place with adhesives or other anchorage system as indicated. Extend vapor retarders to cover miscellaneous voids in insulated substrates, including those filled with loose-fiber insulation.

B. Seal vertical joints in vapor retarders over framing by lapping no fewer than two studs.

1. Fasten vapor retarders to wood framing at top, end, and bottom edges; at perimeter of wall openings; and at lap joints. Space fasteners 16 inches o.c.
2. Before installing vapor retarders, apply urethane sealant to flanges of metal framing including runner tracks, metal studs, and framing around door and window openings. Seal overlapping joints in vapor retarders with vapor-retarder tape according to vapor-retarder manufacturer's written instructions. Seal butt joints with vapor-retarder tape. Locate all joints over framing members or other solid substrates.
3. Firmly attach vapor retarders to metal framing and solid substrates with vapor-retarder fasteners as recommended by vapor-retarder manufacturer.

C. Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarders.

D. Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarders.

3.5 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072100

SECTION 072500 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Building wrap.
2. Flexible flashing.

B. Related Requirements:

1. Division 06 Section "Sheathing" for sheathing joint and penetration treatment.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For building wrap, include data on air and water-vapor permeance based on testing according to referenced standards.

1.4 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Dow Chemical Company (The); Styrofoam Weathermate Plus Brand Housewrap.
b. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.

2. Allowable UV Exposure Time: Not less than three months.

B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, butyl rubber compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

1. Products: Subject to compliance with requirements, provide one of the following:

a. DuPont (E. I. du Pont de Nemours and Company); DuPont Flashing Tape.
b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Butyl Self Adhered Flashing.
c. Protecto Wrap Company; BT-25 XL.
d. Raven Industries Inc.; Fortress Flashshield.
e. Advanced Building Products Inc.; Wind-o-wrap.
f. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
g. Fiberweb, Clark Hammerbeam Corp.; Aquaflash 500.
h. Fortifiber Building Systems Group; Fortiflash 25 or Fortiflash 40.
i. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Plus Self-Adhered Flashing or Vycor V40 Self-Adhered Flashing.
j. MFM Building Products Corp.; Window Wrap.
k. Polyguard Products, Inc.; Polyguard JT-20 Tape or Polyguard JT-30 Tape.
l. Sandell Manufacturing Co., Inc.; Presto-Seal.

B. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

C. Nails and Staples: ASTM F 1667.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover exposed exterior surface of sheathing with water-resistive barrier securely fastened to framing immediately after sheathing is installed.

B. Building Wrap: Comply with manufacturer's written instructions.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. Prime substrates as recommended by flashing manufacturer.
2. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
3. Lap flashing over water-resistive barrier at bottom and sides of openings.
4. Lap water-resistive barrier over flashing at heads of openings.
5. After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 072500

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Division 08 Section "Glazing" for glazing sealants.
3. Division 09 Section "Gypsum Board" for sealing perimeter joints.
4. Division 09 Section "Tiling" for sealing tile joints.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.

1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:

1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
2. Conduct field tests for each application indicated below:

a. Each kind of sealant and joint substrate indicated.

3. Notify Architect seven days in advance of dates and times when test joints will be erected.
4. Arrange for tests to take place with joint-sealant manufacturer's technical representative present.

   a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

      1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

5. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
6. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.

D. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Sealant, Waterproofing, and Restoration Institute (SWRI) Validation Certificate: For each sealant specified to be validated by SWRI's Sealant Validation Program.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

F. Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

G. Field-Adhesion Test Reports: For each sealant application tested.

H. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

D. Mockups: Install sealant in mockups of assemblies specified in other Sections that are indicated to receive joint sealants specified in this Section. Use materials and installation methods specified in this Section.

1.7 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY

A. Special Installer's Warranty: Manufacturer's standard form in which Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Low-Emitting Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.

E. Stain-Test-Response Characteristics: Where sealants are specified to be non-staining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

F. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

G. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. BASF Building Systems; Omniplus.
b. Dow Corning Corporation; 786 Mildew Resistant.
c. GE Advanced Materials - Silicones; Sanitary SCS1700.
d. May National Associates, Inc.; Bondaflex Sil 100 WF.
e. Tremco Incorporated; Tremsil 200 Sanitary.

2.3 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Sika Corporation, Construction Products Division; Sikaflex - 15LM.
b. Tremco Incorporated; Vulkem 921.

B. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Pecora Corporation; Dynatrol II.
b. Polymeric Systems, Inc.; PSI-270.
c. Tremco Incorporated; Dymeric 240.

C. Immersible Multicomponent, Pourable, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type M, Grade P, Class 25, for Use T and I.

1. Products: Subject to compliance with requirements, provide one of the following:

a. LymTal International, Inc.; Iso-Flex 880 GB.
b. May National Associates, Inc.; Bondaflex PUR 2 SL.
c. Tremco Incorporated; Vulkem 245.

2.4 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are non-staining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, type approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.5 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

    1. Do not leave gaps between ends of sealant backings.
    2. Do not stretch, twist, puncture, or tear sealant backings.
    3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

    1. Place sealants so they directly contact and fully wet joint substrates.
    2. Completely fill recesses in each joint configuration.
    3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form

smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.

    a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed and cured sealant joints as follows:

    a. Perform 3 tests for the first 5 of joint length for each kind of sealant and joint substrate.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

    a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

    a. Whether sealants filled joint cavities and are free of voids.
    b. Whether sealant dimensions and configurations comply with specified requirements.
    c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

END OF SECTION 079200

SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Standard hollow metal doors and frames.

B. Related Sections:

1. Division 04 Section "Unit Masonry" for embedding anchors for hollow metal work into masonry construction.
2. Division 08 Section "Door Hardware" for door hardware for hollow metal doors.
3. Division 09 Sections "Interior Painting" for field painting hollow metal doors and frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, fire-resistance rating, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door design.
2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Details of moldings, removable stops, and glazing.
5. Details of conduit and preparations for power, signal, and control systems.

C. Samples for Initial Selection: For units with factory-applied color finishes.

D. Other Action Submittals:

1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency acceptable to authorities having jurisdictaion, for fire-protection ratings indicated, based on testing

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amweld Building Products, LLC.
2. Ceco Door Products; an Assa Abloy Group company.
3. Curries Company; an Assa Abloy Group company.
4. Kewanee Corporation (The).
5. Steelcraft; an Ingersoll-Rand company.

2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum A40 metallic coating.

D. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

F. Cementitious Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

G. Glazing: Comply with requirements in Division 08 Section "Glazing."

H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL DOORS

A. General: Provide doors of design indicated, not less than thickness indicated; fabricated with smooth surfaces, without visible joints or seams on exposed faces unless otherwise indicated. Comply with ANSI/SDI A250.8.

1. Design: Flush panel.

2. Vertical Edges for Single-Acting Doors: Manufacturer's standard.

   a. Beveled Edge: 1/8 inch in 2 inches.

3. Top and Bottom Edges: Closed with flush or inverted 0.042-inch thick, end closures or channels of same material as face sheets.
4. Tolerances: Comply with SDI 117, "Manufacturing Tolerances for Standard Steel Doors and Frames."

B. Exterior Doors: Face sheets fabricated from metallic-coated steel sheet. Provide doors complying with requirements indicated below by referencing ANSI/SDI A250.8 for level and model and ANSI/SDI A250.4 for physical performance level:

   1. Level 3 and Physical Performance Level A (Extra Heavy Duty), Model 2 (Seamless) (16 gauge).

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcing plates from same material as door face sheets.

D. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

2.4 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

   1. Fabricate frames with mitered or coped corners.
   2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.

      a. Knocked down frames are not allowed.

   3. Frames to be double rabbet.
   4. Frame throat width to match thickness of finished wall for stud framed walls.
   5. Frame width to be 5 ¾” at openings 102A, 106 and 111.

B. Exterior Frames: Fabricated from metallic-coated steel sheet.

   1. Frame Thickness: 0.067-inch (14 gauge).

C. Interior Frames: Fabricated from cold-rolled steel sheet unless metallic-coated sheet is indicated.

   1. Frame Thickness for Doors: 0.053-inch (16 gauge).
   2. Frames for Borrowed Lights: 0.053-inch (16 gauge).

D. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Post-installed Expansion Type for Masonry: Minimum 3/8-inch diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

2.6 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.7 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in SDI 117.

C. Hollow Metal Doors:

1. Exterior Doors: Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

D. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
3. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
5. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. See detail on sheet A8.1.

6. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

E. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

F. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

   1. Locate hardware as indicated, or if not indicated, according to ANSI/SDI A250.8.
   2. Reinforce doors and frames to receive non-templated, mortised and surface-mounted door hardware.
   3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
   4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.8 STEEL FINISHES

A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

   1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11.

1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    c. Install frames with removable glazing stops located on secure side of opening.
    d. Install door silencers in frames before grouting.
    e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Metal-Stud Partitions: Solidly pack mineral-fiber insulation behind frames.
3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.
4. Masonry Construction: Secure frames in place with post installed expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. In-Place Gypsum Board Partitions: Secure frames in place with post installed expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Standard Steel Doors:

a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

END OF SECTION 081113

SECTION 081416 - FLUSH WOOD DOORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections:

1. Division 08 Section "Glazing" for glass view panels in flush wood doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For plastic-laminate door faces and factory-finished doors.

D. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color and grain to be expected in the finished work.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors from single manufacturer.

B. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork Quality Standards Illustrated."

1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1.8 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Algoma Hardwoods, Inc.
2. Eggers Industries.
3. Graham; an Assa Abloy Group company.
4. Marshfield Door Systems, Inc.
5. Oshkosh Architectural Door Company.
6. VT Industries Inc.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.

B. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.

1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.

C. Mineral-Core Doors:

1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.

   a. 5-inch top-rail blocking.
   b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
   c. 5-inch mid-rail blocking, in doors indicated to have armor plates.
   d. 4-1/2-by-10-inch lock blocks, in doors indicated to have exit devices.

3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species: White oak.
3. Cut: Plain sliced.

4. Match between Veneer Leaves: Book match.
5. Assembly of Veneer Leaves on Door Faces: Running match.
6. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering. Faces are bonded to core using a hot press.

2.4 LIGHT FRAMES

A. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.

1. Wood Species: Same species as door faces.
2. Profile: Flush rectangular beads.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

B. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.

C. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."
3. Louvers: Factory install louvers in prepared openings.

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

D. Transparent Finish:

1. Grade: Premium.
2. Finish: As selected by Architect from Manufacturers Standard Colors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416

SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Access doors and frames for access to ceiling space in Break/Conference Room 105. See other sections for access doors required for their specific work.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, materials, individual components and profiles, and finishes.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Access Panel Solutions.
2. Babcock-Davis.
3. Jensen Industries; Div. of Broan-Nutone, LLC.
4. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
5. Larsen's Manufacturing Company.
6. Milcor Inc.
7. Nystrom, Inc.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Flush Access Doors with Exposed Flanges:

1. Basis-of-Design Product: Access Panel Solutions, Bauco Softline 30-2424-TL. Galvanized sheet steel, powder coated.

2. Assembly Description: Fabricate door to fit flush to frame. Provide manufacturer's standard-width exposed flange, proportional to door size.
3. Locations: Ceiling.
4. Door Size: 24 inches x 24 inches.
5. Frame Material: Same material, thickness, and finish as door.
6. Hinges: Manufacturer's standard.

D. Hardware:

1. Latch: Manufacturer’s standard key lock.

2.2 MATERIALS

A. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

B. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

C. Frame Anchors: Same type as door face.

D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
3. Provide mounting holes in frames for attachment of units to metal or wood framing.
4. Provide mounting holes in frame for attachment of masonry anchors.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder locks, furnish two keys per lock and key all locks alike.
2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Exterior storefront framing.
2. Entrance doors.
3. Door Hardware.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

1.4 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferring to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
d. Glazing-to-glazing contact.
e. Noise or vibration created by wind and by thermal and structural movements.
f. Loosening or weakening of fasteners, attachments, and other components.
g. Sealant failure.
h. Failure of operating units.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for aluminum-framed systems.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.
2. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Other Action Submittals:

1. Entrance Door Hardware Schedule: Prepared by or under the supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams. Coordinate final entrance door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of entrance door hardware.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer and testing agency.

B. Source quality-control reports.

C. Field quality-control reports.

D. Warranties: Sample of special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

C. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

D. Quality-Control Program for Structural-Sealant-Glazed System: Develop quality control program specifically for Project. Document quality-control procedures and verify results for

aluminum-framed systems. Comply with ASTM C 1401 recommendations including, but not limited to, system material-qualification procedures, preconstruction sealant-testing program, procedures for system fabrication and installation, and intervals of reviews and checks.

E. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

F. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.

G. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

1.9 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.10 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including, but not limited to, excessive deflection.
b. Noise or vibration caused by thermal movements.
c. Deterioration of metals and other materials beyond normal weathering.
d. Adhesive or cohesive sealant failures.
e. Water leakage through fixed glazing and framing areas.
f. Failure of operating components.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 FRAMING SYSTEM

A. Basis-of-Design Product: The design is based on the following:

1. Tubelite Inc., Versa-Therm.

a. Overall Size: 1-3/4 inches by 4-1/2 inches.

B. Subject to compliance with requirements, provide the named products or comparable products by one of the following:

1. EFCO Corporation.
2. U.S. Aluminum.
3. Vistawall Architectural Products.
4. YKK AP America Inc.
5. Kawneer

2.2 FRAMING SYSTEMS STANDARDS

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Reinforce members as required to receive fastener threads.
2. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

2.3 GLAZING SYSTEMS

A. Glazing: As specified in Division 08 Section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

2.4 ENTRANCE DOOR SYSTEMS

A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.

2. Door Design: Medium stile; 3-1/2-inch nominal width.

a. Accessible Doors: Smooth surfaced for width of door in area within 10 inches above floor or ground plane.

3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide non-removable glazing stops on outside of door.

2.5 ENTRANCE DOOR HARDWARE

A. Continuous Gear Hinges: As a minimum, manufacturer's heavy-duty with stainless-steel bearings between knuckles, fabricated to full height of door and frame.

1. Manufacturer's: Subject to compliance with requirements, provide products by the following:

a. IVES Hardware; an Ingersoll-Rand Company.
b. Approved Equals.

2. Finish: Match aluminum framing finish.

B. Closers

1. Product: Provide the following:

a. LCN 4040XP.

2. Mounting: Hinge (Pull) Side.

3. Finish: As selected by the Architect from manufacturer's standard finishes.

C. Pull Handles:

1. Product: Provide the following:

a. IVES 8103EZ Door Pull.

2. Material: Aluminum, to match door framing.

D. Weather Stripping:

1. Product: Provide the following:

a. Reese Weatherstrip 769A.

2. Material: Aluminum, mill finish.

E. Door Sweeps:

1. Product: Provide the following:

a. Reese Door Sweep 323A.

2. Material: Aluminum, mill finish.

F. Thresholds:

1. Product: Provide the following:

a. Reese Threshold S204A.

2. Material: Aluminum, mill finish.

2.6 ACCESSORY MATERIALS

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Division 07 Section "Joint Sealants."

2.7 FABRICATION

A. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

B. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

C. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
1. At exterior doors, provide weather sweeps applied to door bottoms.

2.8 ALUMINUM FINISHES

A. Color Anodic Finish: AAMA 611, AA-M12C22A42/A44, Class I, 0.018 mm or thicker.

1. Color: Dark bronze to match existing aluminum frames adjacent to new.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure non-movement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install glazing as specified in Division 08 Section "Glazing."

D. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.

   a. Set threshold in full sealant bed as specified in Division 07 Section “Joint Sealants” to produce weathertight installation.

2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

E. Install perimeter joint sealants as specified in Division 07 Section "Joint Sealants" to produce weathertight installation.

3.3 ADJUSTING

A. Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

3.4 ENTRANCE DOOR HARDWARE SETS

SET 1:
Continuous Gear Hinges
Pull Handle
Closer w/ Stop
Threshold
Door Sweep
Weather Stripping

END OF SECTION 084113

SECTION 085653 – BULLET RESISTANT TRANSACTION WINDOW

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Bullet Resistant Transaction Window.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

1.4 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

1. Catalog cuts
2. Shop drawings
3. Specificiations
4. Frame profiles
5. Size
6. Type and spacing of anchors
7. Welding details
8. Joint and connection details

1.5 INFORMATIONAL SUBMITTALS

A. Product Certificates: For glass and glazing products, from manufacturer.

1. The provider of this window must be ISO9001:2008 Certified by an accredited registrar and provide proof of such.

2. Provide Verification of UL Listing of natural voice frame, and printed data in sufficient detail to indicate compliance with the contract documents, for all components of the transaction window.

B. Preconstruction adhesion and compatibility test report.

C. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications:

B. Provide manufacturer’s instructions for installation of the transaction window and cleaning of the glazing material.

C. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

D. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

E. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

F. Source Limitations for Glass: Obtain tinted float glass and insulating glass from single source from single manufacturer for each glass type.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.9 WARRANTY

A. All material and workmanship shall be warranted against defects for a period of one (1) year from the date of receipt at the jobsite.

PART 2 - PRODUCTS

2.1 MAUNFACTURER

A. Products: Provide the following:

1. Armortex Bullet Resistant Transaction Window, Model SSTW
2. Size: 39 inch by 56 inch.

B. Products by these additional manufacturers may be acceptable:

1. Diebold, Inc.
2. Ross Engineering
3. Norshield Security Products

2.2 FRAME

1. Vertical frame type: 12ga Stainless steel #3 finish.
2. Top and bottom edges: No less than 20ga stainless steel #3 finish.
3. Shall not be of the hollow metal or aluminum design.
4. UL Listed Level 3.

2.3 GLAZING

1. The glazing to be of the protection level specified and must be UL Listed Laminated Glass. Provide one of the following:
   a. Polycarbonate.
   b. Glass Clad Polycarbonate.
   c. Approved Equals.

2.4 SHELF

1. Provide a shelf not less than 2 inch thick with a recessed dip tray. The shelf to be full width of window and a minimum 12 inch deep centered under the glazing covered with a black high pressure laminate.

2.5 DIP TRAY

1. Model RMDT1016 constructed of no less than 16ga stainless steel, #3 finish 10 inch by 16 inch from the outside edge of flanges with a clear open depth under the glazing no less than 1 5/8 inch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Set windows in accordance with the manufacturer's printed recommendations. Proper anchoring device shall be determined by the material to be anchored to. All exposed anchor holes shall be used for anchoring. Repair damaged units prior to completion and acceptance of the project or replace with new units as directed by the architect.

B. Grout frame per Section 081113 – Hollow Metal Doors and Frames.

3.2 CLEANING AND PROTECTION

A. It shall be the responsibility of the contractor to see that windows are properly stored in a dry location and covered to protect them from damage before and after installation.

B. Upon completion, clean exposed surfaces of windows thoroughly in accordance with manufacturer's instructions.

END OF SECTION 085653

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes:

1. Door Hardware.

B. Related Sections:

1. Division 08 Section "Hollow Metal Doors and Frames" for door silencers provided as part of hollow-metal frames.
2. Division 08 Section "Aluminum-Framed Entrances and Storefronts" for installation of entrance door hardware.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction and installation details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Details of electrified door hardware, indicating the following:

1. Wiring Diagrams: For power, signal, and control wiring and including the following:

a. Details of interface of electrified door hardware and building safety and security systems.
b. Schematic diagram of systems that interface with electrified door hardware.
c. Point-to-point wiring.
d. Risers.
e. Elevations doors controlled by electrified door hardware.

2. Operation Narrative: Describe the operation of doors controlled by electrified door hardware.

3. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks. Include schematic keying diagram and index each key set to unique door designations that are coordinated with the Contract Documents.

1.4 QUALITY ASSURANCE

1. Regulatory Requirements: Comply with Americans with Disabilities Act (ADA), “Accessibility Guidelines for Buildings and Facilities (ADAAG)”.NFPA 101: Comply with the following for means of egress doors:

    a. Latches and Locks: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
    b. Door Closers: Not more than 30 lbf to set door in motion and not more than 15 lbf to open door to minimum required width.

B. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.

C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

D. Means of Egress Doors: Latches do not require more than 15 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

1. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
2. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for door hardware delivered to Project site.

B. Tag each item or package separately with identification coordinated with the final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.

C. Deliver keys to Owner by registered mail or overnight package service.

1.6 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

C. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing

conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

D. Wood Blocking: Coordinate wood blocking location with products surface applied. Provide solid blocking concealed in walls to support door hardware applied to walls.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fails in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Structural failures including excessive deflection, cracking, or breakage.
   b. Faulty operation of doors and door hardware.
   c. Deterioration of metals, metal finishes, and other materials beyond normal weathering and use.

2. Warranty Period: Three years from date of Substantial Completion, unless otherwise indicated.

   a. Electromagnetic Locks: Five years from date of Substantial Completion.
   b. Hinges: Lifetime of the installation.
   c. Locksets/Latchsets: Three years from date of Substantial Completion.
   d. Manual Closers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 HINGES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. IVES Hardware; an Ingersoll-Rand Company.
2. Approved Equals.

B. Hinge Type: Full Mortise with square corners.

C. Quantity:

1. Three hinges: For doors with heights 61 to 90 inches.

D. Base Metal and Finish:

1. Exterior Hinges: Stainless Steel, 630.
2. Interior Hinges: Satin Chrome, 626.

E. Hinge Size: 4 ½ inch by 4 ½ inch.

F. Hinge Weight:

1. Exterior Doors: Standard weight; Grade 2, with 2 ball bearings.
2. Interior Doors with Closers: Standard weight; Grade 2, with 2 ball bearings.

G. Hinge Pins:

1. Non-removable pins for out-swinging exterior doors and doors 108-110.
2. Non-rising pins for all other doors.

H. Hinge Tips: Standard button.

I. Fasteners:

1. Machine Screws: For metal doors and frames. Install into drilled and tapped holes.
2. Wood screws: For wood doors.
3. Screws: Phillips flat-head.

2.2 LOCKS AND LATCHES

A. Basis-of-Design Product: The design is based on the following:

1. Falcon Lock; An Ingersoll-Rand Company.

a. Series: T Series Commercial Grade 1 Cylindrical
b. Lever: Dane
c. Functions: Scheduled in the various hardware sets.
d. Finish: Satin Chrome, 626

B. Interchangeable Cores:

1. Series: C606. For use in all T Series I/C Keyed Locks.
2. Style: 6-pin (cover style).

C. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.

1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.

2.3 ELECTRIC STRIKES

A. Basis-of-Design Product: The design is based on the following:

1. Von Duprin; an Ingersoll-Rand Company.

a. Series: 6211 FS

2. Electrical requirement: 24VDC.

3. Electric wiring, conduit (if required) and hook up provided by Division 26.

2.4 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.

1. Master Key System: Change keys and a master key operate cylinders. Coordinate with any owner requirements.

2. Keyed Alike: Key all cylinders to same change key.

B. Keys: Brass.

1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

a. Notation: "DO NOT DUPLICATE."

2. Quantity: In addition to one extra key blank for each lock, provide the following:

a. Cylinder Change Keys: Three.
b. Master Keys: Five.

2.5 CLOSERS

A. Basis-of-Design: The design is based on the following:

1. LCN Closers; an Ingersoll-Rand Company.

a. Series: 4040XP
b. Finish: Satin Chrome, 626

2.6 WALL BUMPERS

A. Basis-of-Design Product: The design is based on the following:

1. IVES Hardware; an Ingersoll-Rand Company.

a. Wall Bumper: WS407CVX.
b. Material: Wrought stainless steel.
c. Finish: Satin Chrome, 626.

B. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Burns Manufacturing Incorporated.
2. Hager Companies.
3. Hiawatha, Inc.

4. Rockwood Manufacturing Company.
5. Trimco.

2.7 DOOR SWEEPS

A. Basis-of-Design Product: The design is based on the following:

1. Reese Enterprises, Inc.

a. Sweep: 323C
b. Material: Clear Anodized Aluminum.

B. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

1. Hager Companies.
2. Pemko Manufacturing Co.; an ASSA ABLOY Group Company.

2.8 WEATHER STRIPS

A. Basis-of-Design Product: The design is based on the following:

1. Reese Enterprises, Inc.

a. Reese Weatherstrip 769C.
b. Material: Clear Anodized Aluminum.

2. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

a. Hager Companies.
b. Pemko Manufacturing Co.; an ASSA ABLOY Group company.

2.9 THRESHOLDS

A. Basis-of-Design Product: The design is based on the following:

1. Reese Enterprises, Inc.

a. Reese Threshold S204A.
b. Material: Aluminum, mill finish.

2. Subject to compliance with requirements, provide the named product or a comparable product by one of the following:

a. Hager Companies.
b. Pemko Manufacturing Co.; an ASSA ABLOY Group company.

2.10 FABRICATION

A. Manufacturer's Nameplate: Do not provide products that have manufacturer's name or trade name displayed in a visible location except in conjunction with required fire-rated labels and as otherwise approved by Architect.

1. Manufacturer's identification is permitted on rim of lock cylinders only.

B. Base Metals: Produce door hardware units of base metal indicated, fabricated by forming method indicated, using manufacturer's standard metal alloy, composition, temper, and hardness. Furnish metals of a quality equal to or greater than that of specified door hardware units and BHMA A156.18.

C. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
2. Fire-Rated Applications:

   a. Wood or Machine Screws: For the following:

      1) Hinges mortised to doors or frames.
      2) Strike plates to frames.
      3) Closers to doors and frames.

3. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."
4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.11 FINISHES

A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights to comply with the following unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to comply with manufacturer's 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 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

C. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.

D. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as directed by Owner.
2. Furnish permanent cores to Owner for installation.

E. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

G. Stops: Provide wall stops for doors as indicated in door hardware schedule.

H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

I. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

3.4 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Owner will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

1. Independent Architectural Hardware Consultant will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure that door hardware is without damage or deterioration at time of Substantial Completion.

3.7 DOOR HARDWARE SCHEDULE

SET 1:
See Division 08 "Aluminum-Framed Entrances and Storefronts" for hardware set.

SET 2:
Hinges
Closer
Entrance Function
Threshold
Sweep
Weather-stripping

SET 3:
Hinges
Closer
Electric Strike
Storeroom Function

SET 4:
Hinges
Closer
Electric Strike
Storeroom Function
Wall Bumper

SET 5:
Hinges
Closer
Passage Function
Wall Bumper

SET 6:
Hinges
Closer
Storeroom Function
Wall Bumper

SET 7:
Hinges
Closer
Office Function
Wall Bumper

SET 8:
Hinges
Closer w/cush
Electric Strike
Storeroom Function

END OF SECTION 087100

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Glazed entrances.
2. Interior borrowed lites.
3. Interior door lites

B. Related Sections:

1. Division 08 Section "Mirrors."

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

1.5 ACTION SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Glass Samples: For each type of the following products; 12 inches square.

1. Tempered glass.
2. Miirored glass.
3. Insulating glass.

C. Glazing Schedule: Use same designations indicated on Drawings for glazed openings in preparing a schedule listing glass types and thicknesses for each size opening and location.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For installers, manufacturers of insulating-glass units with sputter-coated, low-e coatings, glass testing agency and sealant testing agency.

B. Product Certificates: For glass and glazing products, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass, coated glass and insulating glass..

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.

D. Preconstruction adhesion and compatibility test report.

E. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

E. Source Limitations for Glass: Obtain tinted float glass and insulating glass from single source from single manufacturer for each glass type.

F. Source Limitations for Glazing Accessories: Obtain from single source from single manufacturer for each product and installation method.

G. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA's "Laminated Glazing Reference Manual" and GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.10 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 INSULATING GLASS

1. Type GL-1: 1-inch insulating unit consisting of exterior ¼ inch tinted tempered, ½ inch air space and interior ¼ inch clear tempered. Tint to match existing window units adjacent to opening.

2.2 MONOLITHIC GLASS

1. Type GL-2: 1/4 inch clear tempered.
2. Type GL-3: Fire rated glazing as required to meet requirements for rated wall construction.
3. Type GL-4: 1/4 inch mirrored.

2.3 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; non-staining and non-migrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

2.4 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

2.5 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in the completed work.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Adjust glazing channel dimensions as required by Project conditions during installation to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

H. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

I. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

3.5 CLEANING AND PROTECTION

A. Protect exterior glass from damage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

D. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 092216 - NON-STRUCTURAL METAL FRAMING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Interior non-load-bearing steel framing members.

B. Related Sections:
   1. Division 05 Section "Cold-Formed Metal Framing" for exterior and interior load-bearing and exterior non-load-bearing steel framing members.
   2. Division 06 Section "Miscellaneous Rough Carpentry" for wood blocking and plywood installed with steel framing.
   3. Division 07 Section "Thermal Insulation" for insulation installed with steel framing members.

1.3 SUBMITTALS

A. Product Data: For each product used on Project.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C 754 for conditions indicated.
   1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal, unless otherwise indicated.
   2. Protective Coating: ASTM A 653/A 653M, G40 minimum or manufacturer's standard corrosion-resistant zinc coating.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.0625-inch diameter wire, or double strand of 0.0475-inch diameter wire.

B. Hanger Attachments to Concrete:
   1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
      a. Do not use powder-actuated fasteners for attaching items to precast, concrete, or masonry substrates.

C. Hangers: As follows:
   1. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base metal thickness of 0.0538 inch, a minimum 1/2-inch- wide flange, with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
   1. Depth: As indicated.

E. Furring Channels (Furring Members): Commercial-steel sheet with ASTM A 653/A 653M, G60, hot-dip galvanized zinc coating.
   1. Hat-Shaped, Rigid Furring Channels: ASTM C 645, 7/8 inch deep.
      a. Minimum Base Metal Thickness: 0.0179 inch.

F. Grid Suspension System for Interior Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Products: Provide one of the following:
      a. Armstrong World Industries, Inc., Drywall Grid Systems.
      b. Chicago Metallic Corporation, 640-C/660-C Drywall Furring System.
      c. USG Corporation, Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C 645.
   1. Minimum Base Metal Thicknesses:
      a. General: 0.0179 inch, unless indicated otherwise on Drawings.
      b. Adjacent to Door Jambs: 0.0312 inch.
      c. Covered with Tile Backing Panels: 0.0312 inch.

B. Slip-Type Head Joints: Where indicated, provide the following:
   1. Deflection Track (Non-Fire Rated Walls): Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
      a. Products: Subject to compliance with requirements, provide one of the following:
         1) Metal-Lite, Inc. Slotted Track.
         2) Steel Network Inc., VertiClip SLD/VertiTrack VTD Series.
         3) Superior Metal Trim, Superior Flex Track System (SFT).
   2. Firestop Track (Fire Rated Walls): Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-

resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

a. Products: Subject to compliance with requirements, provide one of the following:

1) Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.

2) Metal-Lite, Inc.; The System.

C. Flat Strap and Backing Plate: Steel sheet for blocking and bracing.

1. Minimum Base Metal Thickness: As indicated on Drawings.

D. Hat-Shaped, Rigid Furring Channels: ASTM C 645.

1. Minimum Base Metal Thickness: 0.0179 inch.
2. Depth: 7/8 inch, unless indicated otherwise on Drawings.

E. Z-Shaped Furring: With slotted or nonslotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8 inch.

1. Minimum Base Metal Thickness: 0.0179 inch.
2. Depth: As required to fit insulation thickness indicated.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

a. Fasteners: Do not use powder-actuated fasteners for attaching items to precast, concrete, or masonry.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8 inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials (if applicable to Project):

1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.

2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754, unless indicated otherwise on Drawings.
   1. Gypsum Board Assemblies: Also, comply with requirements in ASTM C 840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment, wall bumpers, heavy trim, grab bars, toilet accessories, furnishings, and other items anchored to walls.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.3 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
   3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
   4. Do not attach hangers to steel roof deck.
   5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
   6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
   7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.4 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.
   1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
      a. Horizontal Bracing: Provide one (1) row of 1-1/2 inch cold-rolled channels 6-inches below slip track.
   2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install two studs at each jamb, unless otherwise indicated.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
      c. Extend jamb studs full height and attach to underside of overhead structure.
   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
      a. Firestop Track: Install to maintain continuity of fire-resistance-rated assembly indicated.
   5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
   6. Curved Partitions:
      a. Bend track to uniform curve and locate straight lengths so they are tangent to arcs.
      b. Begin and end each arc with a stud, and space intermediate studs equally along arcs. On straight lengths of not less than 2 studs at ends of arcs, place studs 6 inches o.c.

D. Z-Furring Members:
   1. Erect insulation (specified in Division 07 Section "Thermal Insulation") vertically and hold in place with Z-furring members spaced 24 inches o.c.

2. Except at exterior corners, securely attach narrow flanges of furring members to wall with concrete stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.
3. At exterior corners, attach wide flange of furring members to wall with short flange extending beyond corner; on adjacent wall surface, screw-attach short flange of furring channel to web of attached channel. At interior corners, space second member no more than 12 inches from corner and cut insulation to fit.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board.
2. Exterior gypsum board for ceilings and soffits.
3. Tile backing panels.
4. Texture finishes.

B. Related Requirements:

1. Division 06 Section "Sheathing" for gypsum sheathing for exterior walls.
2. Division 09 Section "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Samples: For the following products:

1. Textured Finishes: Manufacturer's standard size for each textured finish indicated and on same backing indicated for Work.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. American Gypsum.

2. CertainTeed Corp.
3. Georgia-Pacific Gypsum LLC.
4. National Gypsum Company.
5. USG Corporation.

B. Gypsum Wallboard: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch
2. Long Edges: Tapered

C. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch.
2. Long Edges: Tapered.

D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch
2. Long Edges: Tapered.

E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.

1. Core: 5/8 inch , Type X where required.
2. Long Edges: Tapered.
3. Mold Resistance: ASTM D 3273, score of 10.

2.4 EXTERIOR GYPSUM BOARD

A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; GlasRoc Sheathing.
b. Georgia-Pacific Gypsum LLC; Dens-Glass Gold.
c. National Gypsum Company; Gold Bond, e(2)XP.
d. USG Corporation; Securock Glass Mat Sheathing.

2. Core: As required to match existing at infill and patch areas.

2.5 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 and ASTM C 1288 or 1325, with manufacturer's standard edges.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. C-Cure; C-Cure Board 990.
b. CertainTeed Corp.; FiberCement BackerBoard.
c. National Gypsum Company, Permabase Cement Board.
d. USG Corporation; DUROCK Cement Board.
e.

2. Thickness: **5/8 inch**
3. Mold Resistance: ASTM D 3273, score of 10.

2.6 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

a. Cornerbead.
b. L-Bead: L-shaped; exposed long flange receives joint compound.

c. Control joint: One-piece control joint formed with V-shaped slot and removable strip covering slot opening.

2.7 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
3. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Exterior Applications:
1. Glass-Mat Gypsum Sheathing Board: As recommended by sheathing board manufacturer.

E. Joint Compound for Tile Backing Panels:
1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.8 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Thermal Insulation: As specified in Division 07 Section "Thermal Insulation."

D. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

2.9 TEXTURE FINISHES

A. Primer: As recommended by textured finish manufacturer.

B. Non-Aggregate Finish: Pre-mixed, vinyl texture finish for spray application.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. CertainTeed Corp.; ProRoc Easi-Tex Spray Texture.
b. National Gypsum Company; Perfect Spray EM Texture.
c. USG Corporation; BEADEX FasTex Wall and Ceiling Spray Texture.

2. Texture: Orange Peel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.

3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Wood Framing: Install gypsum panels over wood framing, with floating internal corner construction. Do not attach gypsum panels across the flat grain of wide-dimension lumber, including floor joists and headers. Float gypsum panels over these members or provide control joints to counteract wood shrinkage.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing) or horizontally (perpendicular to framing) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

    a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints one framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 APPLYING EXTERIOR GYPSUM PANELS

A. Apply panels perpendicular to supports, with end joints staggered and located over supports.

1. Install with 1/4-inch open space where panels abut other construction or structural penetrations.
2. Fasten with corrosion-resistant screws.

3.5 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive wall tile.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.6 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. L-Bead: Use where panels abut other materials and at exposed panel edges.

3.7 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.

3. Level 4: At wall surfaces that will be exposed to view unless otherwise indicated.

a. Primer and its application to surfaces are specified in other Division 09 Sections.

E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.

F. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.8 APPLYING TEXTURE FINISHES – CEILINGS ONLY

A. Surface Preparation and Primer: Prepare and apply primer to gypsum panels and other surfaces receiving texture finishes. Apply primer to surfaces that are clean, dry, and smooth.

B. Texture Finish Application: Mix and apply finish using powered spray equipment, to produce a uniform texture free of starved spots or other evidence of thin application or of application patterns.

C. Prevent texture finishes from coming into contact with surfaces not indicated to receive texture finish by covering them with masking agents, polyethylene film, or other means. If, despite these precautions, texture finishes contact these surfaces, immediately remove droppings and overspray to prevent damage according to texture-finish manufacturer's written recommendations.

3.9 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 093000 - TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Floor Tile.
2. Wall Tile.
3. Tile Base.

B. Related Sections:

1. Division 07 Section "Joint Sealants" for sealing of expansion, contraction, control, and isolation joints in tile surfaces.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.

B. ANSI A108 Series: ANSI A108.01, ANSI A108.02, ANSI A108.1A, ANSI A108.1B, ANSI A108.1C, ANSI A108.4, ANSI A108.5, ANSI A108.6, ANSI A108.8, ANSI A108.9, ANSI A108.10, ANSI A108.11, ANSI A108.12, ANSI A108.13, ANSI A108.14, ANSI A108.15, ANSI A108.16, and ANSI A108.17, which are contained in "American National Standard Specifications for Installation of Ceramic Tile."

C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations of each type of tile and tile pattern. Show widths, details, and locations of expansion, contraction, control, and isolation joints in tile substrates and finished tile surfaces.

1.5 INFORMATIONAL SUBMITTALS

A. Material Test Reports: For each tile-setting and grouting product.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

2.2 TILE PRODUCTS

A. Products: Provide products listed as follows:

1) Composition: Porcelain.
2) Module Size: See Interior Finish Key on drawing sheet A8.1.
3) Product: See Interior Finish Key on drawing sheet A8.1 for required manufacturers.
4) Base: See Interior Finish Key on drawing sheet A8.1.

2.3 SETTING MATERIALS

A. Latex-Portland Cement Mortar (Thin Set): ANSI A118.4, consisting of the following:

1. Provide prepackaged, dry-mortar mix containing dry, redispersible, ethylene vinyl acetate additive to which only water must be added at Project site.

2.4 GROUT MATERIALS

A. Product: See Interior Finish Key on drawing sheet A8.1.
1. Width: 3/16”

2.5 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."

1. Sealants shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G, A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

2.6 MISCELLANEOUS MATERIALS

A. Trowelable Underlayments and Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

2.7 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible with tile-setting materials including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with adhesives or thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

1. For the following installations, follow procedures in the ANSI A108 Series of tile installation standards for providing 95 percent mortar coverage:

    a. Tile floors composed of tiles 8 by 8 inches or larger.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Jointing Pattern: Lay tile in 1/3 offset pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

    1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
    2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
    3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

3.4 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

    1. Remove grout residue from tile as soon as possible.
    2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
    3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.

D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.5 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation: Thin-set mortar; TCA F115.

   a. Thin-set Mortar: Latex-Portland cement mortar.
   b. Grout: As specified.
   c. Joint Width: As specified.

3.6 INTERIOR WALL TILE INSTALLATION SCHEDULE

A. Interior Wall Installations, Metal Studs or Furring:

1. Tile Installation: Thin-set mortar; TCA W243.

   a. Thin-set Mortar: Latex-Portland cement mortar.
   b. Grout: As specified.
   c. Joint Width: As specified.
   d. Align joints with floor tile joints.

END OF SECTION 093000

SECTION 096513 - RESILIENT COVERINGS AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Vinyl composition tile (VCT).
2. Resilient wall base and accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches long, of each resilient product color, texture, and pattern required.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After post-installation period, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor covering installation.

D. Close spaces to traffic for 48 hours after floor covering installation.

E. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION TILE

A. Vinyl Composition Tile (VCT): ASTM F 1066

B. Product: See Interior Finish Key on drawing sheet A8.1 for required products and manufacturers.

C. Thickness: 0.125 inch.

D. Size: 12 inch by 12 inch.

2.2 RESILIENT WALL BASE

A. Wall Base: ASTM F 1861.

B. Product: See Interior Finish Key on drawing sheet A8.1 for required products and manufacturers.

C. Type (Material Requirement): TV (vinyl, thermoplastic).

D. Group (Manufacturing Method): I (solid).

E. Style: Cove.

F. Minimum Thickness: 0.125 inch.

G. Height: 4 inches.

H. Lengths: Rolled coil stock in manufacturer’s standard length.

I. Outside Corners: Preformed.

J. Inside Corners: Preformed.

2.3 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
   b. Johnsonite.
   c. Roppe Corporation, USA.

B. Description: All Required Transition strips

C. Material: Vinyl

D. Profile and Dimensions: As required.

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.4 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Metal Edge Strips: Extruded aluminum with mill finish of width shown, of height required to protect exposed edges of tiles, and in maximum available lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.
3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from resilient stair treads before applying liquid floor polish.

E. Cover resilient products until Substantial Completion.

END OF SECTION 096513

SECTION 096813 - TILE CARPETING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Carpet Tile.

B. Related Requirements:

1. Division 02 Section "Selective Structure Demolition" for removing existing floor coverings.
2. Division 09 Section "Resilient Coverings and Accessories" for resilient wall base and accessories installed with carpet tile.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include installation recommendations for each type of substrate.

B. Shop Drawings: Show the following:

1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
2. Carpet tile type, color, and dye lot.
3. Type of subfloor.
4. Type of installation.
5. Pattern of installation.
6. Pattern type, location, and direction.
7. Pile direction.
8. Type, color, and location of insets and borders.
9. Type, color, and location of edge, transition, and other accessory strips.
10. Transition details to other flooring materials.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

1. Carpet Tile: Full-size Sample.
2. Exposed Edge, Transition, and Other Accessory Stripping: 12-inch long Samples.

D. Product Schedule: For carpet tile. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For carpet tile, for tests performed by a qualified testing agency.

C. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed at least (5) similar installations.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with CRI 104, Section 5, “Storage and Handling.”

1.8 FIELD CONDITIONS

A. Comply with CRI 104, Section 7.2, “Site Conditions; Temperature and Humidity” and Section 7.12, “Ventilation.”

B. Maintain ambient temperatures within range recommended by manufacturer, but not less than 65 deg F or more than 95 deg F, in spaces to receive carpet tile products during the following time periods:

1. 24 hours before installation
2. During installation.
3. 24 hours after installation.

C. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.9 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, loss of face fiber, and delamination.
3. Warranty Period: As specified by Manufacturer’s requirements.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Products: See Interior Finish Key on drawing sheet A8.1 for required products and manufacturers.

B. Fiber Type: Eco Solution Q® Nylon.

C. Pile Characteristic: Multi-level pattern loop pile.

D. Pile Thickness: 0.116 inches for finished carpet tile according to ASTM D 6859.

E. Total Thickness: 0.239 inches.

F. Gage: 1/12 inch.

G. Total Weight: 17.0 oz./sq. yd. for finished carpet tile.

H. Primary Backing: Manufacturer's standard composite materials.

I. Secondary Backing: Manufacturer's standard material.

J. Size: 24 by 24 inches.

K. Applied Soil-Resistance Treatment: Manufacturer's standard material.

L. Antimicrobial Treatment: Manufacturer's standard material.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, non-staining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.

1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Adhesives shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

C. Tackless Carpet Stripping as required: Water-resistant plywood, in strips as required to match cushion thickness and that comply with CRI 104, Section 12.2.

D. Seam Adhesive as required: Hot-melt adhesive tape or similar product recommended by carpet manufacturer for sealing and taping seams and butting cut edges at backing to form secure seams and to prevent pile loss at seams.

E. Metal Edge/Transition Strips: Extruded aluminum with mill finish of profile and width shown, of height required to protect exposed edge of carpet, and of maximum lengths to minimize running joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and the following:

1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials that may interfere with adhesive bond. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by carpet tile manufacturer.
2. Subfloor finishes comply with requirements specified in Division 03 Section "Cast-in-Place Concrete" for slabs receiving carpet tile.
3. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. General: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch wide or wider and protrusions more than 1/32 inch unless more stringent requirements are required by manufacturer's written instructions.

C. Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by carpet tile manufacturer.

D. Clean metal substrates of grease, oil, soil and rust, and prime if directed by adhesive manufacturer. Rough sand painted metal surfaces and remove loose paint. Sand aluminum surfaces, to remove metal oxides, immediately before applying adhesive.

E. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.

B. Installation Method: As recommended in writing by carpet tile manufacturer.

C. Maintain dye lot integrity. Do not mix dye lots in same area.

D. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.

E. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, non-staining marking device.

G. Install pattern parallel to walls and borders.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 096813

SECTION 099100 - PAINTING

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 surface preparation and field painting of the following:

1. Exposed exterior items and surfaces.
2. Exposed interior items and surfaces.
3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Related Sections include the following:

1. Division 5 Sections for shop priming ferrous metal.
2. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
3. Division 9 Section "Gypsum Board" for surface preparation for gypsum board.

1.3 DEFINITIONS

A. General: Standard coating terms defined in ASTM D 16 apply to this Section.

B. “Paint” means coating system materials, including primers, emulsions, stains, varnishes, sealers and fillers, and other applied materials whether used as primer, intermediate or finish coats.

1.4 SYSTEM DESCRIPTION

A. Finish Classification 1 (FC-1): Paint exposed surfaces, except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.

1. Painting includes field painting of exposed bare and covered pipes and ducts hangers, exposed steel and iron work, conduit, and primed metal surfaces of mechanical and electrical equipment, unless indicated otherwise.
2. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

a. Paint walls behind lockers and casework.

3. Prefinished items include the following factory-finished components:

   a. Casework.
   b. Fire extinguisher cabinets.
   c. Light fixtures.
   d. Diffusers.
   e. Cabinet unit heaters.
   f. Fin tube.

4. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

   a. Furred areas.
   b. Ceiling plenums.
   c. Chases.

5. Finished metal surfaces include the following:

   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper.
   e. Bronze and brass.

6. Operating parts include moving parts of operating equipment and the following:

   a. Valve and damper operators.
   b. Linkages.
   c. Sensing devices.
   d. Motor and fan shafts.

7. Labels: Do not paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.5 SUBMITTALS

A. Product Data: For each paint system specified.

B. Samples for Verification: Of each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

   1. Provide stepped Samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing Samples for review. Resubmit until required sheen, color, and texture are achieved.
   2. Provide a list of materials and applications for each coat of each sample. Label each sample for location and application.
   3. Submit Samples on the following substrates for the Architect's review of color and texture only:

      a. Stained or Natural Wood: Provide two 4-by-8-inch samples of natural- or stained-wood finish on actual wood surfaces.

1.6 QUALITY ASSURANCE

A. Benchmark Samples (Mockups): Provide a full-coat benchmark finish sample of each type of coating and substrate required on the Project. Duplicate finish of approved prepared samples.

1. Final approval of colors will be from job-applied samples.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:

1. Color name and number.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.8 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90 deg F.

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 and 95 deg F.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: The design for paint products listed in the paint schedules at the end of Part 3 is based on the following:

1. Sherwin-Williams Co.

B. Subject to compliance with requirements, provide the named products or comparable products by one of the following, unless indicated otherwise in the paint schedule.

1. Diamond-Vogel.
2. Mautz Paint Company.

2.2 PAINT, GENERAL

A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."

B. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

C. Colors: See Interior Finish Key on drawing sheet A8.1.

2.3 SOURCE QUALITY CONTROL

D. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:

1. Owner may engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency may perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with the Applicator present, under which painting will be performed for compliance with paint application requirements.

1. Do not begin to apply paint until unsatisfactory conditions have been corrected and surfaces receiving paint are thoroughly dry.
2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

3.2 PREPARATION

A. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
3. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.

   a. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat.

4. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

C. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

D. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.

4. Sand lightly between each succeeding enamel or varnish coat.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. Omit primer on metal surfaces that have been shop primed and touchup painted.
3. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
4. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer. Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.

E. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.

F. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

G. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, runs, cloudiness, color irregularity, brush marks, orange peel, nail holes, or other surface imperfections.

H. Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling, such as laps, irregularity in texture, skid marks, or other surface imperfections.

I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with procedures specified in PDCA P1.

3.6 EXTERIOR PAINT SCHEDULE

A. Metal:
1 coat S-W Kem Kromik Universal Metal Primer.
2 coats S-W Industrial Enamel Gloss.

B. EIFS/STUCCO:
Match existing

3.7 INTERIOR PAINT SCHEDULE

A. Concrete Block:
1 coat S-W Promar Blockfiller.
2 coats S-W Promar 200 Latex Semi-Gloss.

B. Gypsum Board:
1 coat S-W PrepRite 200 Interior Latex Primer.
2 coats S-W Promar 200 Latex Semi-Gloss.

C. Ferrous Metals: (omit scheduled primer below for factory primed products, except for spot priming of bare metal)
1 coat S-W Kem Kromik Universal Metal Primer.
2 coats S-W Industrial Enamel Gloss.

END OF SECTION 099100

SECTION 102113 - TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Solid-polymer toilet compartments configured as toilet enclosures, entrance screens and urinal screens.

B. Related Sections:

1. Division 06 Section "Rough Carpentry".
2. Division 10 Section "Toilet, Bath, and Laundry Accessories" for toilet tissue dispensers, grab bars, purse shelves, and similar accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For toilet compartments. Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.
2. Show locations of reinforcements for compartment-mounted grab bars.
3. Show locations of centerlines of toilet fixtures.

C. Samples for Initial Selection: For each type of unit indicated. Include Samples of hardware and accessories involving material and color selection.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of toilet compartment, from manufacturer.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Comply with requirements in GSA's CID-A-A-60003, "Partitions, Toilets, Complete."

B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities" for toilet compartments designated as accessible.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum Castings: ASTM B 26/B 26M.

B. Aluminum Extrusions: ASTM B 221.

C. Steel Sheet: Commercial steel sheet for exposed applications; mill phosphatized and selected for smoothness.

1. Electrolytically Zinc Coated: ASTM A 879/A 879M, 01Z.
2. Hot-Dip Galvanized: ASTM A 653/A 653M, either hot-dip galvanized or galvannealed.

D. Stainless-Steel Sheet: ASTM A 666, Type 304, stretcher-leveled standard of flatness.

E. Stainless-Steel Castings: ASTM A 743/A 743M.

F. Zamac: ASTM B 86, commercial zinc-alloy die castings.

G. Adhesives: Manufacturer's standard product that complies with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 SOLID-POLYMER UNITS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Accurate Partitions Corporation.
2. Ampco, Inc.
3. Bradley Corporation; Mills Partitions.

4. Comtec Industries/Capitol Partitions.
5. General Partitions Mfg. Corp.

B. Toilet-Enclosure Style: Floor anchored.

C. Urinal-Screen Style: Wall hung.

D. Door, Panel, and Pilaster Construction: Solid, high-density polyethylene (HDPE) panel material, not less than 1 inch thick, seamless, with eased edges, no-sightline system, and with homogenous color and pattern throughout thickness of material.

1. Integral Hinges: Configure doors and pilasters to receive integral hinges.
2. Color and Pattern: One color and pattern in each room as selected by Architect from manufacturer's full range.
3. Doors and panels shall be mounted 14 inches above the finished floor.

E. Pilaster Shoes: Manufacturer's standard design; stainless steel.

1. Polymer Color and Pattern: As selected by Architect from manufacturer's full range.

F. Brackets (Fittings):

1. Stirrup Type: Ear or U-brackets, clear-anodized aluminum.

2.3 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Chrome-plated zamac.
2. Hinges: Manufacturer's standard integral hinge for solid-polymer doors.
3. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with regulatory requirements for accessibility at compartments designated as accessible.
4. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent in-swinging door from hitting compartment-mounted accessories.
5. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
6. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with regulatory requirements for accessibility. Provide units on both sides of doors at compartments designated as accessible.

B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match the items they are securing, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use stainless steel, hot-dip galvanized steel, or other rust-resistant, protective-coated steel.

2.4 FABRICATION

A. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies with leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

B. Door Size and Swings: Unless otherwise indicated, provide 24-inch wide, in-swinging doors for standard toilet compartments and 36-inch wide, out-swinging doors with a minimum 32-inch wide, clear opening for compartments designated as accessible.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

   a. Pilasters and Panels: 1/2 inch.
   b. Panels and Walls: 1 inch.

2. Stirrup Brackets: Secure panels to walls and to pilasters with no fewer than two brackets attached near top and bottom of panel.

   a. Locate wall brackets so holes for wall anchors occur in masonry or tile joints.
   b. Align brackets at pilasters with brackets at walls.

B. Floor-Anchored Units: Set pilasters with anchors penetrating not less than 2 inches into structural floor unless otherwise indicated in manufacturer's written instructions. Level, plumb, and tighten pilasters. Hang doors and adjust so tops of doors are level with tops of pilasters when doors are in closed position.

C. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.

3.2 ADJUSTING

A. Hardware Adjustment: Adjust and lubricate hardware according to hardware manufacturer's written instructions for proper operation. Set hinges on in-swinging doors to hold doors open approximately 30 degrees from closed position when unlatched. Set hinges on out-swinging doors to return doors to fully closed position.

END OF SECTION 102113

SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Public-use washroom accessories.
2. Custodial accessories.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following:

1. Construction details and dimensions.
2. Anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Material and finish descriptions.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify products using designations indicated.

1.4 INFORMATIONAL SUBMITTALS

A. Warranty: Sample of special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: For products listed together in the same Part 2 articles, obtain products from single source from single manufacturer.

B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.7 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.8 WARRANTY

A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.

1. Warranty Period: 15 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PUBLIC-USE WASHROOM ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. GAMCO Specialty Accessories; a division of Bobrick Washroom Equipment, Inc.

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Bobrick Washroom Equipment, Inc.

C. Toilet Tissue (Roll) Dispenser (TP): Bobrick, B-264. Chrome finish.

D. Combination Towel (Folded) Dispenser/Waste Receptacle (TDS): Bradley Corporation, 2A05-11, surface mounted. Stainless steel with satin finish.

E. Liquid-Soap Dispenser (SDS): Bobrick, B-4112, surface mounted. Stainless steel with satin finish.

F. Grab Bars (GB): Bobrick B6806 x 42 inches and x 36 inches, 1 ½ inch diameter, concealed mounting. ADA compliant. Stainless steel with satin finish. Length, configuration, mounting height, and size as shown on drawings.

G. Mirror Unit (M): Bobrick, B165 Series, 24 inches x 36 inches. Stainless steel with polished edges.

2.3 CUSTODIAL ACCESSORIES

A. Mop and Broom Holder (MBH): Bobrick B-223 x 24 inches. Stainless steel with satin finish.

2.4 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written recommendations.

END OF SECTION 102800

SECTION 104400 - FIRE PROTECTION SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
1. Recessed fire extinguisher cabinets.
2. Portable fire extinguishers.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

1.4 COORDINATION

A. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 RECESSED FIRE EXTINGUISHER CABINETS

A. Products: Provide one of the following:
1. J.L. Industries, Inc., 1835.
2. Larsen's Manufacturing Company, 2409-R1.
3. Potter-Roemer, 7160.

2.2 CABINET COMPONENTS

A. Box:
1. Material: Manufacturer's standard heavy gauge steel.
2. Finish: White baked acrylic enamel.

B. Door Style: Full glazed panel with frame.
1. Glass: Clear tempered
2. Material: Type 304 stainless steel.
3. Finish: No. 4.

2.3 PORTABLE FIRE EXTINGUISHERS

A. Multipurpose Dry-Chemical Type: UL-rated 3-A:40:B:C, 5-lb nominal capacity, in enameled-steel container.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Stud Walls: Examine walls and partitions for suitable framing depth and blocking.

B. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare recesses for recessed and semi recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 CABINET INSTALLATION

A. General: Comply with manufacturer's written instructions for installing fire-protection specialties.

B. Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
   1. Fire Protection Cabinets: 54 inches above finished floor to top of cabinet.

C. Fasten cabinets to structure, square and plumb.

3.4 PORTABLE FIRE EXTINGUISHER INSTALLATION

A. General: Provide fire extinguisher for each cabinet and mounting bracket.

B. Install mounting brackets in locations and at mounting heights indicated or, if not indicated, at heights indicated below:
   1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.

C. Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

3.5 ADJUSTING, CLEANING, AND PROTECTION

A. Remove temporary protective coverings and strippable films after installation.

B. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.

C. Replace fire protection cabinets that cannot be restored to factory-finished appearance.

END OF SECTION 104400

SECTION 220100 - OPERATION AND MAINTENANCE OF PLUMBING

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 work of this section.

1.2 SCOPE

A. Items covered under this Section:
   1. Scope
   2. Coordination
   3. Regulatory Requirements
   4. Abbreviations and Symbols
   5. Reference Standards
   6. Submittals
   7. Operating and Maintenance Instructions
   8. Testing
   9. Cleaning
   10. Record Documents
   11. Warranty

1.3 COORDINATION

A. The Drawings show the general arrangement of piping and equipment and shall be followed as closely as actual building construction and the work of other trades permits. Architectural and Structural Drawings shall take precedence. Because of the scale of the Drawings, it is not possible to indicate all offsets, fittings, and accessories which may be required. Investigate conditions affecting the Work and arrange accordingly, providing offsets, fittings and accessories as may be required to meet conditions.

1.4 REGULATORY REQUIREMENTS

A. CODES AND STANDARDS
   1. Plumbing work shall conform to the requirements of Iowa Plumbing Code.
   2. Materials and workmanship shall comply with applicable Codes, local ordinances, industry standards and utility regulations. In case of differences between Codes, and the Contract Documents, the most stringent shall govern.

B. Non-Compliance
   1. Work performed that does not comply with the project requirements, without having notified the A/E, shall be corrected with no cost to the project.

C. Permits, Inspections and Fees
   1. Request and obtain permits and inspection appointments.
   2. Provide fees and charges for approvals, reviews, and other inspections.
   3. Provide fees and charges assessed by local utilities for water, sewer, gas or other services.

1.5 ABBREVIATIONS AND SYMBOLS

A. Key to abbreviations and symbols shall be on the Drawings.

B. The following are additional abbreviations used in the Specifications:
   1. A/E Architect/Engineer
   2. GC General Contractor
   3. PC Plumbing Contractor
   4. HC Heating Ventilating and Air Conditioning Contractor
   5. EC Electrical Contractor

1.6 REFERENCE STANDARDS

A. Standards cited in the Specifications shall be the most recent editions of the following:
   1. ANSI American National Standards Institute
   2. ASPE American Society of Plumbing Engineers
   3. ASSE American Society of Sanitary Engineers
   4. ASME American Society of Mechanical Engineers
   5. ASTM American Society of Testing and Materials
   6. AWWA American Water Works Association
   7. CISPI Cast Iron Soil Pipe Institute
   8. MSS Manufacturers Standardization Society
   9. NBS National Bureau of Standards
   10. NEC National Electric Code (NFPA 70)
   11. NEMA National Electric Manufacturers Association
   12. NSF National Sanitation Foundation
   13. PDI Plumbing and Drainage Institute
   14. UL Underwriter's Laboratories, Inc.
   15. WCF Water Conditioning Foundation

1.7 SUBMITTALS

A. Submit shop drawings with space for approval stamps of GC and A/E.

B. Furnish a separate, typed list showing fixture designation, manufacturer, model number and additional items supplied with fixture, as in sample entry below.
   1. Lavatory L-1
   2. Lavatory Kohler K-1234
   3. Faucet Chicago Faucet Co. No. 123
   4. Stop/Supplies Chicago Faucet No. 1234
   5. Waste/Trap 1½" size, McGuire #123

1.8 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Upon completion of the work, but before acceptance of the system, instruct the Owner's designated employees on care and operation.

B. Prepare and deliver to the A/E two (2) hard cover ring type binders entitled "Operating and Maintenance Manual" for equipment on the project. Each book shall include:
   1. Index
   2. Separate sections with tabs keyed to Index
   3. Warranties
   4. Manufacturer's instructions for installation, maintenance and operation
   5. Spare parts list
   6. Final approved shop drawings
   7. Diagram and typewritten narrative of operation for equipment and systems
   8. One-line wiring diagrams with schematics on a single sheet
   9. Valve schedules

1.9 TESTING

A. Provide materials, labor, and equipment required for testing.

B. Notify Inspector(s) one day prior to the time when the test is ready to be performed.

C. After testing, submit in writing the time, date, name and title of the person approving the test. This shall also include the description and what portion of the system has been tested. The person approving the test shall sign the submittal.

D. Records shall be maintained of testing that has been completed, and shall be made available at the job site.

E. Upon completion of the work, records and certifications approving testing requirements shall be submitted.

F. Defective work or material shall be replaced or repaired, and the test repeated. Repairs shall be made with new materials.

1.10 CLEANING

A. Keep the premises broom clean and free of surplus materials, rubbish and debris.

B. After fixtures and equipment have been installed, remove stickers, rust stains, labels, and temporary covers.

C. Foreign matter shall be blown out, or flushed out, of pipes, tanks, pumps, strainers, motors, devices, switches, fixtures, and panels.

D. Water heaters shall be cleaned, drained, flushed and recleaned until free of oil and debris.

E. Identification plates on equipment shall be free of paint and dirt.

F. Leave the work in a condition ready for operation.

1.11 RECORD DOCUMENTS

A. See Division 1.

1.12 WARRANTY

A. Warrant that work shall function for one year immediately following acceptance of the system(s).

B. Keep the system in good working order at no expense, unless defects are clearly the result of improper or abnormal usage.

C. Submit for acceptance of the work, written certification that the entire system has been installed and adjusted for operation in accordance with the Contract Documents.

END OF SECTION 220100

SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

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 work of this section.

1.2 SUBMITTALS

A. Submit product data sheets in accordance with Division 1 and Section 22 01 00.

PART 2 - PRODUCTS

2.1 PIPE SUPPORTS, HANGERS AND INSERTS

A. ACCEPTABLE MANUFACTURERS
1. B-Line, Fee and Mason, Grinnell, Michigan Hanger, PHD Manufacturing, Powers/Rawl, Proset, Unistrut, or Victaulic.

B. GENERAL
1. Secure pipe in place to prevent vibration, maintain proper slope and provide for expansion and contraction.
2. Design supports of strength and rigidity to suit loading, service, and manner which do not unduly stress the building construction. Where support is from concrete construction, take care not to weaken concrete or penetrate waterproofing. Fasten supports and hangers to building steel framing wherever practical. Do not use another pipe for support. Do not use perforated iron, chain or wire as hangers.
3. Use inserts for suspending hangers from reinforced concrete slabs wherever practical. Where inserts are not practical, provide channels or angles from which to suspend hangers/supports. Fasten structural steel to concrete with expansion bolts.
4. Provide expansion anchors in concrete slabs for installation of threaded support rods.
5. Provide hangers capable of vertical adjustment after piping is erected. Do not pierce ductwork with hanger rods. On threaded support rods and bolts, weld nuts to rods, peen threads, or provide double set of nuts with lock washers to prevent loosening. Use beam clamps for attaching hangers to structural steel.
6. On piping insulated with vapor barrier covering, use protection shield to cover bottom one-half of insulated pipe. Shield to be a minimum of 12" long and of 16 gauge galvanized steel.
7. Submit anchor drawings for approval upon request.
8. Hangers, supports, and support methods other than those specified shall not be used without obtaining approval on method of support by the Structural Engineer prior to installing piping systems. Submit support method arrangement, pipe weight and spacing scheme for approval.

C. SUPPORT SPACING

1. Support horizontal piping per following table:

Pipe Size	Rod Diameter	Max Span (Feet) Copper	Steel
Up to 1¼"	3/8"	6	8
1½" and 2"	3/8"	10	10
2½" and 3"	1/2"	10	12
4" and 5"	5/8"	10	12
6"	3/4"	10	12

2. Support horizontal lines of hub and spigot cast iron pipe with hanger, spaced not more than 5 feet on center; locate support close to hub. Rod diameter shall be as for steel pipe.
3. Support cast iron No-Hub pipe as recommended in CISPI Publication "Suggestions for Cast Iron No-Hub Pipe and Fittings". Rod diameter shall be as for steel pipe.
4. Support horizontal lines of PVC pipe with hangers, spaced not more than 3 feet on center at branch ends and changes of direction. Rod diameter shall be as for steel pipe.
5. Provide vertical support at each floor level as the pipe passes through the floor. For piping that does not pass through the floor, provide adequate support to stabilize the vertical portion of the piping.
6. Provide galvanized steel supports for cast iron and steel piping.
7. Provide PVC dipped hangers or provide Unistrut "Uni-Cushion" vinyl strip at galvanized hangers for copper lines.

D. OVERHEAD SUPPORTS

1. Adjustable clevis hanger, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure B3100.
2. Adjustable J hook hanger, steel, Dura-Green epoxy coating or electro-plated, B-Line figure B3690.
3. Adjustable band hanger, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure B3172.

E. VERTICAL SUPPORT

1. Riser clamp, steel, Dura-Green epoxy coating or electro-plated, B-Line Figure B3373.
2. Riser clamp, flexible sleeve with stainless steel band, Proset PS #33.

F. STRUT

1. Where several pipes are running parallel and pitching in the same direction, strut style support may be used. Steel channel, 12-gauge thickness, Dura-Green epoxy coating or electro-plated, B-Line B11. Restrain insulated pipes with B-Line B2000 series strut clamps. Restrain un-insulated pipes with Vibraclamp BVT/BVP series strut clamps.

G. HANGER ROD

1. Steel, electro-plated, threads on both ends, B-Line B3205.

H. INSERT

1. Concrete expansion insert, drop-in style, steel material, minimum tension load of 3200 pounds, Powers/Rawl.

2.2 ELECTRICAL REQUIREMENTS

A. GENERAL
1. Work shall conform to requirements of Division 16.
2. Power wiring shall be provided by the EC. Control wiring shall be provided by the PC. Plumbing Contractor shall provide wiring diagrams for use by the Electrical Contractor.

B. MOTORS
1. Motors smaller than ½ HP shall be NEMA standard motors rated for 120 volts, AC, single phase, 60 Hz. Motors shall be capacitor start and capacitor run type and shall have internal overload protection.
2. Motors ½ HP and larger shall be NEMA standard motors rated for specified voltage, AC, three phase and 60 Hz.
3. Motors shall be Design B, squirrel cage, open drip-proof construction with standard T frame, ball bearings, Class B insulation, single winding, continuous duty rated and 1.15 service factor unless noted otherwise.
4. Minimum power factor for motors one HP and larger is 85% at rated capacity. Capacitors for power factor correction are not acceptable.
5. Provide devices for motor overload protection unless integral with equipment. Devices shall be sized according to actual measured current draw with motor operating under normal load conditions. Provide temporary protective devices where installation is not complete.

C. MOTOR STARTERS
1. Motor starters shall be provided by the PC.
2. Provide a combination starter for each motor.
3. Starter shall conform to Allen-Bradley Co. Bulletin 512, consisting of a Bulletin 509 full voltage starter and non-fusible disconnect switch mounted in a NEMA Type 1 general purpose enclosure.
4. Starter shall be equipped as standard with block type overload relays and external reset buttons.
5. Starter shall be equipped as standard with a transformer to provide a 120V, 60 Hz., secondary control circuit.
6. Provide a three position Hand-Off-Auto selector switch for field installation in the enclosure flange: A-B Catalog No. 1481-N51A or 1481-N51B.

2.3 EQUIPMENT ACCESSORIES

A. Provide equipment accessories, connections and incidental items.

B. Install piping connecting to pumps and other equipment without strain at the piping connection. If requested by the A/E, remove the bolts in these flanged connections, or disconnect piping, to demonstrate that piping has been properly connected.

2.4 EQUIPMENT SUPPORT

A. Examine Drawings, and manufacturer's data to determine how equipment, fixtures, and piping are to be supported, mounted or suspended. Support all equipment plumb, rigid, and true to line. Provide rods, bolts, inserts, pipe stands, brackets and accessories for proper support.

2.5 THERMOMETERS AND GAUGES

A. ACCEPTABLE MANUFACTURERS
   1. American, Taylor, Trerice, U.S. Gauge, or Weiss.

B. THERMOMETERS
   1. Industrial type with separable sockets, adjustable angles, black cast aluminum 9" case, frame, glass front, with red appearing mercury tube. Readable by person standing on floor. Provide extension necks for equipment with 2" or thicker insulation. Ranges shall be as follows:
      a. Domestic Water: 30 to 200 degrees Fahrenheit.

C. PRESSURE GAUGES
   1. Industrial quality with phosphor bronze bourdon tube, brass socket, 3½ inch dial face, bronze bushed movement, aluminum case with black finish, white background, black figures readable by person standing on floor. Ranges shall be as follows:
      a. Domestic Water: 0 to 150 psig
   2. Pressure Snubbers: Brass or stainless steel construction, 300 psig working pressure.

PART 3 - EXECUTION

3.1 GENERAL

A. COORDINATION OF WORK
   1. Review the Drawings and Specifications and report discrepancies. Obtain written instructions for changes necessary. Coordinate with each trade prior to beginning installation and make provisions to avoid interferences. Changes required caused by neglect to coordinate shall be made without expense to the project.
   2. Piping shall not be located above electrical panels.

B. ANCHOR BOLTS, SLEEVES, AND SUPPORTS
   1. Anchor bolts, sleeves, and supports shall be provided for installation of piping and equipment. They shall be installed by the trade furnishing and installing the material. Location of anchor bolts, sleeves, and supports shall be directed by the trade requiring them.

C. OPENINGS, CUTTING AND PATCHING
   1. Provisions for openings including chases, holes and clearances through walls, floors, and roof, ceilings and partitions shall be made in advance of construction of each part of the building. Openings shall be provided by the GC for the respective materials in which openings occur, during the construction of the building with the exception of pipe sleeves. The PC shall furnish to the GC opening dimensions and locations.
   2. If the PC neglects to inform the GC of his opening requirements before that portion of the building construction is complete, the PC shall cut the openings and provide framing and lintels. In the event holes must be cut through reinforced concrete, avoid spalling and unnecessary damage or weakening of structural members. No chopping or breaking out is permitted. Before cutting or drilling, obtain permission from the A/E. Patch adjacent materials and repair damage resulting from the cutting.

3. The PC may perform core drilling for openings in existing walls and floors at the direction of the A/E. Framed openings shall be by the GC.
4. Patch interior trench excavation to match existing slab-on-grade with concrete: 3500 PSI at 28 days, 3" slump, 3/4" maximum aggregate size, 5.5 bags of cement per cubic yard.

D. ADJUSTMENTS IN LOCATIONS
1. Locations of pipes, fixtures, and equipment shall be adjusted to accommodate the work interferences anticipated and encountered. Prior to fabrication, determine the exact route and location of each pipe.

E. RIGHT OF WAY
1. New lines which pitch shall have the right-of-way over those which do not pitch. Gravity drains shall normally have right-of-way. Lines whose elevations cannot be changed shall have the right-of-way over lines whose elevations can be changed.
2. Offsets, transitions and changes in direction of electrical raceways, pipes and ducts shall be made to maintain proper room and pitch of sloping lines whether or not indicated on the Drawings. Provide traps, air vents, and sanitary vents, per code, to affect the offsets, transitions and changes in direction.

3.2 ASBESTOS ABATEMENT

A. Asbestos abatement shall be by the Owner. If asbestos is encountered, the Owner shall be notified. Asbestos materials shall be removed prior to continuing work.

3.3 DEMOLITION

A. Perform demolition to accomplish new work. Where demolition work is performed adjacent to existing work that remains in an occupied area, provide measures to prevent contamination of the occupied spaces. Cutting of existing surfaces to install new work shall be done without disruption to existing surfaces. Repair existing surfaces to original condition. Where piping is removed and not reconnected, cap ends of existing services as if they were new work. Coordinate work to prevent disruption to the existing building occupants.

B. Pipe, wiring and associated conduit, insulation, ductwork and similar items demolished, abandoned or deactivated shall be removed from the site by the Contractor unless they are dismantled and removed or stored by the Owner. Turn over designated equipment to the Owner for his use at a place and time he so designates. Maintain the condition of materials that are indicated to be reused to its condition before work began.

C. Piping demolished to shut-off valves shall be capped and valves shall be turned off. Piping which is demolished and temporarily taken out of service shall be capped until time of reconnection.

3.4 PIPING INSTALLATION

A. GENERAL
1. Expansion and contraction of piping shall be provided for by expansion loops, bends, swing joints, or expansion joints to prevent damage to connections, piping, and equipment of the building.
2. Unions or flanges shall be installed on by-passes, ahead of traps, adjacent to screw connection valves, and at connections to equipment.

B. INSTALLATION ARRANGEMENT
1. Install work to permit removal (without damage to other parts) of parts requiring replacement or maintenance. Arrange pipes and equipment to permit ready access to valves, cocks, traps, starters, motors, control components and to clear the openings of swinging and overhead doors and of access panels.

C. CONNECTIONS DIFFERENT FROM THOSE SHOWN
1. Where equipment requiring different arrangement or connections from those shown is used, install the equipment to operate properly and in harmony with the intent of the Drawings and Specifications. When requested by the A/E, submit drawings showing the proposed installation.
2. Upon approval of the revisions, make changes in piping, ductwork, supports, insulation, wiring, and panelboards. Provide additional motors, controllers, valves, fittings and other additional equipment required for the proper operation of the system resulting from the selection of equipment, including required changes in affected trades
3. Changes shall be made at no increase in the Contract amount or additional cost to the other trades.

3.5 LUBRICATION AND MAINTENANCE

A. Equipment shall be properly cared for, lubricated and adjusted before it is placed in operation. Equipment shall be maintained properly and lubricated until building is accepted.

3.6 FLOOR, WALL AND CEILING OPENINGS

A. Pipe sleeves shall be set for pipes passing through new masonry or concrete walls or floors and interior partition walls.

B. Coordinate the location of sleeves, openings, chases and furred spaces with the other Contractors. Provide during the progress of construction sleeves, hangers and inserts that are to be built into the structure.

C. Sleeves for piping at exterior penetrations above and below grade shall be Schedule 40 black steel pipe and shall extend through the construction. Provide flanges for supporting sleeves through existing construction as applicable.

D. Sleeves for horizontal piping at interior partition penetrations shall be 24-gauge sheet metal, closed with snap lock joint or welded longitudinal seam.

E. Sleeves for pipe 4" and smaller shall be at least two pipe sizes larger than the pipe passing through. Sleeves for pipe larger than 4" shall be at least one pipe size larger than pipe passing through. Sleeves for insulated piping shall be 1" larger in diameter than the insulated pipe.

F. Sleeves in floor shall extend 3/8" above the floor, except in mechanical rooms and other areas where water may accumulate, sleeves shall extend 1" above the finished floor.

G. Piping penetrating smoke or fire separations shall not violate the integrity of the separation.

H. When plastic waste and vent piping is used and penetrates a rated fire separation, provide steel sleeves and UL listed intumescent fire rated sealant.

I. Grout between sleeves and openings through concrete or masonry walls or floors, with Dow 8640 or 8641 sealant.

J. The annular space between drilled or sleeved holes and pipes passing through exterior walls or below grade foundation walls shall be sealed with a "Link-Seal" as manufactured by the Thunderline Corporation. "Link-Seal" shall consist of ASTM D2000 EPDM rubber compound interlocking links, Delvin pressure plates and corrosion resistant fasteners. Provide schedule 40-pipe sleeve with anchor collar at wall penetration.

K. Where penetrations occur through fire rated walls or floors, "Link-Seal Pyro-Pac" shall be used, which is rated for 3-hour fire resistance by ASTM E-119-76. "Pyro-Pac" shall consist of two individual sealing units consisting of fire-resistant silicon links, steel pressure plates, and corrosion resistant fasteners.

3.7 ESCUTCHEON PLATES

A. Provide plates on pipes passing through finished floors, walls and ceilings, with outside diameter to cover sleeve opening and inside diameter to fit snugly around pipe. Set tight to building surface. Escutcheon plates shall be chromium plated metal.

3.8 EQUIPMENT, PIPING AND VALVE IDENTIFICATION

A. EQUIPMENT LABELS
   1. After painting and covering, identify equipment, including pumps, water heaters, tanks, compressors, and control panels. Locate identification as conspicuously as possible.
   2. Identification of equipment shall be by engraved white letters on a black plastic panel, permanently attached to the equipment.
      a. Minimum size: 3/4" x 2 1/2" with 3/8" letters.

B. PIPE IDENTIFICATION
   1. Pipe identification shall conform to ANSI A13.1 "Scheme for Identification of Piping Systems".
   2. Printed labels identifying the fluid conveyed and direction of flow shall be attached to pipes in accessible locations, at intervals not to exceed 20 feet, not less than once in each room, at each branch, adjacent to each access door or panel, at each valve and where exposed piping passes through walls and floors.

Outside Diameter of Pipe Covering	Minimum Size of Letters
up to 1¼"	½"
1½" to 2"	¾"
2½" to 6"	1½"

3. Non-potable water piping, valves and outlets shall be labeled in accordance with Local and State Plumbing Codes.

C. VALVE TAGS

1. Identify each valve by means of 1½" diameter brass tag fastened to body of valve with copper or brass chain. Identification number shall be stamped thereon with letters a minimum of ½" high. The following prefixes shall be used: PLBG - Plumbing.

D. VALVE CHARTS

1. Furnish three charts listing each valve. Two charts shall be delivered to A/E. An additional chart shall be framed behind glass and hung in location selected by Owner. Charts shall show the following:

Valve number	Size
Manufacturer	Type of valve
Type of service	Location

2. Furnish a typewritten chart indicating equipment or areas served by each numbered valve and incorporate in Operating and Maintenance Manuals.

3.9 ACCESS PANELS

A. Provide access panels at locations requiring access to mechanical equipment, valves, devices, and accessories. These locations include, but are not limited to areas above drywall ceilings, shaft enclosures and other furred-in spaces concealing valves, ducts or other equipment. Provide UL listed fire rated access panels when penetrating fire rated chases or shaft areas.

B. Access panels shall be of size required to provide adequate access to equipment. Minimum size shall be 12"X12" for hand access and 24"X24" for body access.

C. Panels shall be Milcor brand, or equivalent.

D. Panels shall include concealed hinges, cam type locking devices, and have a frame/border type necessary for the particular wall or ceiling construction in which they are installed. Access panels shall be flush mounted, recessed frame type units. For general applications, access panels shall be field paintable prime coated steel. For toilet rooms, shower rooms and similar wet areas, access panels shall be stainless steel.

E. Refer to architectural room finish schedule for wall and ceiling surfaces and finishes.

F. Panel construction shall utilize a 16 gauge frame with not less than a 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.

3.10 CONCRETE PADS, CURBS, SUPPORTS AND BALLAST

A. Provide concrete equipment pads for floor-mounted equipment. Minimum 3½" thick, sized for purpose intended. Equipment pads shall extend six inches beyond edge of equipment footprint.

B. Provide 3½" high concrete curbs around pipe and equipment sleeves in suspended slabs. Curbs shall prevent water leaks around sleeves.

C. Concrete work shall conform with Division 3.

D. Provide structural steel stands or supports for equipment requiring support. Steel work shall conform to Division 5.

3.11 FLASHING OF ROOF AND WALL PENETRATIONS

A. Flashings on the roof shall be closely coordinated. Install flashings to insure proper vapor barrier.

B. Flash open piping (example: plumbing vents) with sheet lead turned down 1" into pipe.

C. Combustion vents and plumbing vents through roof shall be flashed and counterflashed to conform with details recommended by roof system manufacturer. See roofing specifications for specified system. Provide additional sheet lead, membrane layers and sealant to insure waterproof installation

D. Roof attachments, equipment supports, piping systems and other roof penetrations shall be waterproofed.

E. Install premolded fabric boot flashings with vent cap for vents through roof as recommended by the manufacturer. Include roof mastic and elastomer.

3.12 SAFING OF FLOOR PENETRATIONS AND SHOWERS

A. Extend safing to 18 inches from edge of drain. Safing shall be clamped to drain body and pitched to drain to weep holes. Floor drains installed in unexcavated areas do not require safing.

B. Install safings for showers. The concrete floor shall be smooth and free of dirt. Seal joints per manufacturer's recommendations and turn up sides a minimum of 6 inches above curb or maximum water level. Safing shall connect and clamp to drain body.

C. Chlorinated polyethylene (CPE) as manufactured by the Noble Company under the tradename Chloraloy 240.

D. Safings shall be subject to a standing water test to detect leaks and proper drainage to weep holes of floor drain.

3.13 PAINTING

A. Refer to Division 9.

3.14 EXCAVATION AND TRENCHING

A. GENERAL
1. Become familiar with soil conditions affecting excavation and trenching. Obtain a copy of the soils report and take note of underground conditions, including water level.
2. Provide excavation required to the depths indicated. During excavation, backfill material shall be piled in an orderly manner at a distance from the trench to avoid overloading and to prevent slides or cave-ins. Provide proper disposal of debris and excavated materials not required or not acceptable for backfill.
3. Grading shall be done as needed to prevent surface water from flowing into trenches or excavations.
4. Sheeting or shoring shall be provided for the protection of the work and for the safety of personnel.
5. Excavation shall be by open cut except that short sections of a trench may be tunneled with prior approval of the A/E. Each excavation shall include clay, silt, sand, rock mulch, gravel, hardpan, loose shale, loose stone, and other materials.
6. Open trench ahead of pipe laying to reveal obstructions.
7. Provide trench crossing to accommodate public travel.

B. TRENCH EXCAVATION
1. Trenches shall be of necessary width or the proper laying of the pipe but not more than 16" wider than pipe diameter, and the banks shall be as nearly vertical as practicable. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of the pipe on undisturbed soil along its entire length. Except where rock is encountered, care shall be taken not to excavate below the depths indicated.
2. Where rock excavations are required, the rock shall be excavated to a minimum overdepth of four inches below the trench depths indicated on the Drawings or specified. Overdepths in the rock excavations and unauthorized overdepths shall be backfilled with loose granular material properly compacted.
3. Whenever wet or otherwise unstable soil that is incapable of properly supporting the pipe is encountered in the bottom of the trench, that soil shall be removed to the depth required and the trench backfilled to the proper grade with coarse sand, fine gravel or other material.
4. Keep trenches free from water while construction is in progress. Pipe or appurtenances shall not be laid in water. Pump the discharge from trench dewatering to drains or natural drainage channels.

C. GRADING TRENCH BOTTOM
1. Perform grading of trench bottoms by hand tools. Grade the bottom of trenches evenly to insure bearing for pipes. Cut holes for joints and joint-making.

D. PIPE BEDDING
1. Crushed stone chips or bedding sand, compacted according to Class "B" bedding standards.

3.15 BACKFILLING OF TRENCHES

A. Backfill trenches only after piping has been inspected, tested, and locations of pipe lines and appurtenances have been recorded.

B. For a depth of 12 inches above the top of the pipe, backfill by hand with material specified for Compacted Backfill. Tamp this backfill thoroughly in layers not exceeding 6" in thickness, taking care not to disturb the pipe.

C. For the remaining trench backfill and compact with material as specified in the following paragraphs. Jetting the backfill with water is not permitted.

D. NORMAL BEDDING
   1. Where compacted backfill is not specified, the trenches shall be backfilled with the excavated materials approved for backfilling consisting of earth, loam, sandy clay, sand and gravel, soft shale or other approved materials, free from large clods of earth or stones over 2½" maximum dimension, deposited in 12" layers and compacted.
   2. The surface shall be graded to a reasonable uniformity and the mounding over trenches left in a uniform and neat condition.

E. COMPACTED BACKFILL
   1. Compacted backfill shall be used under the slab on grade, slabs within building structure, concrete paving and asphaltic concrete paving. The soils used in the fill shall be granular in nature and shall not contain roots, sod, rubbish or stones over 2½" maximum dimension. The A/E may reject on-site or borrowed materials which he considers not intended for use as fill.

F. COMPACTION DENSITY FOR BACKFILL
   1. Fills shall be compacted to a dry density equal to at least 95 percent of the maximum density determined in accordance with the Proctor Test, ASTM D 698-66T or modified D1557-66T. The maximum density and optimum moisture content shall be determined by the A/E on the basis of laboratory test conducted on the materials used in the fill.

G. CONTROL TEST
   1. Adequacy of compaction shall be determined on the basis of in place density determinations that are to be conducted while the fills are being placed. The results of these tests shall be the basis on which satisfactory completion of the work is judged. If the fills fail to meet the specified densities, the Contractor shall remove and recompact the soils until the specified densities are achieved. Contractor shall provide proof of test upon request.

H. EQUIPMENT
   1. The choice of compaction shall be made by the Contractor, however, the equipment shall be adequate for achieving the specified densities. To achieve adequate compaction at locations inaccessible to roller type equipment, use of hand operated, power driven compaction equipment may be necessary.

END OF SECTION 220500

SECTION 220525 - PLUMBING SPECIALTIES

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 work of this section.

1.2 DESCRIPTION

A. Furnish and install fittings and specialties.

1.3 SUBMITTALS

A. Submit product data sheets in accordance with Division 1 and Section 22 01 00.

PART 2 - PRODUCTS

2.1 GENERAL

A. Refer to Plumbing Equipment Schedule for specific model numbers and sizing information regarding the plumbing fittings and specialties specified herein.

2.2 BACKFLOW PREVENTION DEVICES

A. ACCEPTABLE MANUFACTURERS
   1. Cash-Acme, Chicago, Cla-Val, Conbraco, Febco, Nidel, Watts or Wilkins.

B. VACUUM BREAKERS
   1. Hose thread inlet and outlet, non-removable hose connection, vacuum breaker for use on service sink faucets, Chicago Faucet No. E27, ¾ inch.

C. REDUCED PRESSURE ZONE TYPE (RPBP)
   1. Sizes ¾ Inch thru 3 Inch:
      a. Bronze body, replaceable seats, ball valve shutoff valves, strainer, union connections, ball valve test ports, ASSE 1013, Watts series 909 or 919.
      b. Backflow preventors 3" and smaller shall have ball valve shut-off.

2.3 HOSE BIBBS/WALL HYDRANTS

A. Hose bibs and wall hydrants shall be manufactured by Chicago Faucet, MIFAB, Woodford, or Zurn.

PART 3 - EXECUTION

3.1 INSTALLATION

A. VACUUM BREAKER/BACKFLOW PREVENTORS
   1. Install per Plumbing Code.

B. REDUCED PRESSURE ZONE BACKFLOW PREVENTORS
   1. Install in conformance with requirements of Iowa Plumbing Code, manufacturer's recommendations and as shown. After installation and initial testing, submit the paperwork to the proper authority.

C. HOSE BIBBS/WALL HYDRANTS
   1. Install 24 inches above finished grade or floor.

ECTION 220525

SECTION 220700 - PLUMBING INSULATION

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 work of this section.

1.2 DESCRIPTION

A. Furnish labor, equipment, accessories, materials and services required to install insulation, fittings and finishes for piping and related equipment.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Armstrong, Halstead, Johns-Manville, Knauf, or Owens-Corning.

2.2 INSULATION TYPES

A. GLASS FIBER
1. Manville Micro-Lok meeting ASTM C547; rigid molded, non-combustible, "K" Value: 0.23 at 75°F, maximum service temperature: 850°F, with vapor Retarder Jacket: AP-T Plus White Kraft paper reinforced with glass fiber yarn and bonded to aluminum foil, secure with self-sealing longitudinal laps and butt strips or AP Jacket with outward clinch expanding staples or vapor barrier mastic as needed.

2.3 PIPING INSULATION

A. MINIMUM INSULATION THICKNESS

	PIPE SIZE			
SYSTEMS	**1" OR LESS**	**1 ¼" TO 2"**	**2 ½" TO 4"**	**5" AND UP**
Domestic Cold Water	½"	½"	---	---
Domestic Hot Water	1"	1"	---	---
Domestic Hot Water Return	1"	---	---	---

*Above ground horizontal storm drain piping, underside of roof drain, and initial 5 feet of vertical conductors.

PART 3 - EXECUTION

3.1 GENERAL

A. Application of insulation to piping equipment shall be done in accordance with the manufacturer's installation recommendations. Where thickness of insulation is not specified, use thickness recommended by manufacturer or required by applicable Codes.

B. Insulation shall be applied in as warm an environment as possible, and in no instance below 25°F.

C. No pipe shall be covered until after it has been installed, inspected, tested and approved.

3.2 PIPING INSTALLATION

A. Pipe insulation shall be installed with joints butted firmly together. Valves and fittings shall be insulated with mitered sections of insulation equal in density and thickness to the adjoining insulation, or with insulating cement equal in thickness to the adjoining insulation, or with "Zeston" type, premolded PVC fittings installed in accordance with the manufacturer's instructions. Fittings are to be finished with 8 oz. glass mesh and mastic (use breather mastic on systems operating above 50°F except where Zeston PVC covers are used). Jackets on pipe insulation may be stapled using outward clinch staples spaced 3" apart at least ¼" in from the lap edge on systems operating at 60°F and above; below 50°F the laps are to be vapor sealed using self-sealing lap, lap-seal tape gun or adhesive (ex: Armstrong 520.) Insulation ends shall be tapered and sealed regardless of service.

B. Use protection shield to cover bottom one-half of insulated pipe. Shield to be minimum of 12" long and 16 gauge galvanized steel. Provide half-round, 12" long, hanger block at the bottom half of the pipe in place of the fiberglass pipe insulation. The hanger blocks shall be molded cork or calcium silicate pipe insulation of the same thickness as the adjoining fiberglass pipe insulation. The vapor barrier jacket shall be continuous through the hanger location on piping insulated with vapor barrier covering.

C. Vapor barrier jackets shall be applied with a continuous, unbroken vapor seal. Pipe hangers shall be sized large enough to be installed over the outer surfaces of the insulation.

D. Omit insulation for:
   1. Unions and flanges.
   2. Vents to atmosphere, discharges from relief valves and drain pipes.

E. Provide finished edges at access doors and end.

END OF SECTION 220700

SECTION 221100 - FACILITY WATER DISTRIBUTION

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 work of this section.

1.2 DESCRIPTION

A. Provide a domestic water distribution system including hot and cold water supply piping, hot water return piping, valves, fittings, hardware, and specialties. Connect to plumbing fixtures, specialties, and equipment.

B. Work under this section shall commence with connection below slab to the existing water service.

1.3 SUBMITTALS

A. Submit piping, valves, unions, dielectric fittings, water hammer suppressors, product data sheets in accordance with Division 1 and Section 22 01 00.

PART 2 - PRODUCTS

2.1 WATER DISTRIBUTION PIPE AND FITTINGS

A. UNDER GROUND
   1. 2" and Smaller:
      a. Copper tube, type K, soft temper, ASTM B88, with wrought copper fittings. ANSI B16.22. Join using lead free flux and solder, ASTM B32, flux ASTM B813.

B. ABOVE GROUND
   1. Copper tube, Type L, hard temper, ASTM B88; with wrought copper fittings, ANSI B16.22. Join using lead free flux, ASTM B813, and solder, ASTM B32.
   2. Wrought copper, ANSI B16.22 or cast bronze, ANSI B16.18 fittings, copper tube dimensioned grooved ends, joined with mechanical couplings, synthetic rubber gasket seal, Victaulic style 606.

2.2 VALVES

A. MANUFACTURER
1. Valves throughout the project shall be by one manufacturer, unless otherwise specified.
2. Standard valves are based on Nibco models. Equivalent style valves as manufactured by Apollo, Crane, DeZurik, Grinnell, Hammond, Jenkins, Milwaukee Valve, Victaulic, or Watts are acceptable. Valves shall be of standard dimensions, comparable to the number specified.
3. Balancing valves are based on Bell & Gossett models. Equivalent style valves by Armstrong, Flowset, Nibco, Victaulic/TA Hydronics, or Taco are acceptable.

B. SHUTOFF VALVES
1. Except as otherwise specified, shutoff valves 2-1/2" and smaller shall be ball valves, unless required otherwise by local Water Utility specifications.
2. Ball Valves:
   a. Bronze, two piece full port ball valves with bronze body, solder or threaded ends, stainless steel ball, reinforced Teflon seats and seals, blowout proof stem design, rated at 600 PSI non-shock WOG, Nibco model T/S-585-70-66. Include handle extension for insulated piping, NIB-SEAL by Nibco.

C. CHECK VALVES (In-line Type)
1. 2” and smaller:
   a. Bronze body, ASTM B62, in-line lift type, spring, Buna-N disc, 250 psig WOG rating. Nibco 480

D. GAUGE VALVES
1. ¼” Size:
   a. Bronze body, rising stem gauge/globe valve with renewable seat and disc and malleable iron hand-wheel, Nibco T-235. Valve shall be rated for 300 PSI non-shock WOG.

2.3 UNIONS AND FLANGES

A. UNIONS
1. Bronze, solder connection, Nibco figure 733.
2. Where grooved joint piping systems are utilized, grooved joint couplings shall serve as unions.

B. FLANGES
1. Cast copper alloy, class 125, MSS SP-106, Nibco figure 741.
2. Ductile iron housings, coated with copper colored alkyd enamel, class 125, Victaulic Style 641.

2.4 DIELECTRIC COUPLINGS

1. Steel casing, zinc electroplated, with inert thermoplastic lining, various end types, Clearflow, style 47 by Victaulic.
   a. Dielectric flanges 2” and larger; with iron female pipe thread to copper solder joint or brass female pipe thread end connections, non-asbestos gaskets and pressure

rating of not less that 175 psig at 180 degrees Fahrenheit. Watts Regulator Company, Lochinvar, Wilkins, Epco Sales, Inc.

2.5 WATER HAMMER SUPPRESSORS

A. Acceptable manufacturers are MIFAB, PPP, Sioux Chief, and Watts.

B. Piston compressed air column type, with sealed air chamber.

C. Water supply piping serving fixtures, appliances, equipment and devices with quick closing or solenoid- actuated valves shall be provided with water hammer arrestors. Also provide water hammer arrestors where indicated on the water supply piping as shown on the water supply isometrics. Devices shall be mechanical arrestors installed in accordance with PDI Standard WH201. Air chambers shall not be used.

D. Shop drawings are required. Submit to A/E for approval prior to installation.

E. Water hammer arrestors must be accessible for inspection and replacement. Provide access panel.

PART 3 - EXECUTION

3.1 TRENCHING, BACKFILLING AND COMPACTING

A. See Section 22 05 00.

3.2 WATER PIPING SYSTEM

A. Piping shall be pitched to drain entire system; install drain valves at low points. Provide unions or grooved joint couplings at equipment and valves. Provide offsets and transition fittings. Avoid dips or depressions in pipe runs.

B. No water piping shall be installed in exterior walls, unless adequately protected from freezing. Two inch insulation shall be installed on back and sides of chase, front shall be open to room heat, covered only by finished wall material.

C. Install unions, grooved joint couplings, or flanges at equipment connections and to facilitate removal of equipment.

D. Install dielectric couplings at connections between copper pipe and other metals. Use dielectric unions for connecting copper and steel piping.

E. Provide backflow devices as dictated by Code on water connections to HVAC equipment and other equipment.

F. Extend hot water piping from water heater and connect to fixtures and equipment.

G. Hot water and cold water lines shall be kept at least 6 inches apart whenever possible.

H. SOLDERED JOINTS

1. Remove all slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with metal brush, emery cloth or sandpaper. Remove residue from the cleaning operation, apply flux and assemble joint to socket stop. Apply flame to fitting until solder melts when placed at joint. Remove flame and feed solder into joint until full penetration of cup and ring of solder appears. Wipe excess solder and flux from joint.

I. THREADED JOINTS

1. Use a thread lubricant or Teflon tape when making joints. Hard setting pipe thread cement or caulking will not be allowed.

J. GROOVED JOINTS

1. All grooved couplings, fittings and valves shall be of the same manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Gaskets shall be molded and produced by the grooved coupling manufacturer. Grooved ends shall be clean and free from indentations, projections and roll marks in the area from pipe end to groove. Grooved coupling manufacturer's factory trained field representative shall provide on-site training for contractor's field personnel in the proper use if grooving tools, application of groove, and installation of grooved piping products. Factory trained representative shall periodically inspect the product installation. Contractor shall remove and replace any improperly installed products.

K. VALVE INSTALLATION

1. Install shutoff valves with stem vertical. Exception; the stem may be horizontal if a vertical installation does not allow access to the valve handle.
2. Valves with screwed ends shall be installed using "Teflon" tape applied on male portion of piping fitting.
3. Each individual fixture or piece of equipment shall have an independent shut-off valve adjacent to fixture in addition to the required branch shut-off. Where valves are installed in walls, an access panel shall be provided.

L. BRANCHES

1. Valve shut-off full size of branch for each branch take-off to supply stack or fixture group.

M. DRAINS

1. Provide valved drains at low points of systems. Piping shall be arranged to drain through valved drains.

N. FLUSHING MAINS AND BRANCH PIPING

1. Upon completion of the water distribution system, test valves to insure their full opening and flush out the system progressively by opening drain valves and building outlets and permitting the flow to continue from each until the water runs clear.

O. PIPE INSULATION

1. Provide pipe insulation for all domestic water piping per Section 22 07 00.

P. STERILIZATION OF WATER DISTRIBUTION SYSTEM

1. Immediately after the water distribution system has been flushed out until water at all taps is clear, it shall be sterilized in accordance with the requirements of the local Health Department/Water Utility. In the absence of local requirements, the following methods shall be used:
   a. Introduce chlorine or a solution of calcium or sodium hypochlorite, filling the lines slowly and applying the sterilizing agent at a rate of 50 parts per million of chlorine, as determined by residual chlorine tests at the ends of the lines. Open and close valves and hydrants while the system is being chlorinated.
   b. After the sterilizing agent has been applied for 24 hours, test for residual chlorine at the ends of the lines. If less than 5 PPM, repeat the sterilization process.
   c. When tests show at least 5 PPM of residual chlorine, flush out the system until traces of the chemical used are removed.

Q. SAMPLES

1. After disinfecting the water distribution system, take water samples to check for bacteria. Take 5 water samples from remote faucets, plus the main entrance. Send the samples to the Department of Health Lab to sample for a safe water supply system.

3.3 TESTING

A. Refer to Division 1, "Starting of Systems" and Section 22 01 00 – Operation and Maintenance of Plumbing.

B. Hydro-statically pressure test water piping to 150 psig for 4 hours. No decrease in pressure is allowed. Provide pressure gauge with shutoff and a bleeder valve at the highest point of the system tested. Inspect joints in system under test. No leaks allowed.

C. Do not conceal pipe until satisfactorily tested.

D. Testing with air will not be allowed.

END OF SECTION 221100

SECTION 221300 - DRAIN AND VENT

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 work of this section.

1.2 DESCRIPTION

A. Interior sanitary drain and vent piping systems including branches, drains, cleanouts, fittings and hardware. Work under this section shall commence with connection to the existing sanitary building drain.

PART 2 - PRODUCTS

2.1 UNDERGROUND PIPE AND FITTINGS

A. PVC, Schedule 40, Type I, ASTM D-1785, and PVC drain-waste-vent fittings, ASTM D-2665, with solvent weld joints, ASTM D2855.

2.2 ABOVE GROUND PIPE AND FITTINGS

A. Cast iron, no-hub, service weight, ASTM A888, CISPI 301, with rubber gasket couplings, ASTM C564, and stainless steel clamp, CISPI 310. Piping and fittings shall be manufactured by AB&I, Charlotte, or Tyler.

B. PVC, Schedule 40, Type I, ASTM D-1785, and PVC drain-waste-vent fittings, ASTM D-2665, with solvent weld joints, ASTM D2855. (Note: PVC materials shall not be installed in spaces used as air plenums).

2.3 DRAINS AND CLEANOUTS

A. Drains and cleanouts shall be manufactured by J.R. Smith, Josam, Sioux Chief, Wade, Watts, or Zurn. Refer to Plumbing Drain and Cleanout Schedule.

PART 3 - EXECUTION

3.1 DRAIN AND VENT PIPING SYSTEM

A. Connect drain and vent piping to each fixture and piece of equipment. Provide fittings and hardware to make required offsets and transitions.

B. Changes in direction of drainage piping shall be made by the appropriate use of 45 degree wyes, long or short sweep 1/4 bends, 1/6, 1/8, 1/16 bends or combination.

C. Fittings installed shall make for the least possibility of stoppage. Horizontal drainage piping shall be pitched a minimum of 1/4 inch per foot of run.

D. When running drain piping below a footing and parallel to it, piping shall be at least one foot greater in distance away from footing than below its bottom. Where possible, run sewers at centerpoint between two parallel footings and maintain above-mentioned distances at a minimum. When running drain piping under a footing, disturb as little of the soil under footing as possible. Provide concrete fill under footings where excavations wider than 18" are required.

E. Connect to drains, fixtures and equipment.

3.2 PIPE JOINTS

A. Install cast iron pipe and fittings, hubless pattern, as recommended by CISPI standards 301, 310, and in their publication "Installation Suggestions for Cast Iron No-Hub Pipe and Fittings".

B. Prepare PVC pipe ends as recommended by manufacturer. Use a P-70 type primer (for PVC) and a PVC solvent cement appropriate to the pipe size and temperature range.

C. Soldered joints shall be as described in Section 22 11 00.

3.3 PLENUM CEILING SPACES

A. PVC piping shall not be installed in spaces used as air plenums. Review HVAC drawings and specifications to determine locations of areas used as air plenums.

3.4 VENT FLASHING

A. Vent pipes passing through roof shall be covered with sheet lead weighing not less than 4 pounds per square foot. Sheet lead shall be well flashed onto the roof, 12" around pipe. Vent pipes shall extend a minimum of 12" above roof.

3.5 CLEANOUTS

A. Provide cleanouts as shown on plans and per Plumbing Code.

3.6 TRAPS

A. Trap fixtures and equipment. Trap seals shall be standard depth, except when deep seals are required by Code. Traps shall be set true and level and located within the limits of the Code requirements. A trap shall not be used as a separator, interceptor or other type of device to retain solids. Traps above grade shall be provided with screw-type cleanout plugs.

B. Traps shall be protected during construction and sealed to prevent foreign matter from entering. Provide adjustable expansion plug, plastic cap, or equivalent.

3.7 TESTING

A. Refer to Testing paragraph of Section 22 01 00.

B. Hydro-statically pressure test piping to 10 feet of water column pressure for 2 hours. No leaks allowed. Provide mint test of entire system when required by local authorities.

END OF SECTION 221300

SECTION 223000 - PLUMBING EQUIPMENT

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 work of this section.

1.2 DESCRIPTION

A. Provide plumbing equipment as listed in this section and as scheduled on the drawings.

1.3 SUBMITTALS

A. Submit product data sheets in accordance with Division 1 and Section 22 01 00.

PART 2 - PRODUCTS

2.1 GENERAL

A. Refer to Plumbing Equipment Schedule for specific model numbers and sizing information of the plumbing equipment specified herein.

2.2 WATER HEATERS

A. Relocated existing gas fired water heater.

2.3 HOT WATER CIRCULATING PUMPS

A. Pump shall be manufactured by Armstrong, Bell & Gossett, Taco, or Thrush.

B. Pump shall be 120 volt, single phase, 3450 RPM, in-line bronze pump, with brass impeller. Refer to Plumbing Equipment Schedule on drawings for model number and capacity.

C. TIME CONTROL
   1. Time controls shall be manufactured by Paragon Electric Co. or equivalent. Provide a 120 VAC electronic programmable time controller for each circulating pump. Unit shall include seven day, 365 day per year programmable features and rechargeable battery backup; Paragon Electric Co. model number EC72, or equal.

D. MOTOR STARTER
1. Starters shall be manufactured by Allen-Bradley, Cutler-Hammer, G.E., or Square D. Provide a single phase manual motor starter switch for starting and controlling each pump, with internal overload protection, general purpose enclosure, neon pilot light and HAND-OFF-AUTO selector switch; Allen-Bradley Model 600-TAX142.

2.4 EXPANSION TANKS

A. ACCEPTABLE MANUFACTURERS
1. Amtrol, Bell and Gossett, or Wessels.

B. Vertical steel precharged hydro-pneumatic expansion tank, 125 psi ASME labeled construction, including a replaceable flexible butyl rubber bladder, system connection fitting, Schrader type air charge fitting, steel base ring stand, factory prime and enamel painted exterior finish, ASME relief valve. Materials exposed to water to be NSF or FDA approved for potable water service.

PART 3 - EXECUTION

3.1 WATER HEATERS AND CIRCULATING PUMPS

A. Provide piping, unions, valves, thermometers, relief valves, and hardware.

B. Locate water heaters with controls, relief valves, and access holes accessible for service and replacement without moving heaters. Install relief valve and extend relief piping individually and full size to the nearest floor drain.

C. Install the domestic water heater(s) and circulator(s) in accordance with the Manufacturer's instructions and recommendations.

D. Power wiring shall be provided by the EC.

E. Mount each domestic water heater and storage tank on a 3½" high concrete pad.

F. The manufacturer shall provide a written service warranty which shall provide factory service for a period of one year following the acceptance of the installation. The one-year service warranty shall be submitted at the time of the certified shop drawings submittal. The one-year service warranty by the manufacturer shall provide free parts and labor to correct malfunctions of the boiler-burner unit during the warranty period.

G. GAS FIRED WATER HEATERS
1. Provide the services of a local factory authorized representative for gas fired equipment startup. A letter of compliance with factory recommendations and installation instructions shall be submitted with operation and maintenance instructions.
2. The discharge of boiler relief or safety valves shall be piped individually and full size to the nearest floor drain. Extend a condensate drain line from the boiler and also the boiler venting individually to the nearest floor drain.
3. The vent connections on pressure regulating valves, shall be piped separately to the outside atmosphere and terminated with an insect screened, weatherproof cap.

4. Vent the gas fired units in accordance with the manufacturer's requirements. Vent piping and fittings shall be provided by the boiler manufacturer in a single kit specific for this boiler and for this project. Install venting to maintain appliance sealed combustion rating.

END OF SECTION 223000

SECTION 224000 - PLUMBING FIXTURES

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 work of this section.

1.2 DESCRIPTION

A. Furnish and install plumbing fixtures with traps, drains, stops, faucets, flush valves, carriers and hardware.

1.3 SUBMITTALS

A. Submit product data sheets in accordance with Division 1 and Section 22 01 00.

PART 2 - PRODUCTS

2.1 GENERAL

A. Fixtures must conform to general requirements given below and to specified requirements for each type.

B. Vitreous china fixtures shall conform to ANSI A112.19.2M.

C. Stainless steel fixtures shall conform to ANSI A112.19.3.

D. Fixtures shall be installed so that parts are accessible for repairs when fixtures are in place. Manufacturer's trademark or name shall be visible on fixtures.

E. Faucets, traps, exposed fittings and trim shall be polished chrome plated unless otherwise specified. Provide polished chrome plated nipples at lavatories.

F. Exposed piping penetrating walls, floors or ceilings shall have chrome plated escutcheons, or flanges of depth to seal the opening.

G. Fixture stops shall be heavy duty commercial grade, slow compression angle valves with 1/2" inlet and 3/8" or 1/2" chrome plated flexible riser.

H. Traps shall be semi-cast 17-gauge brass, chrome plated, with cleanout and escutcheon. Lavatory traps shall be 1-1/4” minimum. Sink traps shall be 1-1/2”minimum.

2.2 MANUFACTURERS

A. Vitreous china and enameled cast iron fixtures shall be manufactured by American-Standard, Kohler, Toto, or Zurn. Fixture color shall be white unless specified otherwise.

B. Flush valves shall be manufactured by Sloan ("Royal" series), or Zurn ("Aquavantage" series).

C. Solid plastic toilet seats shall be manufactured by Bemis, Benneke, Centoco, Church, Olsonite, Kohler, or Zurn. Seat color shall match fixture unless specified otherwise.

D. Carriers for wall-mounted fixtures shall be manufactured by J.R. Smith, Josam, Wade, Watts, or Zurn.

E. Manual faucets shall be manufactured by American Standard, Chicago Faucet, Kohler, Speakman, Symmons, T&S Brass, or Zurn.

F. Heavy duty stops and supplies shall be manufactured by Chicago Faucet, Dearborn, EBC, Kohler, McGuire, T&S Brass, or Zurn.

G. Lavatory drains shall be offset type, 1-1/4" size, with flat grid strainer, manufactured by Dearborn, EBC, Keeney, Kohler, McGuire, or Zurn.

H. Traps shall be semi-cast 17 gauge brass, chrome plated, with cleanout and escutcheon as manufactured by Dearborn, EBC, Keeney, Kohler, McGuire, or Zurn.

I. Supply, drain and trap insulating kits shall be manufactured by Brocar, EBC, McGuire, Plumberex, or Truebro.

J. Fixtures - See Plumbing Fixture Schedule on drawings for type, manufacturer, and model for fixtures.

PART 3 - EXECUTION

3.1 GENERAL

A. Plumbing fixtures shall be installed as recommended by their respective manufacturer.

B. Individual supplies to fixtures shall be provided with support to prevent movement.

C. Seal joints between countertop, wall, floor and fixtures with G.E. Silicone caulk; white, clear or color to match fixture with colored caulk by fixture manufacturer.

D. After installation, fixtures shall be protected to prevent scratching or other damage during construction.

E. Prior to acceptance, fixtures shall be cleaned with compounds recommended by the respective manufacturer.

END OF SECTION 224000

SECTION 230500 - COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SCOPE

A. This section includes information common to two or more technical specification sections or items that are of a general nature, not conveniently fitting into other technical sections.

B. All Division 23 work as specified herein shall be provided by the HVAC Contractor unless otherwise specified on the Bid Form.

1.2 RELATED WORK

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

B. Section 23 05 93 – Testing, Adjusting and Balancing for HVAC

C. Section 23 33 00 – Air Duct Accessories

1.3 REFERENCE

A. Provisions of Division 01 govern work under this Section.

B. This Section of Work applies to all work specified under Division 23.

1.4 REFERENCE STANDARDS

A. Abbreviations of standards organizations referenced in other sections are as follows:

1.	AABC	Associated Air Balance Council
2.	ADC	Air Diffusion Council
3.	AGA	American Gas Association
4.	AMCA	Air Movement and Control Association
5.	ANSI	American National Standards Institute
6.	ARI	Air-Conditioning and Refrigeration Institute
7.	ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
8.	ASME	American Society of Mechanical Engineers
9.	ASTM	American Society for Testing and Materials
10.	AWWA	American Water Works Association
11.	AWS	American Welding Society
12.	EPA	Environmental Protection Agency
13.	GAMA	Gas Appliance Manufacturers Association
14.	IEEE	Institute of Electrical and Electronics Engineers
15.	ISA	Instrument Society of America
16.	MCA	Mechanical Contractors Association

17. MICA Midwest Insulation Contractors Association
18. MSS Manufacturer's Standardization Society of the Valve & Fitting Industry, Inc.
19. NBS National Bureau of Standards
20. NEBB National Environmental Balancing Bureau
21. NEC National Electric Code
22. NEMA National Electrical Manufacturers Association
23. NFPA National Fire Protection Association
24. SMACNA Sheet Metal and Air Conditioning Contractors' National Association. Inc.
25. UL Underwriters' Laboratories Inc.

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. The Contractor shall review his own work for compliance with the construction documents. Prior to punch list activity by A/E, the contractor shall provide documentation to the A/E that a review has taken place and shall issue a letter indicating that the work has been performed in compliance with the construction documents. In the event that the contractor does not satisfactorily review his own work and results in additional site visits by the A/E, the contractor shall reimburse the A/E for the additional time required to close out the project.

1.6 ABBREVIATIONS

A. A/E Architect/Engineer

B. GC General Contractor

C. FPC Fire Protection Contractor

D. PC Plumbing Contractor

E. HC Heating Contractor

F. EC Electrical Contractor

G. TCC Temperature Contractor

H. DDC Direct Digital Controls

I. BAS Building Automation System

J. TCS Temperature Control System

1.7 DEFINITIONS

A. Furnish
1. Supply and deliver to the project site ready for unpacking, assembly and installation

B. Install
   1. Operations at the site including unpacking, assembling, erecting, placing, anchoring, applying, finishing, cleaning, and connecting all related devices required for a product that is fully functional for its intended use after its installation.

C. Provide
   1. Furnish and install product as required to be fully functional for its intended use.

1.8 DRAWINGS

A. The drawings show the general arrangement of piping, equipment and appurtenances and shall be followed as closely as actual building construction and work of other trades permits. Work shall conform to requirements shown on the drawings. Architectural and structural drawings shall take precedence. Because of the scale of the drawings, it is not possible to indicate all offsets, fittings and accessories that may be required. Investigate structural and finish conditions affecting work and arrange work accordingly, providing offsets, fittings and accessories as may be required to meet as constructed conditions.

B. HVAC equipment and systems, including piping and ductwork shall be installed as high as possible unless otherwise noted on drawings. Equipment and systems shall also be installed to maintain required operation and maintenance clearances.

1.9 CAD DRAWINGS

A. Drawings in an electronic format can be made available to the successful HVAC contractor. The drawings provided may or may not be updated to reflect all addenda items. The use of the drawings is limited to this project and may not be forwarded to any other party, or used for any other purpose. Use of the files will be at the contractor's sole risk and without liability or legal exposure to Arnold & O'Sheridan, Inc or its employees. Architectural drawings or any other drawings not produced by Arnold & O'Sheridan will not be provided.

1.10 CODES AND STANDARDS

A. All materials and workmanship shall comply with applicable codes, specifications, local ordinances, industry standards and utility company regulations. In case of differences between building codes, specifications, state laws, local ordinances, industry standards and utility company regulations and contract documents, the most stringent shall govern. Promptly notify A/E in writing of differences.

B. Non-compliance
   1. If the Contractor installs materials or performs any work that does not comply with above requirements, he shall correct the work and shall bear all costs arising from correcting deficiencies.

1.11 CONTINUITY OF EXISTING SERVICES

A. Refer to Division 01 of the Project Manual.

B. Do not interrupt or change existing services without prior approval from the Owner, Architect, Engineer or Construction Manager. When interruption is required, coordinate the down-time with the Owner to reduce disruption to his activities. The scope of this work is indicated on the Contract Documents or described herein. Unless specifically stated, work involved in interrupting or changing existing services is to be done during normal working hours.

1.12 PROTECTION OF FINISHED SURFACES

A. Refer to Division 01 of the Project Manual.

B. Furnish one can of touch-up paint for each different color factory finish which is to be the finished surface of the product. Deliver touch-up paint with other "loose and detachable parts" as covered in the General Requirements.

1.13 SUBMITTALS

A. Refer to Division 01 and the General Conditions of the Contract.

B. Shop drawings are to be reviewed by the lead contractor and the HVAC contractor before submission to the A/E. Submittals shall be stamped by the contractor and clearly indicate all corrections made by the contractor during their review process. Submittals not reviewed and stamped by the contractor will be automatically rejected.

C. Submit for equipment and systems as specified in the respective specification sections, marking each submittal with that specification section number. Mark general catalog sheets and drawings to indicate specific items being submitted and proper identification of equipment by name and number, as identified in the contract documents. Include the plan designation mark (i.e. "AHU-1") on the submittals. Include dimensions, capacities, ratings, and installation instructions.

D. Before submitting electrically powered equipment, verify that the electrical power and control requirements for the equipment are in agreement with the motor schedule on the HVAC and electrical drawings. Include a statement on the shop drawing transmittal to the Architect/Engineer if the equipment submitted and the motor schedules are not in agreement, indicating any discrepancies. See related comments in Section 23 05 13, Part 1 under Electrical Coordination.

E. Include wiring diagrams of electrically powered equipment.

F. Submit the quantity of shop drawings as specified under the Division 01 Specification Section titled “Submittals.”

G. Submittals shall be legible, clear and complete. Shop drawings submitted that are incomplete, illegible or are not specific to the project will be returned as “not reviewed”. In addition, equipment installed without having approved shop drawings will be considered defective and shall be removed and replaced with approved equipment at no expense to the project.

1.14 SPECIFIED MATERIALS AND EQUIPMENT

A. The design is based on the equipment specified by the manufacturer and model number as specified on the plan schedules. Where certain items are specified by manufacturer or trade name, Contractor's bid shall be based on use of the named item. Where one make is described and other makes are listed, comparable models of other named equipment may also be used, provided that they meet all requirements of the specifications.

B. When equipment or accessories are used which differ in arrangement, configuration, dimensions, ratings, or engineering parameters from those on the plan schedules, the Contractor shall be responsible for costs involved in integrating the equipment or accessories into the system. The Contractor shall also be responsible for obtaining the original design performance from the system into which these items are placed, regardless of whether the manufacturer/model is a specified equivalent or a substitute. This may include changes found necessary during the testing, adjusting, and balancing phase of the project.

C. If the Contractor wishes to use items other than those named in specifications in his base bid, request for approval of substitution must be made in writing to A/E at least 14 days prior to opening of bids. Including complete technical and descriptive data with the request. If approved, an addendum will be issued notifying all planholders of the approval.

1.15 EQUIPMENT INSTALLATION

A. The drawings show the general arrangement and location of equipment and appurtenances. It is the Contractor’s responsibility to install equipment in a location and manner that allows for proper service and maintenance access to equipment. Work shall generally conform to requirements shown on the drawings. However, the location of equipment may require field adjustments to obtain the required service space. DO NOT SCALE OFF PLANS to determine proper location of equipment. Also, because of the scale of the drawings, it is not possible to indicate the exact routing of ductwork and piping, and offsets, fittings and accessories that may be required to provide proper service access to equipment. The Contractor shall route and install ductwork and piping to provide required service access to equipment.

B. If during the construction phase of the project the contractor feels that inadequate space exists, or that equipment locations must be substantially modified to provide the proper service and maintenance access, prior to installing the equipment the contractor shall notify the engineer in writing, outlining the general concerns and the proposed modifications. Equipment installed without providing the manufacturer’s required maintenance and service clearance shall be considered defective. The Contractor shall remove and relocate piping, ductwork and equipment, to provide the required service clearances at the Contractor’s expense.

1.16 OFF SITE STORAGE

A. Refer to Division 01 of the Project Manual.

1.17 CERTIFICATES AND INSPECTIONS

A. Refer to the General Conditions of the Contract, Article 13.

B. Obtain and pay for required Federal, State and local installation inspections, certificates and permits required, except those provided by the Architect/Engineer in accordance with State and local Codes. Deliver originals of these certificates to the Architect or Construction Manager.

1.18 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Refer to Division 01 of the Project Manual.

B. Provide HVAC systems and equipment operation and maintenance manuals in accordance with the requirements of the project specification.

C. Assemble material in three-ring or post binders, using an index at the front of each volume and tabs for each system or type of equipment. In addition to the data indicated in the General Requirements, include the following information:
   1. Copies of all approved shop drawings.
   2. Manufacturer’s instructions for installation, operation, and maintenance.
   3. Manufacturer's wiring diagrams for electrically powered equipment.
   4. Records of tests performed to indicate compliance with system requirements (system start-up reports).
   5. Temperature control record drawings and control sequences.
   6. Parts lists for manufactured equipment.
   7. Lubrication instructions, including list/frequency of lubrication done during construction.
   8. Warranties.
   9. Testing, adjusting and balancing data.

1.19 TRAINING OF OWNER PERSONNEL

A. Instruct Owner personnel in the proper operation and maintenance of systems and equipment provided as part of this project, using the Operating and Maintenance manuals during this instruction. Demonstrate startup and shutdown procedures for equipment. Training shall be during normal working hours.

1.20 RECORD DRAWINGS

A. Refer to Division 01 of the Project Manual.

B. Maintain record drawings on a daily basis to be turned over at the completion of the project.

C. Maintain temperature control record drawings on originals prepared by the installing contractor/subcontractor. Include copies of these record drawings with the Operating and Maintenance manuals.

1.21 PROJECT CLOSEOUT

A. Refer to Division 01 of the Project Manual.

B. The Contractor shall complete and provide items and materials, training and start-up associated with project closeout as specified under Division 1 of the Project Manual. In addition to these items, the Contractor shall provide the following items prior to acceptance of the installation:
   1. Final air and water system balancing, completed in accordance with the requirements of Section 23 05 93 and code, including the submission of testing, adjusting and balancing reports. Reports shall indicate the amount of total supply air, return air and outside ventilation air being provided to the spaces and to the air handling system(s).
   2. Submission of Operating and Maintenance instructions in accordance with the requirements of Division 01, of this Section and code. Operation and maintenance manuals shall include a copy of the completed testing, adjusting and balancing report for the Owner's records.
   3. Submission of start-up report for the temperature control system, signed by the technician in responsible charge of the control system, indicating that the system has been adjusted, calibrated and put into operation in accordance with the requirements of the specification and code.

PART 2 - PRODUCTS

2.1 ACCESS PANELS

A. Manufacturers:
   1. Milcor

B. Provide access panels at locations requiring access to mechanical equipment. These locations include, but are not limited to areas above drywall ceilings, shaft enclosures and other furred-in spaces concealing valves, ducts or other equipment. Provide UL listed fire rated access panels when penetrating fire rated chase or shaft areas.

C. Access panels shall be of size required to provide adequate access to equipment. Minimum size shall be 12"x12" for hand access and 24"x24" for body access.

D. Panels shall be Milcor brand, or equivalent.

E. Panels shall include concealed hinges, cam type locking devices, and have a frame/border type necessary for the particular wall or ceiling construction in which they are installed. Access panels shall be flush mounted, recessed frame type units. Access panels shall be prime coated steel, able to accept for field painting for general applications and stainless steel for use in toilet rooms, shower rooms and similar wet areas.

F. Refer to architectural room finish schedule for wall and ceiling surfaces and finishes.

G. For non-security applications, panel construction shall utilize a 16 gauge frame with not less than a 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.

2.2 PIPE PENETRATIONS

A. FIRE, SMOKE AND FIRE/SMOKE RATED SURFACES
   1. 3M CP 25N/S or CP 25S/L caulk, 3M FS 195 wrap/strip with restricting collar, 3M CS 195 composite sheet, Pipe Shields Inc. Series F fire barrier kits, Proset Systems fire rated floor and wall penetrations, Insta-Foam Products Insta-Fire Seal Firestop Foam or Dow Corning Fire Stop System.
   2. UL listed or tested by an independent testing laboratory, approved by the State and Local Code jurisdictions. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Sleeves in concrete to be schedule 40 steel pipe with integral water stop unless the fire stop material used includes a sleeve that is an integral part of the rated assembly.

B. NON-RATED SURFACES
   1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor/ceiling plates for covering openings in occupied spaces.
   2. In exterior wall openings below grade, use a modular mechanical type seal consisting of interlocking synthetic rubber links shaped to continuously fill the annular space between the un-insulated pipe and the cored opening or a water-stop type wall sleeve.
   3. At interior partitions where pipe penetrations are sealed, use Tremco Dymonic, Sika Corp. Sikaflex 1a, Sonneborn Sonolastic NPI, or Mameco Vulken 116 urethane caulk to effect the seal. Use galvanized sheet metal sleeves in hollow wall penetrations.

2.3 DUCT PENETRATIONS

A. FIRE, SMOKE AND FIRE/SMOKE RATED SURFACES
   1. 3M CP 25N/S or CP 25S/L caulk, 3M FS 195 wrap/strip with restricting collar, Insta-Foam Products Insta-Fire Seal Firestop Foam or Dow Corning Fire Stop System.
   2. UL listed or tested by an independent testing laboratory, approved by the State and Local Code jurisdictions. Use a product that has a rating not less than the rating of the wall or floor being penetrated. Sleeves in concrete to be minimum 16 gauge galvanized steel sleeves.

B. NON-RATED SURFACES
   1. Fiberglass insulation fill at voids with galvanized steel sheet metal bank-off on both side of duct penetration thru walls. Caulking for sealing and sound proofing shall be fire resistant.

2.4 IDENTIFICATION

A. STENCILS
   1. Not less than 1 inch high letters/numbers for marking pipe and equipment.

B. ENGRAVED NAME PLATES
   1. White letters on a black background, 1/16 inch thick plastic laminate, beveled edges, screw mounting, Setonply ® Style 2060 by Seton Name Plate Company, Emedolite Style EIP by EMED Co., or equal by W. H. Brady.

PART 3 - EXECUTION

3.1 DEMOLITION

A. Perform demolition as specified on the drawings or otherwise to accomplish new work.

B. Carefully examine the present building and site, together with the drawings and specifications. Within areas involving remodeling, each contractor shall be responsible for removal of, relocation of, or revisions to existing equipment, wiring, piping fixtures and other existing facilities which is necessary to accomplish the arrangement indicated on plans. To assist the contractor in meeting the above requirement, drawings note certain items, but absence of notes shall not limit responsibility of each Contractor to perform the work as described in this paragraph.

C. Where demolition work is to be performed adjacent to existing work that remains in an occupied area, provide measures to limit the amount of contamination of the occupied spaces. Where piping or ductwork is removed and not reconnected, cap ends of existing services as if they were new work. Coordinate work to avoid disruption to the existing building occupants.

D. All pipe, wiring and associated conduit, insulation, ductwork, and similar items demolished, abandoned, or deactivated are to be removed from the site by the Contractor. Piping and ductwork specialties are to be removed from the site by the Contractor unless they are dismantled and removed or stored by the Owner. Designated equipment is to be turned over to the Owner for his use at a place and time he so designates. Maintain the condition of material and equipment that is indicated to be reused.

3.2 CUTTING AND PATCHING

A. Refer to Division 01 requirements.

B. This Contractor shall be responsible for cutting and patching of the existing general construction to accommodate installation of the new HVAC system(s) unless otherwise noted.

C. Patching includes repairing the openings remaining from the removal or relocation of existing system components and painting the surface to match existing. Painting means covering the entire wall where patching is to be done unless indicated to be done by other trades.

D. Required cutting and patching shall be performed by personnel skilled in cutting and patching work.

E. Do not pierce, modify or affect beams or columns without permission of the Architect/Engineer. If piping is required to pass through walls or floors where no sleeve has been provided, use a core drill to avoid unnecessary damage and structural weakening.

3.3 PAINTING

A. Refer to Division 09 requirements.

B. Exposed steel support structures (metal surfaces located both inside and outside the building) shall be painted after installation with one coat of a compatible metal primer coat and two coats of a finish coat of paint for the application. Color shall be gray unless otherwise specified.

C. Exposed piping (uninsulated piping located outside the building, exposed to the weather) shall be painted after installation with one coat of a compatible metal primer coat and two coats of a finish coat of paint for the application.

D. Paint piping in accordance with the following color schemes:

Service	**Color**
Natural gas	Yellow

E. Piping systems shall be clearly identified after painting with pipe markings as specified under the paragraph titled identification under this section.

3.4 BUILDING ACCESS

A. Arrange for the necessary openings in the building to allow for admittance or removal of equipment and materials. When building access was not previously arranged and must be provided by this contractor, restore opening to its original condition after the apparatus has been brought into the building. Coordinate with the Architect/Engineer.

3.5 EQUIPMENT ACCESS

A. Install piping, conduit, ductwork, and accessories to permit access to equipment for maintenance. Coordinate the exact location of wall and ceiling access panels and doors with the General Contractor, making sure that access is available for equipment and specialties. Where access is required in plaster walls or ceilings, furnish and install access doors required. Coordinate for installation of access doors utilizing the General Contractor and other appropriate on-site Subcontractor for access door installation.

B. Accessible ceilings, (i.e. lay-in ceilings) do not require access panels. Provide color coded thumb tacks or screws, depending on the surface, for use in accessible ceilings.

3.6 COORDINATION OF WORK

A. Verify that devices are compatible for the surfaces on which they are used. This includes, but is not limited to, diffusers, registers, grilles, and recessed or semi-recessed heating and cooling terminal units installed in/on architectural surfaces.

B. Coordinate work with other contractors prior to installation. Installed work that is not coordinated and that interferes with other contractor's work shall be removed or relocated at the installing contractor's expense.

C. Verify system completion prior to start of the testing and balancing. Work to be completed prior to testing and balancing shall include, but not be limited to the following: cleaning and replacement of filters, adjusting and calibration of controls, controls cycled through their sequences. Install dampers, shutoff and balancing valves, flow measuring devices, gauges, and

temperature controls for fully functional and balanced systems. Demonstrate the starting, interlocking and control features of each system so the test and balance agency can perform its work. Provide the appropriate sections of work with required wall, roof and floor opening locations and dimensions. If this Contractor neglects to coordinate this information, openings shall then be the responsibility of this Contractor.

3.7 PIPE PENETRATIONS

A. GENERAL

1. Coordinate the location of building surface penetrations with the appropriate contractors. Furnish sleeves, inserts, and other devices that are to be built into the structure to the contractor performing that work. Prepare shop drawings for approval for penetrations of structural elements, including floor slabs, shear walls, and bearing walls. Do not allow penetrations to be made until shop drawings are approved.

B. FIRE RATED SURFACES

1. Install products in accordance with the manufacturer's instructions where a pipe penetrates a fire rated surface. When pipe is insulated, use a product which maintains the integrity of the insulation and vapor barrier. Where a sleeve must be installed in an existing floor, grout area around sleeve to restore the floor integrity. In a wet area floor penetration, top surface of penetration to be 2 inches above the adjacent floor with the additional height obtained by means of a concrete pad poured integral with the floor; wet areas for this paragraph are rooms or spaces containing air handling unit coils, convertors, pumps, chillers, boilers, and similar equipment.

C. NON-RATED SURFACES

1. Install escutcheons or floor/ceiling plates where pipe penetrates non-fire rated surfaces in occupied spaces. Size units to accommodate insulation, where applicable. Escutcheons are not required when the insulation completely covers the wall opening and the insulation end is trimmed in a neat manner. Occupied spaces for this paragraph include only those rooms with finished ceilings and the penetration occurs below the ceiling.
2. Install the galvanized sheet metal sleeve in hollow wall penetrations to provide a backing for the sealant. Apply sealant to both sides of the penetration in a manner that the annular space between the pipe sleeve and pipe or insulation is completely blocked.
3. Completely seal pipe penetrations as specified below:

3.8 DUCT PENETRATIONS

A. GENERAL

1. Coordinate the location of building surface penetrations with the appropriate contractors. Furnish sleeves, inserts, and other devices that are to be built into the structure to the contractor performing that work. Prepare shop drawings for approval for penetrations of structural elements, including floor slabs, shear walls, and bearing walls. Do not allow penetrations to be made until shop drawings are approved.

B. FIRE RATED SURFACES

1. Install products in accordance with the manufacturer's instructions where a duct penetrates a fire rated surface. When duct work is insulated, use a product which maintains the integrity of the insulation and vapor barrier. Where a sleeve must be

installed in an existing floor, grout area around sleeve to restore the floor integrity. In a wet area floor penetration, top surface of penetration to be 2 inches above the adjacent floor with the additional height obtained by means of a concrete pad poured integral with the floor; wet areas for this paragraph are rooms or spaces containing air handling unit coils, convertors, pumps, chillers, boilers, and similar equipment.

C. NON-RATED SURFACES
   1. Completely seal duct penetrations as specified below: for walls of the following rooms below:
   2. Install sheet metal blank - off plates and caulk where ducts penetrate non-fire rated surfaces. Size units to accommodate insulation, where applicable.
   3. Duct penetration thru smoke partitions shall be caulked and sealed to prevent the passage of smoke.

3.9 CLEANING

A. Contractor shall at all times keep premises free of waste or surplus materials, rubbish and debris which is caused by his employees or resulting from his work.

B. After equipment and fixtures have been installed, Contractor shall remove all stickers, stains, labels and temporary covers.

C. All foreign matter shall be removed from pipes, tanks, pumps, fans, motors, devices, switches, fixtures, panels and ductwork before acceptance of systems.

D. Contractor shall leave his portion of the work in a safe and clean condition ready for operation.

E. In case of dispute, Owner may remove rubbish, excess materials or do cleaning, and charge the cost to Contractor.

3.10 IDENTIFICATION

A. Identify equipment in mechanical equipment rooms and above ceilings, including terminal heating devices by stenciling equipment number and service with one coat of black enamel against a light background or white enamel against a dark background. Use a primer where necessary for proper paint adhesion. Do not label equipment in occupied spaces (for example cabinet heaters and ceiling fans).

B. Identification plates on equipment shall be free of excess paint and shall be legible.

C. Where stenciling is not appropriate for equipment identification, engraved nameplates shall be used.

D. Identify piping not less than once every 30 feet, not less than once in each room, adjacent to each access door or panel, and on both side of the partition where exposed piping passes through walls, floors or roofs. Place flow directional arrows at each pipe identification location. Use one coat of black enamel against a light background or white enamel against a dark background.

E. Use engraved nameplates to identify control equipment and motor starters. Motor starters shall be provided with an engraved nameplate identifying the piece of equipment it serves by plan identification (i.e. "AHU-1").

F. Identify all fire and smoke dampers. Dampers shall be permanently identified on the exterior of the duct with a label (or painted) having a minimum letter height of 1”. Identification shall read either ”FIRE DAMPER”, “ SMOKE DAMPER” or “FIRE/SMOKE DAMPER”.

3.11 LUBRICATION

A. Lubricate bearings with lubricant as recommended by the manufacturer before the equipment is operated for any reason. Once the equipment has been run, maintain lubrication in accordance with the manufacturer's instructions until the Owner accepts the work. Maintain a log of all lubricants used and frequency of lubrication. Include this information in the Operating and Maintenance Manuals at the completion of the project.

3.12 PROJECT CLOSEOUT

A. Contractor shall provide the following submittal data prior to final site walk-through review. If this closeout work is not completed or is inaccurately completed, the Contractor shall be responsible for the expense of additional site reviews made by A/E.

CLOSEOUT DATA SUBMITTALS
Record drawing submission
Air balance test reports
Operating and maintenance manuals
Instructional walk-through and training
Inspectors test reports - HVAC inspector
Pipe pressure test report - Gas piping leak test
System startup reports - Heating equipment - Cooling equipment - Temperature control equipment
Closeout statements - Work completion - Warranty statements - Punch list completion

END OF SECTION 230500

SECTION 230513 - COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. This section includes requirements for single and three phase motors that are used with equipment specified in other sections. Also included are general requirements for electrical wiring and electrical connections. Included are the following requirements:

1.2 RELATED WORK

A. Section 230500 – Common Work Results for HVAC

B. Division 26 – Electrical

C. All electrical and temperature control wiring installation shall conform to the requirements of the applicable electrical sections of these specifications.

1.3 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.4 REFERENCE STANDARDS

A. ANSI/NFPA 70 National Electrical Code

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.6 SUBMITTALS

A. Submit shop drawings for motors and motor starters.

B. Submit wiring diagrams for motors and HVAC equipment requiring wiring by the Electrical Contractor for this project. Wiring diagrams shall be prepared by the Contractor specifically for this work.

1.7 OPERATING AND MAINTENANCE INSTRUCTIONS

A. Include manufacturer's instructions in the manuals with the specific equipment to which they apply. Also include the following information if not previously documented on shop drawings: full load power factor, service factor, NEMA design designation, insulation class, and frame type.

1.8 ELECTRICAL COORDINATION AND GENERAL REQUIREMENTS

A. All starters, overload relay heater coils, disconnect switches and fuses, relays, wire, conduit, push-buttons, pilot lights, and other devices required for the control of motors or electrical equipment will be furnished and installed by the Electrical Contractor, except as specifically noted elsewhere in this division of specifications.

B. The drawings and specifications show number and horsepower rating of motors furnished by this Contractor, together with their actuating devices if these devices are furnished by the HVAC Contractor. Any discrepancy in size, horsepower rating, electrical characteristics, or means of control for motors or other electrical equipment after contracts are awarded, and shall be addressed with the A/E.

C. Costs involved in changes required due to equipment substitutions initiated by this contractor will be the responsibility of the contractor. See related comments in Section 23 05 00, Basic HVAC Requirements, under Submittals.

D. The Contractor shall be responsible for providing control wiring (line and low voltage) for the project unless noted otherwise, including but not exclusive of the following:
   1. Interlock wiring of line and low voltage motorized automatic dampers associated with fans.

E. Furnish project specific wiring diagrams to Electrical Contractor for equipment, starters and devices furnished by this Contractor and indicated to be wired by the Electrical Contractor.

F. Provide on the front enclosure face of starting equipment, selector switches and push-buttons stations, a securely mounted, laminated plastic engraved name plate which shall identify the motorized equipment served by the respective starter. The name tags shall be constructed of black and white plastic (black face and white lettering) with ¼" high lettering. The lettering shall identify the unit served by the plan identification mark (example: "Exhaust Fan EF-1").

1.9 PRODUCT CRITERIA

A. Motors to conform to applicable requirements of NEMA, IEEE, ANSI, and NEC standards and shall be listed by UL for the service specified.

B. Select motors for conditions in which they will be required to perform; i.e., general purpose, splash-proof, explosion proof, standard duty, high torque or other special type by the equipment or motor manufacturer's recommendations and as specified on the drawings and as specified herein.

C. Furnish motors for starting in accordance with utility requirements and with compatible starters as specified.

PART 2 - PRODUCTS

2.1 MOTORS

A. SINGLE PHASE, SINGLE SPEED MOTORS
   1. Use NEMA rated 120 volt, single phase, 60 hertz motors for motors 1/3 HP and smaller.
   2. Use permanent split capacitor or capacitor start, induction run motors equipped with permanently lubricated and sealed ball or sleeve bearings and Class B insulation. Service factor to be not less than 1.35. Motors are to be provided with internal overload protection.

PART 3 - EXECUTION

3.1 MOTOR INSTALLATION

A. Lubricate motors requiring lubrication. Record lubrication material used and the frequency of use. Include this information in the maintenance manuals.

END OF SECTION 230513

SECTION 230529 - HANGERS AND SUPPORTS FOR HVAC SYSTEMS

PART 1 - GENERAL

1.1 SCOPE

A. This section includes specifications for supports of HVAC equipment and materials as well as piping system hangers and anchors.

1.2 RELATED WORK

A. Section 23 05 48 – Vibration and Seismic Controls for HVAC Systems and Equipment

B. Section 23 07 00 – HVAC Insulation

1.3 REFERENCE

A. Provisions of Division 01 shall govern work under this section.

1.4 REFERENCE STANDARDS

A. U.L. Underwriters Laboratory

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.6 DESCRIPTION

A. Provide supporting devices for the installation of mechanical equipment and materials.

B. Do not hang mechanical items directly from a metal deck or run piping so it rests on the bottom chord of trusses or joists.

C. Support apparatus and material under all conditions of operation, variations in installed and operating weight of equipment and piping, to prevent excess stress, and allow for proper expansion and contraction.

1.7 SUBMITTALS

A. Submit shop drawings for equipment roof curbs, equipment roof rails and roof pipe portals.

1.8 DESIGN CRITERIA

A. Materials and application of pipe hangers and supports shall be in accordance with MSS Standard Practice SP-58 and SP-69 unless noted otherwise.

B. Piping supported by laying on the bottom chord of joists or trusses is not acceptable.

PART 2 - PRODUCTS

2.1 STRUCTURAL SUPPORTS

A. Provide supporting steel for the installation of mechanical equipment and materials, whether or not it is specifically indicated or sized, including angles, channels and beams to suspend piping and other HVAC equipment.

2.2 PIPE HANGER AND SUPPORT MANUFACTURERS

A. Grinnell figure numbers are listed below. Equivalent products by B-Line, Fee and Mason, Kindorf, Michigan Hanger or Unistrut are acceptable.

2.3 PIPE HANGERS AND SUPPORTS

A. Black hangers are specified below. Substitute equivalent galvanized hangers for use in wet areas or areas that are frequently washed down.

B. STEEL PIPING SYSTEMS OPERATING AT 250° F OR LESS
   1. Hangers for Pipe sizes ½" through 2½": Carbon steel, adjustable clevis, black finish.
      a. Grinnell Figure 65 or 260
      b. Provide Grinnell Figure 167 insulation protection shield for each hanger on insulated piping systems.

C. INSULATED COPPER PIPE SUPPORT
   1. Hangers for Pipe sizes 4" and less: Carbon steel, adjustable clevis, black finish.
      a. Grinnell Figure 65 with Grinnell Figure 167 insulation protection shield for each hanger.

D. UN-INSULATED COPPER PIPE SUPPORT
   1. Hangers for Pipe sizes 4" and less: Carbon steel with copper finish and adjustable clevis.
      a. Grinnell Figure CT-65

2.4 BEAM CLAMPS

A. MSS SP-69 Type 23 malleable black iron clamp for attachment to beam flange to 0.62 inches thick for single threaded rods of *3/8*, ½, and *5/8* inch diameter, for use with pipe sizes 4 inch and less. Furnish with a hardened steel cup point set screw. Grinnell Figure 86.

2.5 PIPE HANGER RODS

A. Steel Hanger Rods
1. Threaded both ends, threaded one end, or continuous threaded, black finish.
2. Size rods for individual hangers according to the following schedule.
3. Total weight of equipment, including valves, fittings, pipe, pipe content, and insulation, are not to exceed the limits indicated.

Maximum Load (Lbs.)	Rod Diameter (Inches)
610	3/8
1130	1/2

4. Provide rods with adjusting and lock nuts.
5. Maximum temperature shall not exceed 650° F.

2.6 EQUIPMENT ROOF RAILS

A. Manufacturers
1. Custom Curb, Pate, Roof Products and Systems, ThyCurb or Vent Products Co. Inc.
2. Constructed of not less than 18 gauge galvanized steel reinforced so it is structurally capable of supporting the intended load with no penetrations through the curb flashing, inside and outside corner sections that are mitered and continuously welded, filled with 3 pound density insulation, integral deck mounting flange, nominal two inch wood nailer, and galvanized steel counterflashing with attached galvanized steel channel track for securing pipe or duct roller and roller support. Do not use built-in metal base flashings or cants. Cant strips shall be provided for the application when required.

B. HEIGHT OF SUPPORTS
1. Based on the length of the main support member, the height of the support member above the roof deck to be as follows:

Length of Support Member (inches)	Min. Height of Support Above Deck (inches)
up to 36	12
37 - 60	18

2.7 EQUIPMENT ROOF CURBS

A. Manufacturers
1. Custom Curb, Pate, Roof Products and Systems, ThyCurb, Vent Products.
2. Equipment manufacturer's curbs that match their equipment are acceptable if they are approved by the National Roofing Contractors Association.
3. Minimum 12 inch clear height from above roof insulation thickness. Roof curbs shall be constructed of not less than 18 gauge galvanized steel reinforced so it is structurally capable of supporting the intended load with no penetrations through the curb flashing, inside and outside corner sections that are mitered and continuously welded, filled with 3 pound density insulation, integral deck mounting flange, nominal two inch wood nailer, and galvanized steel counterflashing. Do not use built-in metal base flashings or cants. Cant strips shall be provided for the application when required.

2.8 ROOF PIPE PORTALS

A. Manufacturers
   1. Custom Curb, Pate, Roof Products and Systems, ThyCurb, Vent Products.
   2. Minimum 12 inch clear height from above roof insulation thickness. Roof curbs for portal assembly shall be constructed of not less than 18 gauge galvanized steel reinforced so it is structurally capable of supporting the intended load, inside and outside corner sections that are mitered and continuously welded, filled with 3 pound density insulation, integral deck mounting flange, nominal two inch wood nailer, laminated acrylic clad thermoplastic or ABS cover with EPDM graduated step boots to accommodate various size pipes, fastening screws for cover, and stainless steel clamps for securing boots around the pipe. Do not use built-in metal base flashings or cants. Cant strips shall be provided for the application when required.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install supports to provide for free expansion of the piping and duct system. Support piping from the structure using concrete inserts, beam clamps, ceiling plates, wall brackets, or floor stands. Fasten ceiling plates and wall brackets securely to the structure and test to demonstrate the adequacy of the fastening.

B. Coordinate hanger and support installation to properly group piping of other trades.

3.2 HANGER AND SUPPORT SPACING

A. Place a hanger within 12 inches of each horizontal elbow, valve, strainer, or similar piping specialty item.

B. Where several pipes can be installed in parallel and at the same elevation, provide multiple or trapeze hangers.

C. Support riser piping independently of connected horizontal piping.

D. Adjust hangers to obtain the slope specified in the piping section of this specification.

E. SPACE HANGERS FOR PIPE AS FOLLOWS

Pipe Material	Pipe Size	Max. Horizontal Spacing	Max Vertical Spacing
Steel	½" through 1¼"	6' - 0"	15‘ – 0”
Steel	1½"	8' - 0"	15’ – 0”
Steel	2" through 4"	10' - 0"	15’ – 0”
PVC	All sizes	4' - 0"	10’ – 0”
Copper	½" through 1"	6' - 0"	10’ – 0”

3.3 EQUIPMENT ROOF RAILS

A. Use for piping, ductwork and equipment on roof. Secure bottom of support flat on roof deck. Secure equipment to curb in accordance with equipment manufacturer's instructions. Apply two coats of zinc rich paint to cut edges of all galvanized steel elements. Flashing and counterflashing provided by the HVAC Contractor.

3.4 EQUIPMENT ROOF CURBS

A. Secure bottom of support flat on roof deck. Secure equipment to curb in accordance with equipment manufacturer's instructions. Flashing and counterflashing provided by the HVAC Contractor.

3.5 ROOF PIPE PORTALS

A. Install at points where pipes penetrate roof. Provide arrangements for each application. Install as shown on the drawings, as detailed and according to the manufacturer's installation instructions. Flashing and counterflashing provided by the HVAC Contractor.

END OF SECTION 230529

SECTION 230593 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 SCOPE

A. This section includes specifications for air and water testing, adjusting and balancing (TAB) specifications for the entire project. Included are the following requirements:

1.2 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC submittals to be furnished for use by the testing and balancing agency for coordination of work.

B. Project drawings and specifications which define the scope of the systems to be balanced.

1.3 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.4 REFERENCE STANDARDS

A. AABC National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems, Fifth Edition, 1989.

B. ASHRAE ASHRAE Handbook, 1987 HVAC Systems and Applications, Chapter 57, Testing Adjusting and Balancing.

C. NEBB Procedural Standards for Testing Adjusting Balancing of Environmental Systems, Latest Edition.

1.5 QUALITY ASSURANCE

A. Testing, adjusting and balancing of air systems, including electrical measurement and verification of performance of equipment shall be completed in accordance with standards published by AABC or NEBB.

B. Air balancing work shall be completed by an AABC or NEBB certified air balance contractor. Certification number and seal of registration shall be included with each balancing report.

1.6 DESCRIPTION

A. Provide mechanical systems testing, adjusting and balancing. Requirements include the balancing of air systems, including adjustment of new and existing systems to provide design

quantities as specified on the drawings, electrical measurement and verification of performance of equipment.

B. Test, adjust and balance air systems so that each room, piece of equipment or terminal device is using the quantities indicated on the drawings and in the specifications.

C. Accomplish testing, adjusting and balancing work in a timely manner that allows partial occupancy of major buildings, occupancy of one building when the project involves many buildings, and completion of the entire project in the time stated in the Instruction to Bidders and in accordance with the completion schedule established for this project. Coordinate with other sections of work as specified to provide timely and accurate completion of the TAB work.

D. The test and balance agency is encouraged to make periodic site visits to make sure that provisions are being made to accomplish the specified testing, adjusting and balancing work. If problems are found, handle as specified in Part 3 under Deficiencies.

1.7 COORDINATION

A. The testing, adjusting and balancing Contractor shall coordinate his work with the mechanical system and temperature control system installing Contractors to accomplish coordination and verification of system operation and readiness for testing, adjusting and balancing.

1.8 SUBMITTALS

A. Submit testing, adjusting and balancing reports bearing the seal and signature of the NEBB or AABC Certified Test and Balance Supervisor. The reports to be certified prove that the systems have been tested, adjusted and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed and are operating; and are an accurate record of all final quantities measured to establish normal operating values of the systems.

B. Submission
   1. Submit 5 sets of reports for distribution. Final distribution of submittals shall be as follows:
      a. Owner — 3 copies for record purposes after approval (to be included in the operation and maintenance manuals).
      b. Project Architect — 1 copy for record purposes after approval.
      c. Project Engineer — 1 copy for record purposes after approval.
      d. Contractor — 1 copy for record purposes after approval.
   2. Include a copy of the approved final balancing report for this project.

C. Format
   1. Bind report forms in three-ring binders or portfolio binders. Label edge or front with label identifying project name, project number and descriptive title of contents. Divide the contents of the report into the below listed divisions, separated by divider tabs:
      a. General Information
      b. Summary
      c. Air Systems

D. Contents

1. Provide the following minimum information, forms and data:

a. General Information: Inside cover sheet identifying Test and Balance Agency, Contractor, Architect, Engineer, Project Name and Project Number. Include addresses, contact names and telephone numbers. Also include a certification sheet containing the seal and signature of the Test and Balance Supervisor.

b. Summary: Provide summary sheet describing mechanical system deficiencies. Describe objectionable noise or drafts found during testing, adjusting and balancing. Provide recommendations for correcting unsatisfactory performances and indicate whether modifications required are within the scope of the contract, are design related or installation related. List instrumentation used during testing, adjusting and balancing procedures.

c. The remainder of the report to contain the appropriate standard NEBB or AABC forms for each respective item and system. Fill out forms completely including the percent deviation from design values. Where information cannot be obtained or is not applicable indicate same.

PART 2 - PRODUCTS

2.1 INSTRUMENTATION

A. Provide required instrumentation to obtain proper measurements. Application of instruments and accuracy of instruments and measurements are to be in accordance with the requirements of NEBB or AABC Standards and instrument manufacturer's specifications.

B. All instruments used for measurements shall be accurate, and calibration histories for each instrument shall be available for examination upon request. Calibration and maintenance of instruments shall be in accordance with the requirements of NEBB or AABC Standards

PART 3 - EXECUTION

3.1 PRELIMINARY PROCEDURES

A. Check filters for cleanliness, dampers and valves for correct positioning, equipment for proper rotation and belt tension, temperature controls for completion of installation.

B. Do not proceed until systems are fully operational with components necessary for complete testing, adjusting and balancing. Installing Contractors are required to provide personnel to check and verify system completion, readiness for balancing and assist Balancing Agency in providing specified system performance.

3.2 PERFORMING TESTING, ADJUSTING AND BALANCING

A. Perform testing, adjusting and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards except as may be modified below.

B. Unless specifically instructed in writing, work specified in this section is to be performed during the normal workday.

C. In areas containing ceilings, remove ceiling tile to accomplish balancing work; replace tile when work is complete and provide new tiles for tiles that are damaged by this procedure. If the ceiling construction requires the installation of access panels for completion of work under this section, provide panels for access as necessary.

D. Cut insulation, ductwork and piping for installation of test probes to the minimum extent necessary for adequate performance of procedures. Patch using materials identical to those removed, maintaining vapor barrier integrity and pressure rating of systems.

E. In air systems employing filters, blank off filter area to simulate a pressure drop that is midway between that of a clean filter and that of a dirty filter.

F. Adjust equipment to yield specified total flow at terminals. Proceed taking measurements in mains and branches for final terminal balancing. Perform terminal balancing to specified flows balancing branch dampers, deflectors, extractors and valves prior to adjustment of terminals.

G. Determine air handling system total supply and return airflow and return and exhaust fan total airflow at each piece of equipment utilizing a pitot tube duct traverse. Summation of air terminal inlet/outlet CFM's is not acceptable, unless a pitot tube traverse is impractical. If summation of the air inlets/outlets is used in lieu of the traverse method, a valid explanation shall be submitted along with the balancing reports. Insufficient back-up information to support use of the summation method is cause for rejection of the balancing reports without review.

H. Measure and record airflow and static air pressure conditions across fans, coils and filters. Indicate in report if cooling coil measurements were made on a wet or dry coil and if filter measurements were made on a clean or dirty filter. Spot check static air pressure conditions directly ahead of terminal units. Submit a static pressure profile for each air handling unit system. Unit static pressure profile shall be done at both minimum outside air CFM and at maximum outside air CFM (full economizer cycle) and also with the face and bypass dampers (when provided on air handling systems) in full bypass position as well as full face position. <u>Reports submitted without air handling system static pressure profiles is cause for rejection of the balancing reports without review.</u>

I. Adjust outside air, return air and relief air dampers for design conditions at both the minimum and maximum settings and record both sets of data. Balance modulating dampers at extreme conditions and record both sets of data. Balance variable air volume systems at maximum air flow rate, full cooling, and minimum flow rate, full heating; record all data.

J. Provide fan and motor drive sheave adjustments to obtain design performance. If fan and motor drive sheaves require replacement to obtain design air volumes, provide sheave replacements at no additional cost to the project. Design air volume shall be obtained at all air handling unit operating conditions – minimum outside air and 100% outside air (economizer position) for all face and bypass damper positions (full face and full bypass).

K. Final air system measurements to be within the following range of specified CFM:
   1. Fans -5% to +10%

L. Cycle controls and verify proper operation and setpoints. Include in report description of temperature control operation and any deficiencies found.

M. Permanently mark equipment settings, including damper positions, control settings, and similar devices allowing settings to be restored. Set and lock memory stops.

N. Leave systems in proper working order, replacing belt guards, closing access doors and electrical boxes, and restoring temperature controls to normal operating settings.

3.3 DEFICIENCIES

A. Contractor shall correct installation deficiencies found during the test and balance stage. Test and balance agency shall notify the Construction Representative of these items.

END OF SECTION 230593

SECTION 230700 - HVAC INSULATION

PART 1 - GENERAL

1.1 SCOPE

A. This section includes insulation specifications for heating, ventilating, and air conditioning piping, ductwork, and equipment.

1.2 RELATED WORK

A. Section 23 05 29 – Hangers and Supports for HVAC Systems

B. Section 23 31 00 – HVAC Ducts and Casings

1.3 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.4 REFERENCE STANDARDS

A.	ASTM/ANSI C518	Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
B.	ASTM E84	Surface Burning Characteristics of Building Materials
C.	NFPA 225	Surface Burning Characteristics of Building Materials
D.	MICA Manual	National Commercial & Industrial Insulation Standards, 1988, Third Edition, published by the Midwest Insulation Contractors Association
E.	UL 723	Surface Burning Characteristics of Building Materials

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. Label insulating products delivered to the construction site with the manufacturer's name and description of materials.

1.6 SUBMITTALS

A. Include manufacturer's data for the following:
   1. Pipe insulation
   2. Duct Insulation

B. Insulation submittal shall include data on thermal conductivity, materials of composition, jacket information and temperature limitations. Include in the submittals a schedule of insulation types and thickness for each type (and size) of surface to be insulated. Include in the schedule a listing of specialty type jackets for the applications required for the project.

1.7 DESCRIPTION

A. Furnish and install insulating materials and accessories as specified. The following types of insulation are specified in this section:
   1. Pipe insulation
   2. Duct Insulation

B. Install insulation materials in accordance with the latest edition of MICA (Midwest Insulation Contractors Association) Standard and manufacturer's installation instructions. Exceptions to these standards will only be accepted where specifically modified in these specifications, or where prior written approval has been obtained from the Engineer.

1.8 DEFINITIONS

A. “Concealed”
   1. Shafts, furred spaces, space above finished ceilings, utility tunnels and crawl spaces. All other areas, including walk-through tunnels, shall be considered as exposed.

B. “Unconditioned spaces”
   1. Unheated or non-cooled attics, utility tunnels and crawl spaces were ambient temperatures may rise above 90°F, or drop below 50°. Ducts in these instances are considered to be located outside of the building thermal envelope.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials or accessories containing asbestos will not be accepted.

B. Use composite insulation systems (insulation, jackets, sealants, mastics, and adhesives) that have a flame spread rating of 25 or less and smoke developed rating of 50 or less except that outdoor mechanical insulation may have a flame spread rating of 75 and a smoke developed rating of 150.

2.2 INSULATION AND JACKETS

A. MANUFACTURERS:
1. Armstrong, Halstead, Owens-Corning, Johns-Manville, Knauf, Certainteed or equivalent to types as specified herein.
2. Insulating materials shall be fire retardant, moisture and mildew resistant, and vermin proof. Insulation shall be capable of receiving jackets, adhesives and coatings for the required application.
3. Jackets shall have puncture resistance based on ASTM D-781 test methods. Vapor barriers, where required, shall have perm ratings based on ASTM E-96 procedure A.

B. FLEXIBLE FIBERGLASS INSULATION
1. Owens-Corning "All-Service Duct Wrap" or Johns-Manville "R" Series Microlite with a minimum density of 0.75 lb. per cu. ft., thermal conductivity of not more than 0.35 at 75□F mean temperature, and be suitable for an operating temperature up to 250□F. Vapor retarder facing shall be a foil-scrim-kraft laminate jacket, factory applied to the insulation. Permeance shall not exceed 0.02 perms when tested in accordance with ASTM E 96. Beach puncture resistance shall be 50 units minimum.

C. RIGID FIBERGLASS INSULATION - DUCTWORK
1. Owens-Corning 700 Series, having a thermal conductivity of not more than 0.23 at 75□F mean temperature and a maximum operating temperature of 450□F.
2. Inside applications: Minimum nominal density of 3 lbs. per cu. ft.,
3. Exterior applications: 6 lbs. per cu. ft. nominal density.
4. Jacket: FRK foil reinforced vapor barrier jacket, factory applied to insulation, maximum permeance of 0.02 perms (aged) and minimum beach puncture resistance of 25 units.

D. RIGID FIBERGLASS INSULATION - PIPING
1. Owens-Corning SSL-II having a thermal conductivity of not more than 0.23 at 75□F mean temperature and a maximum operating temperatures of 450□F.
2. Jacket: White kraft reinforced vapor barrier all service jacket, factory applied to insulation with a self-sealing pressure sensitive adhesive lap, maximum permeance of 0.02 perms (aged) and minimum beach puncture resistance of 50 units.

E. ELASTOMERIC INSULATION
1. Armstrong AP Armaflex or Armaflex II or Halstead F/R Insul-Tube closed cell insulation, with minimum nominal density of 5.5 lbs. per cu. ft., thermal conductivity of not more than 0.27 at 75□F mean temperature, and maximum water vapor transmission of 0.17 perm inch. The material shall have an acceptable application temperature range from 220□F to -40□F.
2. No jacket is required for inside applications unless specified or noted otherwise.

2.3 ACCESSORIES

A. Products shall be compatible with surfaces and materials on which they are applied, and be compatible for use at operating temperatures of the systems to which they are applied.

B. Adhesives, sealants, and protective finishes shall be as recommended by insulation manufacturer for applications specified.

C. Insulation bands to be ¾ inch wide, constructed of aluminum or stainless steel. Minimum thickness to be 0.015 inch for aluminum and 0.010 inch for stainless steel.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Do not insulate systems or equipment that is specified to be pressure tested or inspected, until testing and inspection have been successfully completed.

B. Piping, ductwork, and equipment shall be installed with clearances from walls, piping, ductwork, equipment and other obstacles to permit the application of the full thickness of insulation as specified.

C. Insulation, jackets, or accessories shall only be installed under ambient temperatures or conditions recommended by the manufacturer of the material.

D. Insulation and jackets shall be provided as specified in the listings contained within this specification section, or as otherwise noted on the plans. Requirements apply to both exposed and concealed applications unless noted otherwise.

E. Install insulation with smooth and even surfaces, and on clean and dry surfaces. Poorly fitted joints or use of filler in voids will not be accepted. Provide neatly beveled terminations at nameplates, uninsulated fittings, and at other locations where insulation terminates.

F. Use full length material (as delivered from manufacturer) wherever possible. Scrap piecing of insulation will not be accepted.

G. Provide removable insulation sections to permit easy access where inspection, service, or repair is required.

H. Install jackets with longitudinal joints facing wall or ceiling.

I. Insulation shall be continuous through sleeves and openings except where partitions or assemblies are fire rated. Penetrations through rated assemblies shall be sealed with fireproofing insulation.

J. Provide a continuous vapor barrier for insulation on the following systems:
   1. Refrigerant
   2. Insulated duct
   3. Condensate drainage
   4. Equipment with a surface temperature below 65º F.

3.2 PIPING, VALVE AND FITTING INSULATION

A. Fittings and valves may be insulated with factory molded "Zeston" type covers, or built up insulation. Built up insulation must have the same thickness as adjoining insulation.

B. One piece, insulated PVC covers may be used for fittings and valves if insulation thickness and thermal performance is the same as adjoining insulation. Seams, joints between PVC cover and adjoining pipe insulation, and any staples or tacks used to secure seams in PVC covers, must be covered with 2 inch wide, 10 mil PVC tape and one coat of vapor barrier mastic.

C. Insulation shall be applied to piping with butt joints and longitudinal seams closed tightly.

D. Minimum acceptable lap on factory applied jackets shall be 2 inches, firmly cemented with lap adhesive.

E. Joints shall be covered with factory furnished tape (2" minimum width) to match the jacket, firmly cemented with lap adhesive.

F. Insulation shall be additionally secured to piping with the use of staples. Where staples are used on systems that require a vapor barrier, the lap and staples must be covered with a finish coat of vapor barrier mastic.

G. Install insulation with smooth and even surfaces, and on clean and dry surfaces. Provide neatly beveled terminations. Poorly fitted terminations or use of filler in voids will not be accepted.

H. Where anchors or supports are secured directly to the pipe, extend insulation up the anchor or support for a distance of 4 times the insulation thickness. Maintain vapor barrier where insulation is terminated.

I. Elastomeric insulation may be used where piping is not in a return air plenum.

J. Elastomeric insulation shall be slipped onto the pipe prior to connection wherever possible. Where the slip on technique is not possible, the insulation shall be slit, and applied to the pipe. Seams and butt joints shall be sealed with an adhesive recommended by the insulation manufacturer.

K. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints. Insulation for valves, unions, strainers, flexible connections and expansion joints shall be removable for inspection and repair.

L. Provide insulation as specified in the following schedule:

Service	**Insulation**	**Insulation Thickness by Pipe Size**				
		Type1" and smaller	**1¼" to 2"**	**2½" to 4"**	**5" to 6"**	**8" and larger**
Refrigerant Suction	rigid fiberglass	1"	1½"	1½"	1½"	1½"
Cooling Coil Condensate	rigid fiberglass	1"	1"	1"	1"	1"

3.3 DUCT INSULATION

A. Where ductwork is specified to be pressure tested, do not insulate duct until pressure test has been successfully completed.

B. Duct insulation shall be applied evenly over the duct surface, secured with bonding adhesive in accordance with manufacturer's recommendations.

C. Rigid and flexible insulation on sides and bottom of ductwork over 24" wide shall also be secured with stick clip or weld pin fasteners spaced 18" on center. Where weld pin fasteners are used, they shall be installed without damage to the interior galvanized surface of the duct. Pins to be neatly clipped back to each fastener.

D. Where vapor barrier jackets are specified, pins shall be covered with jacket material matching that of the duct insulation, sealed vapor tight, and covered with vapor barrier mastic.

E. Insulation without factory jacket shall be cut and mitered to suit the surface on which it is being applied. Voids, seams, and joints shall be built up with insulating cement, finished to a smooth surface, and covered with glass fabric.

F. For ductwork surfaces insulated with rigid ductboard insulation, apply 2 coats of vapor barrier mastic after application of the insulating cement. Vapor barrier and weatherproof mastics to be applied with glass fiber reinforcing fabric.

G. Surface of duct must be cleaned before application of adhesives.

H. Stop and point insulation around access doors and damper operators to allow operation without disturbing insulation or jacket material.

I. Where reinforced kraft jackets are used, joints and seams shall be firmly butted together and covered with 3" wide tape furnished by jacket manufacturer, and specifically recommended for the type of jacket being used.

J. On exterior ducts use mechanical fasteners for insulation. Provide overlapping insulation joints on exterior applications. Seal joints, breaks, and penetrations of vapor barrier facing with a vapor barrier tape as recommended by jacket manufacturer. Apply two coats of weatherproof mastic covering over the duct insulation with a glass fabric jacket between the two coats. Mastic surface shall have a smooth outside finish.

K. Provide duct insulation as specified in the following table for all new ductwork:

Service	**Insulation Type**	**Insulation Thickness**
Concealed supply ducts	Flexible fiberglass	1½"
Exposed supply ducts in equipment rooms and other non-finished areas	Rigid fiberglass	1½"
Exposed supply ducts in finished/occupied areas	Rigid fiberglass	1½"
Exhaust ducts downstream of motorized backdraft dampers	Flexible fiberglass	1½"
Ducts exposed to weather	Rigid fiberglass	3" (2 - 1½" layers)**

** Wrap insulated ductwork exposed to weather with self-adhesive, puncture proof, aluminum clad wrap such as Venture tape or equal. Complete installation shall provide vapor barrier.

Ducts in unconditioned spaces (attics, etc.)	Rigid fiberglass	3" (2 - 1½" layers)

END OF SECTION 230700

SECTION 230914 - INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 - GENERAL

1.1 SCOPE

A. This section includes pneumatic and/or electronic control system specifications for all HVAC work as well as related pneumatic control for systems found in other specification sections. Included are the following topics:

1.2 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 09 93 – Sequence of Operations for HVAC Controls

C. Section 23 33 00 – Air Duct Accessories

D. Section 23 82 13 – Terminal Heating Units (Electric)

E. Division 26 – Electrical

1.3 REFERENCE

A. Applicable provisions of Division 01 govern work under this Section.

B. Electrical work shall be constructed in accordance with requirements of Division 26 of these specifications (Electrical).

1.4 REFERENCE STANDARDS

A. ASTM D1693 Environmental Stress-Cracking of Ethylene Plastics

B. UL94 Standard for Flammability of Plastic Materials for Parts in Devices and Appliances

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.6 SYSTEM DESCRIPTION

A. Systems shall be electric/electronic.

1.7 SUBMITTALS

A. Include the following information: Manufacturers data sheets indicating model number, pressure/temperature ratings, capacity, methods and materials of construction, installation instructions, and recommended maintenance.

1.8 DEMOLITION

A. Where existing control devices or wiring are discontinued from use, remove from premises. Remove any previously abandoned control devices in a similar manner.

1.9 DESIGN CRITERIA

A. Size control apparatus to properly supply and/or operate and control the apparatus served.

B. Provide control devices subject to corrosive environments with corrosion protection or construct them so they are suitable for use in such an environment.

C. Provide devices exposed to outside ambient conditions with weather protection or construct them so they are suitable for outdoor installation.

D. Use only U.L. labeled products which comply with NEMA Standards. Electrical components and installation to meet all requirements of the electrical sections (Division 26) of project specifications.

1.10 OPERATING AND MAINTENANCE MANUALS

A. Furnish three bound operating and maintenance manuals for review and approval prior to substantial completion, system testing and Owner training.

B. Operation and maintenance instructions for the equipment and systems shall include, at a minimum, the following items:
   1. Recommendations for frequency of service and preventative maintenance.
   2. List indicating types and grades of oil and/or grease, packing materials, normal and abnormal tolerances for devices, and method of equipment adjustment.
   3. A description of recommended replacement parts and materials which the owner should stock.
   4. A summary of equipment vendors, or location where replacement parts can be purchased.
   5. Manufacturer's literature indicating features, materials of construction, and operating limits of installed equipment; brochures giving brief descriptions of multiple pieces of control apparatus are not acceptable.
   6. A complete set of record control drawings.
   7. Name, address, and telephone number of the person or office to contact for service during the warranty period.
   8. Name, address, and telephone number of the person or service organization to be contacted for service after the warranty period.

1.11 OWNER TRAINING

A. Provide training to the Owner's Representatives, concerning the proper operation and maintenance of all control systems and all sensing, monitoring, and control equipment. Training sessions shall be conducted during normal business hours after system start-up and acceptance by Owner.

B. Submit operating and maintenance manuals to Owner a minimum of five (5) working days prior to training session. Use these manuals as the basis for instruction at all training sessions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Johnson Controls, Honeywell, Barber-Colman, Andover, CSI or approved equal.

2.2 THERMOSTATS

A. Provide insulated sub base for all thermostats installed on outside walls or walls exposed to outside air temperatures.

B. LOW VOLTAGE THERMOSTATS
   1. Electronic type with automatic night setback, suitable for heating or heating and cooling as required. Provide setback schedule adjustment through keypad entry on front of unit.

C. LINE VOLTAGE THERMOSTATS
   1. Use single or two pole as required, with minimum rating equal to electrical load of device being controlled. Provide integral manual On/Off/Auto selector switch, maximum dead band of 2° F, concealed temperature adjustment, and locking cover.

2.3 TIME CLOCKS

A. UL listed, electronic digital type with individual 365 day programming, including holiday schedules, daylight savings compensating, adjustable set-up and setback schedules and manual bypass override switch. Unit shall include battery back-up to prevent data loss. Upon restoration of power after power loss, the unit/system shall return to the current mode of operation of which the schedule period is designated.

2.4 POWER SUPPLIES

A. Provide all required power supplies for transducers, sensors, transmitters and relays.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install system with trained mechanics employed by the control equipment manufacturer or an authorized representative of the manufacturer. Where installing contractor is an authorized representative of the control manufacturer, such authorization shall have been in effect for a period of no less than three years.

B. Install all control equipment, accessories, wiring, and piping in a neat and workmanlike manner. All control devices must be installed in accessible locations.

C. Provide all electrical relays and wiring, line and low voltage, for control systems, devices and components. Install all wiring in metal conduit, in accordance with electrical sections (Division 26) of this specification and the National Electrical code.

D. Controls serving equipment fed by emergency power shall also be served by emergency power.

E. Install "hand/off/auto" selector switches on systems where automatic interlock controls are specified. When switch is in "hand" position, allow manual operation of the selected device without operating the interlocked motors but allowing all unit safety devices to stay in the circuit.

F. After completion of installation, test and adjust control equipment. Submit data showing set points and final adjustments of controls.

G. at each valve and damper actuator branch line.

3.2 ROOM THERMOSTATS AND TEMPERATURE SENSORS

A. Check and verify location of thermostats and other exposed control sensors with plans and room details before installation. Locate room thermostats 48 inches above floor. Align with light switches and humidistats.

B. Any room thermostats mounted on an exterior wall shall be mounted on a thermally insulated sub-base.

END OF SECTION 230914

SECTION 230993 - SEQUENCE OF OPERATION FOR HVAC CONTROLS

PART 1 - GENERAL

1.1 SCOPE

A. This section includes control sequences describing the manner in which the automatic control systems shall operate. Included are the following requirements:

1.2 RELATED WORK

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

B. Section 23 09 14 – Instrumentation and Control Devices for HVAC

1.3 REFERENCE

A. Provisions of Division 01 govern work under this section.

PART 2 - PRODUCTS

A. NOT USED.

PART 3 - EXECUTION

3.1 DESCRIPTION OF WORK

A. Control sequence is hereby defined to mean the manner in which, and methods by which, the automatic temperature control system shall function. The requirements for each type of operation are detailed in this section.

B. All necessary operating equipment, devices and system components required for the automatic temperature control system shall be provided whether or not specifically itemized, in order to install a complete automatic temperature control system within the intent of this specification.

C. The extent of the automatic temperature control system work shall be as shown on the drawings and by the control performance requirements as specified in this section.

3.2 CONTROL SEQUENCES

A. Existing Rooftop Unit
   1. Existing programmable thermostat shall be relocated as shown on the plans. Programming shall be reviewed and modified as required to achieve Owner's desired scheduling and operation.
   2. Outside air damper shall be closed during UNNOCCUPIED Mode and when unit is off.
   3. Outside air shall be open during Occupied Mode to provide ventilation rates identified on the plans.

B. Toilet Room Exhaust Fans
   1. Fan operation shall match light operation and shall be controlled by the room occupancy control switch provided by the EC. Control installation and programming is by EC.

C. Split System Air Conditioner
   1. Unit control is by standalone controls provided with system. Contractor shall program and ensure control operation as directed by Owner.

D. Electric Baseboard Heaters
   1. Unit control is by standalone controls provided with unit. Contractor shall program and ensure control operation as directed by Owner.

E. Electric Ceiling/Wall Heaters
   1. Unit control is by standalone controls provided with unit. Contractor shall program and ensure control operation as directed by Owner.

END OF SECTION 230993

SECTION 231100 - NATURAL GAS FUEL PIPING

PART 1 - GENERAL

1.1 SCOPE

A. This section contains specifications for natural gas fuel systems for this project. Included are the following requirements:

1.2 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 29 – Hangers and Supports for HVAC Systems

1.3 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.4 REFERENCE STANDARDS

A. ANSI B16.3 Malleable Iron Threaded Fittings

B. ASTM A53 Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless

C. ASTM A181 Forgings, Carbon Steel for General Purpose Piping

D. NFPA 54 ANSI Z223.1 National Fuel Gas Code

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. Order all Type E and Type S steel pipe with heat numbers rolled, stamped, or stenciled to each length or each bundle, depending on the size of the pipe, and in accordance with the appropriate ASTM specification.

C. Installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the project.

1.6 DESIGN CRITERIA

A. Where valves are specified for individual mechanical services all valves shall be of the same manufacturer unless prior written approval is obtained.

B. Valves and piping specialties are to be rated for the highest pressures and temperatures in the respective system in accordance with ANSI B31, but not less than 125 PSIG at 240□F unless specifically indicated otherwise.

1.7 DELIVERY, STORAGE AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to eliminate rust and corrosion while allowing ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements will not relieve the contractor from using proper storage techniques.

1.8 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

B. Construct piping systems for not less than 125 psig unless specifically indicated otherwise.

C. Piping systems shall comply with NFPA 54, latest edition.

D. Steel piping and fittings shall be manufactured in the United States.

PART 2 - PRODUCTS

2.1 NATURAL GAS

A. 2" and Smaller
   1. ASTM A53, type E or S, standard weight (schedule 40) black steel pipe with ASTM A197/ANSI B16.3 class 150 black malleable iron threaded fittings.

2.2 UNIONS AND FLANGES

A. 2" and Smaller
   1. ASTM A197/ANSI B16.3 malleable iron unions with brass seats. Use black malleable iron on black steel piping and galvanized malleable iron on galvanized steel piping. Use

unions of a pressure class equal to or higher than that specified for the fittings of the respective piping service but not less than 250 PSI.

2.3 GAS VALVES

A. Crane, Walworth, Jenkins, Nibco, Milwaukee or Southern Manufacturing Company are acceptable manufacturers.

B. ½" to 4"
   1. Cast iron body, screwed or flanged ends, bronze bearings, bronze plug and resilient seal ring for drop tight shutoff to 175 PSIG working pressure.

PART 3 - EXECUTION

3.1 ERECTION

A. Remove all foreign material from interior and exterior of pipe and fittings.

B. Install piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping to clear interferences. In all cases, consult drawings for exact location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

C. Mitered ells, notched tees, and orange peel reducers are not acceptable. On threaded piping, bushings are not acceptable.

D. "Weldolets" and "Threadolets" may be used for branch takeoffs up to one-half (½) the diameter of the main.

E. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.

F. Install valves and piping specialties, including items furnished by other sections of work, as specified and detailed. Make connections to equipment installed by other sections of work where that equipment requires the piping services indicated in this section.

G. Piping and equipment is to be installed according to the latest utility requirements, NFPA 54, and local codes.

H. Pitch horizontal piping down 1" in 60 feet in the direction of flow. Install a 4" minimum depth dirt leg at the bottom of each vertical run and at each appliance. When installing mains and branches, cap gas tight each tee or pipe end which will not be immediately extended. All branch connections to the main shall be from the top or side of the main.

I. Piping through the roof shall be run through specified roof penetration with flashing and counter flashing.

J. Exposed (existing and new) gas piping outside of the building (downstream of the gas service meter) shall be painted after installation with a compatible metal primer coat and a finish coat of yellow paint compatible for the application. Gas piping shall be clearly identified with pipe markings as specified under section 23 05 00.

3.2 THREADED PIPE JOINTS

A. Use a thread lubricant or Teflon tape when making joints; no hard setting pipe thread cement or caulking shall be used.

3.3 UNIONS AND FLANGES

A. Install a union or flange at each piping specialty or piece of equipment which may require removal for maintenance, repair, or replacement. Where a valve is located at a piece of equipment, locate the flange or union connection on the equipment side of the valve. Concealed unions or flanges are not acceptable.

3.4 PIPING SYSTEM LEAK TESTS

A. Verify that the piping system being tested is fully connected to components and that equipment is properly installed, wired, and ready for operation. Verify that hangers can withstand the additional weight load that may be imposed by the test.

B. Conduct pressure test with test medium of air to 100 psig. Minimum test time of 24 hours; additional time may be necessary to conduct an examination for leakage. Each test must be witnessed by the Architect or Engineer. Notify the above parties 72 hours prior to pipe system testing. If leaks are found, repair the area with new materials and repeat the test; caulking will not be acceptable.

C. Gradually increase the pressure to not more than one half of the test pressure; then increase the pressure in steps of approximately one-tenth of the test pressure until the required test pressure is reached. Examine joints and connections with a soap bubble solution or equivalent method. The piping system shall show no evidence of leaking.

D. Measure natural gas system test pressure with a manometer or with a pressure measuring device designed to read, record or indicate a pressure loss in the piping system due to leakage during the pressure test period. The test medium shall be air, Nitrogen, or carbon dioxide. OXYGEN OR FUEL GAS SHALL NOT BE USED.

E. The pressure measuring device shall be calibrated in increments not greater than 0.5 PSIG having an accuracy of not less than 1% over the entire range of the pressure measuring device. A Trerice No. 450 gauge, 0-60 PSI range meets these requirements. The piping system shall show no pressure loss. Any pressure drop shall be deemed to indicate the presence of a leak unless the reduction can be attributed to some other cause. Systems will not be accepted until it can be demonstrated that there is no measurable loss of test pressure during the test period.

F. Testing shall conform to the requirements of NFPA Chapter 54, latest edition.

3.5 GAS VALVES

A. Install a line size gas valve and union at each gas appliance connection, and as shown on the drawings.

B. Provide a valved connection at the main for equipment and appliances furnished by other sections of work.

END OF SECTION 231100

SECTION 232300 - REFRIGERANT PIPING

PART 1 - GENERAL

1.1 SCOPE

A. This section contains specifications for refrigerant pipe and pipe fittings for this project.

1.2 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 29 – Hangers and Supports for HVAC Systems

C. Section 23 07 00 – HVAC Insulation

1.3 REFERENCE

A. Provisions of Division 01 govern work under this section.

1.4 REFERENCE STANDARDS

A. ASTM B280 Seamless Copper Tube for Air Conditioning and Refrigeration Field Service

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

B. Order copper refrigeration tube with each shipping unit marked with the purchase order number, metal or alloy designation, temper, size, and name of supplier; with soft straight lengths or coils identified with a tag indicating that the product was manufactured in accordance with ASTM B280; and with each hard temper straight length identified throughout its length by a blue colored marking not less than 3/16 inch in height and a legend at intervals of not greater than three feet that includes the designation "ACR" and pipe outside diameter.

C. Installed material not meeting the specification requirements must be replaced with material that meets these specifications without additional cost to the project.

1.6 DELIVERY, STORAGE AND HANDLING

A. Promptly inspect shipments to insure that the material is undamaged and complies with specifications.

B. Cover pipe to eliminate rust and corrosion while allowing adequate ventilation to avoid condensation. Do not store materials directly on grade. Protect pipe, tube, and fitting ends so they are not damaged. Where end caps are provided or specified, take precautions so the caps remain in place. If end caps are not present on tube bearing the "ACR" designation, clean and re-cap in accordance with ASTM B280. Protect fittings, flanges, and unions by storage inside or by durable, waterproof, above ground packaging.

C. Offsite storage agreements does not relieve the Contractor from using proper storage techniques.

1.7 DESIGN CRITERIA

A. Use only new material, free of defects, rust and scale, and meeting the latest revision of ASTM specifications as listed in this specification.

PART 2 - PRODUCTS

2.1 REFRIGERANT PIPING

A. ASTM B88 type L hard drawn copper tube, cleaned and capped in accordance with ASTM B280, and marked "ACR", with ANSI B16.22 wrought copper or forged brass solder-type fittings.

B. Provide factory furnished refrigerant tubing sets with the air conditioning units as specified in other sections of this specification.

2.2 VENTS AND RELIEF VALVES

A. Use pipe and pipe fittings as specified for the system to which the relief valve or vent is connected.

PART 3 - EXECUTION

3.1 PREPARATION

A. Remove foreign material from interior and exterior of pipe and fittings.

3.2 ERECTION

A. Install piping parallel to building walls and ceilings and at heights which do not obstruct any portion of a window, doorway, stairway, or passageway. Where interferences develop in the field, offset or reroute piping to clear interferences. Consult the plans for the location of pipe spaces, ceiling heights, door and window openings, or other architectural details before installing piping.

B. Mitered ells and notched tees are not acceptable.

C. Do not route piping through transformer vaults or above transformers, panelboards, or switchboards, including the required service space for this equipment, unless the piping is serving this equipment.

D. Remove slivers and burrs remaining from the cutting operation by reaming and filing both pipe surfaces. Clean fitting and tube with emery cloth or sandpaper. Remove residue from the cleaning operation and assemble joint.

E. Solder joints shall be ASTM Grade 4 or 5 and have a melting point of approximately 1250 degrees F. Solder impurities shall not exceed 0.15%. Tubing to be new and delivered to the job site with the original mill end caps in place. Clean and polish joints before soldering. Avoid prolonged heating and burning during soldering. Purge lines with nitrogen during soldering. Provide manual shut-off and check valves to permit system servicing.

F. No refrigerant is to be vented directly to the atmosphere except that which may escape through leaks in the system during leak testing. During evacuation procedures, use equipment designed to recover and allow recycling of the refrigerant.

G. Refrigeration piping to be installed by firms who are experienced in installation of refrigerant piping.

3.3 PIPING SYSTEM LEAK TEST

A. Verify that the piping system being tested is fully connected to system components and that equipment is properly installed, wired, and ready for operation.

B. Leak test the system by charging the system to a pressure of 10 psig with an HFC refrigerant, with the compressor suction and discharge valves closed and with all other system valves open. Increase pressure to 300 PSIG with dry nitrogen. Rap joints with a mallet and check for leaks with an electric leak detector having a certified sensitivity of at least one ounce per year. Seal leaks and retest.

C. After completion of the leak test, evacuate the system with a vacuum pump to an absolute pressure not exceeding 1500 microns while the system ambient temperature is above 60°F. Break the vacuum to 2 PSIG with the refrigerant to be used in the system. Repeat the evacuation process, again breaking the vacuum with refrigerant. Install a drier of the required size in the liquid line, open the compressor suction and discharge valves, and evacuate to an absolute pressure not exceeding 500 microns. Leave the vacuum pump running for not less than two hours without interruption. Raise the system pressure to 2 PSIG with refrigerant and remove the vacuum pump.

D. Charge refrigerant directly from original containers through a combination filter-drier. Each drier may be used for a maximum of three cylinders of refrigerant and then must be replaced with a fresh drier. Charge the system by means of a charging fitting in the liquid line. Weigh the refrigerant drum before charging so that an accurate record can be kept of the weight of refrigerant put in the system. If refrigerant is added to the system through the suction side of the compressor, charge in vapor form only.

E. Do not insulate pipe until it has been successfully tested.

END OF SECTION 232300

SECTION 233100 - HVAC DUCTS AND CASINGS

PART 1 - GENERAL

1.1 SCOPE

A. This section includes specifications for duct systems used on this project. Included are the following requirements:

1.2 RELATED WORK

A. Section 23 05 00 – Common Work Results for HVAC

B. Section 23 05 29 – Hangers and Supports for HVAC Systems

C. Section 23 33 00 – Air Duct Accessories

D. Section 23 05 93 – Sequence of Operation for HVAC Controls

1.3 REFERENCE

A. Provisions of Division 01 govern work under this Section.

1.4 REFERENCE STANDARDS

A.	ANSI/ASTM B209	Specification for Aluminum and Aluminum-Alloy Sheet and Plate
B.	ASTM A90	Test Method for Weight of Coating on Zinc-Coated (Galvanized) Iron or Steel Articles
C.	ASTM A653/A653M	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
D.	ASTM C 1071	Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material)
E.	NFPA 90A	Standard for the Installation of Air Conditioning and Ventilating Systems
F.	UL 181	Factory-Made Air Ducts and Air Connectors.

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.6 DESIGN CRITERIA

A. Construct ductwork to be free from vibration, chatter, objectionable pulsations and leakage under specified operating conditions.

B. Use material, weight, thickness, gauge, construction and installation methods as outlined in the latest editions of the following SMACNA publications, unless noted otherwise:
   1. HVAC Duct Construction Standards, Metal and Flexible
   2. HVAC Air Duct Leakage Test Manual,
   3. HVAC Systems - Duct Design

C. Use products which conform to NFPA 90A, possessing a flame spread rating of not over 25 and a smoke developed rating no higher than 50.

PART 2 - PRODUCTS

2.1 GENERAL

A. Spiral round ductwork 12" diameter and less shall be 26 gauge or heavier.

B. Other sheet metal used for construction of duct shall be 24 gauge or heavier.

C. Duct sizes indicated on plans are net inside dimensions; where duct liner is specified, dimensions are net, inside of liner.

D. Duct system pressure classes shall be according to the following schedule:

Duct type/location	***Pressure class***	***Duct Construction***	***Inner Wall***	***Lining***
Supply ducts	2 inch positive	Single wall	None	No
Return ducts	2 inch negative	Single wall	None	No
Transfer ducts	½ inch positive	Single wall	None	Yes
Exhaust ducts	2 inch negative	Single wall	None	No

2.2 MATERIALS

A. GALVANIZED STEEL SHEET
   1. Use ASTM A924 (Formerly ASTM A525) or ASTM A653 (Formerly ASTM A527) galvanized steel sheet of lock forming quality. Galvanized coating to be 1.25 ounces per square foot, both sides of sheet, G90 in accordance with ASTM A90.

2.3 FLEXIBLE DUCT

A. Manufacturers
   1. Clevaflex, Thermaflex, Wiremold or Flexmaster.
   2. Factory fabricated, UL 181 listed as a class 1 duct, and having a flame spread of 25 or less and a smoke developed rating of 50 or under in accordance with NFPA 90A.

3. Rated for pressures and temperatures involved but not less than a 180°F service temperature and ±6 inch pressure class.
4. Duct to be composed of polyester film, aluminum laminate or woven and coated fiberglass fabric bonded permanently to corrosion resistant coated steel wire helix. Two-ply, laminated, and corrugated aluminum construction may also be used.
5. Where duct is specified to be insulated, provide a minimum 1-inch fiberglass insulation blanket with maximum thermal conductance of 0.23 K (75 degrees F.) and vapor barrier jacket of polyethylene or metalized reinforced film laminate. Maximum perm rating of vapor barrier jacket to be 0.1 perm.

2.4 DUCT LINING

A. Manufacturers
1. Manville, CertainTeed. Owens-Corning or Knauf.
2. Glass fiber material, mat faced with an anti-microbial coating, 1" nominal thickness having a density of 3 lbs/FT^3 with maximum thermal conductivity of 0.25 Btu-inch per hour-square foot - degree F at 75°F mean temperature and an acoustical performance rating of NRC.060.
3. Liner shall be rated in accordance with the following standards:
   a. ASTM C 1071
   b. NFPA 90A and 90B
   c. UL181
   d. ASTM C 1104
   e. ASTM C 665
   f. ASTM G 22
   g. ASTM C 1338
   h. ASTM G 21
4. Air friction correction factor shall not exceed 1.15 at 2000 fpm air velocity.
5. Lining and adhesive shall be rated for air velocities to 6000 fpm and temperatures to 250°F.

2.5 LOW PRESSURE DUCTWORK (Maximum 3 inch pressure class)

A. GENERAL
1. Fabricate and install ductwork in sizes indicated on the drawings and in accordance with SMACNA recommendations, except as modified below.
2. Construct so that interior surfaces are smooth. Use riveted or bolted construction when fabricating ductwork. Sheet metal screws may be used on duct hangers, transverse joints and other SMACNA approved locations if the screw does not extend more than ½ inch into the duct.
3. Use elbows and tees with a center line radius to width or diameter ratio of 1.0 wherever space permits. When a short radius (less than 1.0 ratio) elbow must be used due to limited space, install single wall sheet metal turning vanes in accordance with Section 23 33 00. Where space does not allow, and the C value of the radius elbow, as given in SMACNA publications, exceeds 0.31, use rectangular elbows with turning vanes as specified in Section 23 33 00. Square throat-radius heel elbows is not acceptable.
4. Where rectangular elbows are used, provide turning vanes in accordance with Section 23 33 00.

5. Provide expanded take-offs for branch duct connections or 45-degree entry fittings. Square edge 90-degree take-off fittings or straight taps is not acceptable.
6. Round ducts may be substituted for rectangular ducts if sized in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission of the Architect/Engineer.
7. 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.

B. SINGLE WALL ROUND AND OVAL
1. Manufacturers
a. Ajax, Semco, Lindab or United Sheet Metal.
b. Machine formed round and flat oval spiral lock seam duct constructed of G-90 galvanized steel.
c. Contractor fabricated spiral round ductwork meeting specified construction standards is acceptable with prior approval of Architect/Engineer. Submit construction details, a description of materials to be used, type of service, reinforcing methods, and sealing procedures.

2.6 DUCT SEALANT

A. Manufacturer
1. 3M 800, 3M 900, H.B. Fuller/Foster, Hardcast, Lockformer cold sealant, Mon-Eco Industries, or United Sheet Metal.
2. Install sealants in strict accordance with manufacturer's recommendations, paying special attention to temperature limitations. Allow sealant to fully cure before pressure testing of ductwork, or before startup of air handling systems.

2.7 GASKETS

A. 3 INCH PRESSURE CLASS AND LOWER
1. Soft neoprene gaskets in combination with duct sealant for flanged joints.
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PART 3 - EXECUTION

3.1 INSTALLATION

A. Verify dimensions at the site, making field measurements and drawings necessary for fabrication and erection. Check plans showing work of other trades and consult with Architect in the event of any interference.

B. Make allowances for beams, pipes or other obstructions in building construction and for work of other contractors. Transform, divide or offset ducts to fit the installation, in accordance with SMACNA HVAC Duct Construction Standards, Figure 2-10, Fig. C, except do not reduce duct to less than six inches in either dimension and do not exceed an 8:1 aspect ratio. Where it is necessary to take pipes or similar obstructions through ducts, construct easement as specified in

SMACNA HVAC Duct Construction Standards, Figure 2-10, Fig. E. In all cases, seal to prevent air leakage. Pipes or similar obstructions may not pass through high pressure or fume exhaust ductwork.

C. Cut or drill temporary test holes in ducts for all testing required. Cap with neoprene plugs, threaded plugs, or threaded or twist-on metal caps. Test openings for test and balance work will be provided under Section 23 05 93.

D. Provide frames constructed of angles or channels for coils, filters, dampers or other devices installed in duct systems, and make connections to equipment including equipment furnished by other sections of work. Secure frames with gaskets and screws or nut, bolts and washers.

E. Install duct to pitch toward outside air intakes to outside of building. Solder or seal seams to form watertight joints in outside air intake ducts.

F. Where two different metal ducts meet, the joint shall be installed in a manner that metal ducts do not contact each other by using proper seal or compound.

G. Install motor operated dampers and connect to, or install equipment furnished by other sections of work.

H. Blank off unused portions of louvers with 1½ inch board insulation with galvanized sheet metal backing on both sides.

I. Do not install ductwork through dedicated electrical rooms or spaces unless the ductwork is serving this room or space.

J. Locate ducts with space around equipment to allow normal operating and maintenance activities.

K. During construction provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system. Protect ductwork against entry of foreign matter during construction.

L. Use double nuts and lock washers on threaded rod supports for ducts.

M. Remove dirt and foreign matter from the entire duct system and clean diffusers, registers and grilles before operating fans.

N. Provide temporary capping of ductwork to prevent entry of foreign matter during construction.

O. Ductwork located outside the building that is exposed to the weather shall have seams and joints soldered or caulked watertight. Ductwork shall be reinforced additionally by a factor of 50% beyond the reinforcing requirements as specified in the SMACNA duct construction manual. Ductwork shall be externally covered with duct insulation as specified under section 23 07 00. Exhaust ductwork need not be insulated. Under no conditions is the use of tape acceptable for sealing ducts exposed to the weather.

P. When appropriate, metallic foil backed duct tape may be used to seal duct seams and joints. Under no circumstances shall “typical” cloth duct tape be used for sealing ductwork, or for any other purpose.

Q. Install turning vanes in rectangular, mitered elbows in accordance with SMACNA standards. Follow turning vane manufacturer's recommendations for installation.

R. Support ductwork from the building construction in accordance with SMACNA standards and guidelines. Refer to Section 23 05 29 for anchors and supports required to suspend ductwork from concrete structures and steel structural members.

S. For ductwork running through joists or trusses, do not support ductwork by laying on the bottom chord. Hang ductwork from the top chord of the truss or joist.

T. Wire hangers shall only be used for rounds ducts 12 inches or less in diameter. Rectangular ducts and larger diameter round ducts shall be supported with strap hangers or steel shapes or uni-strut supports in accordance with SMACNA standards.

3.2 FLEXIBLE DUCT

A. Flexible duct may be used for final connection of air outlets, diffusers and grilles. Where flexible duct branch run-out is perpendicular to the air outlet connection, provide a sheetmetal elbow at the connection to the air outlet to facilitate connection of the flexible duct. Where flexible duct is used, it shall be the minimum length required to make the final connections, but no greater than [5] [10 feet in length with support spacing not exceeding every 4 feet].

B. Secure flexible ducts to the rigid branch duct with stainless steel draw bands. The use of sheetmetal screws or duct tape to attached flexible ducts to hard ducts is not acceptable.

C. Flexible duct used to compensate for misalignment of main duct or branch duct is not acceptable.

D. Flexible ductwork is not acceptable in mechanical chases or in exposed locations.

E. Individual sections of flexible ductwork shall be of one-piece construction. Splicing of short sections is not acceptable.

F. Penetration of partitions, walls, or floors with flexible duct is not acceptable.

G. The use of flexible ductwork for connecting branch ducts to exhaust and return grilles is not acceptable.

3.3 DUCT LINING

A. When lining ductwork as specified in the schedule listed under part 2 of this section, follow the following requirements:
   1. Line only the first 30 feet upstream of the return fan/air handling unit only when lining return air ductwork.
   2. Line only supply ductwork five feet downstream of VAV terminals (when lining is specified under the schedule in part 2).

3.4 LOW PRESSURE DUCTWORK (Maximum 3 inch pressure class)

A. Seal ductwork in accordance with SMACNA seal class "B". All seams, joints, and penetrations shall be sealed.

B. Install a manual balancing damper in each branch duct and for each diffuser or grille. The use of splitter dampers, extractors, or grille face dampers is not acceptable as use as a balancing dampers.

C. Hangers must be wrapped around bottom edge of duct and securely fastened to duct with sheetmetal screws or pop rivets. Trapeze hangers may be used at Contractor's option.

3.5 LEAKAGE TEST

A. Test ductwork in accordance with test methods described in Section 5 of SMACNA HVAC Air Duct Leakage Test Manual. Do not insulate ductwork until it has been successfully tested. Test pressure shall be equal to the duct pressure class.

B. If in the opinion of the engineer excessive air leakage is found the contractor shall locate leaks, repair the duct in the area of the leak, seal the duct, and retest.

END OF SECTION 233100

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE

A. This section includes accessories used in the installation of duct systems. Included are the following requirements:

1.2 RELATED WORK

A. Section 23 05 29 – Hangers and Supports for HVAC Systems

1.3 REFERENCE

A. Provisions of Division 01 govern work under this Section.

1.4 REFERENCE STANDARDS

A. NFPA 90A Standard for Installation of Air Conditioning and Ventilating Systems

B. SMACNA HVAC Duct Construction Standards - Metal and Flexible, First Edition, 1985

C. UL 214

D. UL 555 Standard for Fire Dampers and Ceiling Dampers

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.6 SUBMITTALS

A. Submit for ductwork accessories specified under this section. Include dimensions, capacities, ratings, installation instructions, and appropriate identification.

B. Include certified test data on dynamic insertion loss, self-noise power levels, pressure losses, and aerodynamic performance of each sound attenuator at its specified conditions.

C. Submit manufacturer's color charts where finish color is specified to be selected by the Architect/Engineer.

D. Fire dampers submittals shall include free area data, certified pressure drop data and air leakage data for the actual damper sizes used.

PART 2 - PRODUCTS

2.1 MANUAL VOLUME DAMPERS

A. Manufacturers
1. Air Balance, Kees, Nailor, Ruskin, or Vent Products.
2. Dampers must be constructed in accordance with SMACNA Fig. 2-12 and Fig. 2-13, and notes relating to these figures, except as modified below.
3. Reinforce blades to prevent vibration, flutter, or other noise. Construct dampers in multiple sections with mullions where width is over 48 inches. Use rivets or tack welds to secure individual components; sheet metal screws will not be accepted. Provide operators with locking devices and damper position indicators for each damper; use an elevated platform on insulated ducts. Provide end bearings or bushings for all volume damper rods penetrating ductwork constructed to a 3" W.C. pressure class or above.

2.2 TURNING VANES

A. Manufacturers
1. Aero Dyne, Anemostat, Barber-Colman or Hart & Cooley.
2. Construct turning vanes and runners for square elbows in accordance with SMACNA Fig. 2-3 and Fig. 2-4 except use only airfoil type vanes. Construct turning vanes for short radius elbows and elbows where one dimension changes in the turn in accordance with SMACNA Fig. 2-2 and Fig. 2-5.

2.3 GRAVITY BACKDRAFT DAMPERS

A. Manufacturers
1. Ruskin model CBD4 or equivalent Air Balance, Advanced Air, Cesco, American Warming and Ventilating, Vent Products Company Inc., Greenheck or Arrow.
2. Dampers shall be adjustable type, counterbalanced, self-acting, multiple bladed backdraft air dampers of sizes indicated or required.
3. Dampers shall begin to open in the desired direction of airflow when the upstream to downstream differential static pressure reaches approximately 0.05 to 0.10 inches of water column.
4. Blades shall be constructed of 0.070" thickness aluminum with a 6" maximum blade width, interlocking neoprene or extruded vinyl blade edge seals, dust proof ball bearing shaft supports, interconnecting linkage and adjustable counterbalancing weights.
5. Frame shall be constructed of 0.081 thickness extruded aluminum.

2.4 FIRE DAMPERS

A. Manufacturers
   1. Greenheck, Ruskin, Air Balance, Advanced Air, American Warming and Ventilating, Cesco, Nailor, National Control Air, Safe-Air, Phillips-Aire, or Prefco.
   2. Fire damper assemblies shall be UL 555 listed and labeled for the application and meet requirements of NFPA 90A. Dampers shall be type B. Damper blades must be 100% out of air stream; dampers with blades in the air stream will not be accepted. Damper fire rating to be compatible with the rating of the building surface in which the damper is used.
   3. Use ceiling fire dampers that are designed for use in floor or roof/ceiling assemblies in which they are to be installed.
   4. Provide closure springs and latches for horizontal damper installations.
   5. Fire dampers installed in stainless steel or aluminum duct systems shall be constructed of stainless steel.
   6. Factory provided integral damper sleeves are not acceptable.
   7. Provide pressure drop information as part of the damper submittal.

2.5 ACCESS DOORS

A. Manufacturers
   1. SMACNA Standard access doors as manufactured by Greenheck, Ruskin, Air Balance, Advanced Air, American Warming and Ventilating, Vent Products Company Inc., or Arrow.
   2. Access doors shall be constructed in accordance with SMACNA Fig. 2-10 and Fig. 2-11, and notes relating to these figures, except as modified below.
   3. Construction to be rated for the pressure class of the duct in which the door is to be installed. Materials of construction to be identical to adjacent ductwork. Doors in exposed areas shall be hinged type with sash lock. Doors in concealed spaces may be secured in place with cam latches. Gasket all access doors. Use insulated doors when installed in insulated ductwork. Access doors constructed with sheet metal screw fasteners will not be accepted.
   4. Use insulated, 1½ hour UL 555 listed and labeled access doors in kitchen exhaust ducts.

2.6 FLASHINGS

A. Provide flashing and counterflashing for roof curbs, roof equipment rails and roof pipe portals as required. Flashing and curbs for duct and pipe penetrations of roof assemblies to be in accordance with details.

2.7 DUCT FLEXIBLE CONNECTIONS

A. Material to be fire retardant, be UL 214 listed, and meet the requirements of NFPA 90A.

B. Connections to be a minimum of 3 inches wide, crimped into metal edging strip, and air tight. Connections to have adequate flexibility and width to allow for thermal expansion/contraction, vibration of connected equipment, and other movement.

C. Use coated glass fiber fabric for all applications.Material for inside applications to be double coated with neoprene, air and water tight, rated for temperatures between -10° F and 200° F, and have a nominal weight of 30 ounces per square yard. Material used for outdoor applications be double coated with Hypalon, air and water tight, rated for temperatures between -10° F and 250° F, and have a nominal weight of 26 ounces per square yard.

PART 3 - EXECUTION

3.1 MANUAL VOLUME DAMPERS

A. Install manual volume dampers in each branch duct and for each grille, register, or diffuser as far away from the outlet as possible while still maintaining accessibility to the damper. Install so there is no flutter or vibration of the damper blade(s).

B. Splitter dampers shall not be used in place of volume dampers. Splitter dampers are not allowed on any duct system.

3.2 TURNING VANES

A. Install turning vanes in all rectangular, mitered elbows in accordance with SMACNA standards and manufacturer's recommendations.

B. Install double wall, airfoil, 2 inch radius vanes in ducts with vane runner length 18" or greater and air velocity less than 2000 fpm. Install double wall, airfoil, 4½ inch radius vanes in ducts with vane runner length 18" or greater and air velocity 2000 fpm or greater.

C. If duct size changes in a mitered elbow, use single wall type vanes with a trailing edge extension. If duct size changes in a radius elbow or if short radius elbows must be used, install sheetmetal turning vanes in accordance with SMACNA Figure 2-5 and Figure 2-6.

3.3 GRAVITY BACKDRAFT DAMPERS

A. Install dampers at locations indicated on plans. Provide a duct access door for service and access to the counterbalancing weight for inspection and adjustment.

3.4 FIRE DAMPERS

A. Install dampers in strict accordance with manufacturer's installation instructions. Install damper sleeves with retaining angles on both sides of rated partition. Connections of ductwork to fire damper assemblies to be as specified on the installation instructions. Where it is necessary to set dampers out from the rated wall, install a sleeve extension encased in two hour rated fire proofing insulation. Install an access door at each fire damper, located to permit resetting the damper replacing the fusible link.

B. Manually test each fire damper for proper operation by removing the fusible link. Repair or replace all fire dampers that do not close completely. Re-install fusible link after test.

C. Fire dampers are not permitted in laboratory hood fume exhaust duct applications.

D. Identify all fire and smoke dampers. Dampers shall be permanently identified on the exterior of the duct with a label (or painted) having a minimum letter height of 1”. Identification shall read: “FIRE DAMPER”

3.5 ACCESS DOORS

A. Install access doors where specified, indicated on the drawings, and in locations where maintenance, service, cleaning or inspection is required. Examples include, but are not limited to motorized dampers, fire and smoke dampers, smoke detectors, fan bearings, heating and cooling coils, filters, valves, air flow measuring stations, and control devices needing periodic maintenance.

B. Provide duct access doors to be to perform the intended service. Minimum access door size shall be 8” x 8” inch size for hand access, 18” x 18” inch size for shoulder access, or other size as specified. Provide access doors on inlet side of reheat coils as well as on both sides of other duct mounted coils.

3.6 FLASHINGS

A. Provide flashing and counterflashing for roof curbs. Flashing and curbs for duct and pipe penetrations of roof assemblies to be in accordance with details.

3.7 DUCT FLEXIBLE CONNECTIONS

A. Install at all duct connections to rotating or vibrating equipment, including air handling units, fans, or other motorized equipment. Physical connection to equipment shall be made in accordance with SMACNA Figure for flexible duct connections. Install thrust restraints to prevent excess strain on duct flexible connections at fan inlets and outlets; see Related Work.

END OF SECTION 233300

SECTION 233400 - HVAC FANS

PART 1 - GENERAL

1.1 SCOPE

A. This section includes specifications for fans that are not an integral part of a manufactured device. Included are the following requirements:

1.2 RELATED WORK

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

B. Section 23 05 14 – Variable Frequency Drives

C. Section 23 05 29 – Hangers and Supports for HVAC Systems

D. Section 23 33 00 – Air Duct Accessories

1.3 REFERENCE

A. Provisions of Division 01 govern work under this Section.

1.4 REFERENCE STANDARDS

A.	AMCA 203	AMCA Fan Application Manual - Troubleshooting
B.	AMCA 210	Laboratory Method of Testing Fans for Rating
C.	AMCA 300	Reverberant Room Method for Sound Testing of Fans
D.	NFPA 90A	Standard for the Installation of Air Conditioning and Ventilating Systems
E.	UL	Underwriters Laboratory for fan electrical components and wiring.

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.6 SUBMITTALS

A. Include dimensions, capacities, fan curves, materials of construction, ratings, weights, motors and drives, sound power levels, appropriate identification and vibration isolation for equipment. Sound power levels to be based on tests performed in accordance with AMCA Standard 300.

B. Submit color selection charts for equipment where applicable.

C. Fan curves shall indicate the relationship of CFM to static or total pressure for various fan speeds. Brake horsepower, recommended selection range, and limits of operation are to also be indicated on the curves. Indicate operating point on the fan curves at design air quantity and indicate the manufacturer's recommended drive loss factor for the specific application. **Tabular fan performance data is not acceptable**.

D. For units specified with motorized backdraft dampers, submit damper air leakage data with unit shop drawings.

E. Include vibration isolation equipment shop drawing information as part of the fan submittal. Reference Section 23 05 48 for additional requirements.

1.7 DESIGN CRITERIA

A. Tested and certify all fans in accordance with the applicable AMCA test code.

B. Each fan and motor combination shall be capable of delivering 110% of air quantity scheduled at scheduled static pressure. The motor furnished with the fan shall not operate into the motor service factor when operating under these conditions.

C. Consider drive efficiency in motor selection according to manufacturer's published recommendation or according to AMCA Publication 203, Appendix L.

D. Where inlet and outlet ductwork is field modified at fan location from what is shown on the drawings, provide all required motor, drive and wiring changes required due to increased static pressure or baffling necessary to prevent uneven airflow or improve mixing.

E. Internal insulation and other components exposed to the air stream are to meet the flame spread and smoke ratings contained in NFPA 90A.

PART 2 - PRODUCTS

2.1 GENERAL

A. Use fan size, class, type, arrangement, and capacity as scheduled.

B. Furnish complete with motors, wheels, drive assemblies, bearings, vibration isolation devices, and accessories required for specified performance and proper operation.

C. Single-phase motors shall have inherent thermal overload protection.

D. Statically and dynamically balance fans so they operate without objectionable noise or vibration.

2.2 CENTRIFUGAL FANS

2.3 CEILING EXHAUST FANS

A. Manufacturers
   1. Greenheck, Broan, Carnes, Cook, Jenco or ILG.
   2. Centrifugal blower wheel, steel housing with integral exhaust grille, adjustable mounting brackets to allow for varying ceiling thickness, permanently lubricated motor, integral junction box with permanently lubricated and thermally protected motor factory wired, and integral backdraft damper.
   3. Furnish a solid state, variable speed controller for each fan. Speed controller to be used for final air balancing of the fan.
   4. Provide wall cap, eave, brick vent or roof cap/jack discharge assembly as specified on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

A. Install units as shown on the drawings, as detailed, and according to manufacturer's installation instructions. On units provided with a drain connection, install a drain valve and cap discharge of drain.

B. Furnish wall and roof opening locations and dimensions to other sections of work requiring opening information.

C. For direct drive fans furnished with variable fan speed controllers, the Electrical Contractor will wire and install the fan speed controllers on the fans.

3.2 CEILING EXHAUST FANS

A. Installation of fan speed controllers is provided by other sections of work.

END OF SECTION 233400

SECTION 233713 - DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SCOPE

A. This section includes specifications for air devices, which includes grilles, registers, ceiling diffusers and slot diffusers used on this project. Included are the following requirements:

1.2 RELATED WORK

A. Section 23 31 00 – HVAC Ducts and Casings

B. Section 23 33 00 – Air Duct Accessories

1.3 REFERENCE

A. Provisions of Division 01 shall govern work under this section.

1.4 REFERENCE STANDARDS

A. ISO Standard 5219 and 3741

B. ADC Test Code 1062 GRD84

C. ASHRAE

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.6 SUBMITTALS

A. Include sizes, air flow quantities, types, appropriate identification, locations, quantities, materials of construction, performance ratings, accessories, finishes and appropriate frame styles for the various mountings.

1.7 WORK OF OTHER SECTIONS

A. Door transfer grilles are furnished and installed by other sections of work. Coordinate door grille locations and sizes with the trade of work furnishing and installing the door grilles to for proper sizing and placement.

B. Openings for door transfer grilles are furnished by other sections of work. Coordinate door grille locations and sizes with the trade of work furnishing the doors/openings for proper sizing and placement of door grille openings.

PART 2 - PRODUCTS

2.1 GENERAL

A. Grilles, registers and diffusers shall be provided with the appropriate frames compatible with ceiling types. Coordinate ceiling types with other trades.

B. Registers shall be provided with opposed blade manual volume dampers.

C. Finishes are specified within. Verify finishes with the Architect prior to ordering grilles. Submit color charts for custom finishes were applicable.

2.2 MANUFACTURERS

A. Titus, Carnes, Krueger, Metalaire, Nailor, Price or Tuttle & Bailey.

2.3 GRILLES AND REGISTERS

A. Grilles shall be types as scheduled on the plans.

B. Provide aluminum grilles and registers for areas serving high humidity rooms including shower and tub rooms.

C. Frame types and styles shall be compatible with the specified mountings.

2.4 DIFFUSERS

A. SQUARE CEILING DIFFUSERS
   1. Square faced, lay-in or surface mounting as specified with adjustable center core for variation from horizontal to vertical air throw and baked enamel finish of color as selected by the Architect or as specified on the plan schedule.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Mount grilles to provide sight proof view.

B. Grilles and registers shall be securely and neatly attached to the building construction or sheet metal duct flanges.

C. Adjust front and rear blades for draft free air pattern.

D. Diffusers shall be securely mounted to the sheet metal duct construction.

E. Where grilles, registers, or diffusers are permitted to be connected to the duct system by flexible duct; the inner non metallic metal duct shall be connected using a drawband and the outer insulation/vapor barrier shall be attached using a drawband. If a plastic drawband is used it must be plenum rated. The use of duct tape or insulating tape as the means of attachment is not acceptable.

F. Drop ducts from bottom of supply duct to diffuser shall be same size as the diffuser neck duct collar.

G. Coordinate exact locations of grilles, registers and diffusers with other trades to avoid interferences.

H. Grilles or registers mounted on a painted masonry wall shall have silicon sealant applied around the entire perimeter of the grille/register in a color matching the wall.

I. Diffusers or grilles mounted in a hard ceiling, where the ceiling construction is the vapor barrier separation from an unconditioned attic space, shall have a silicon sealant applied around the entire perimeter of the diffuser/grille to maintain the vapor barrier. Coordinate this and dother requirements with the GC.

J. Coordinate door grille locations and sizes with the trade of work furnishing the doors/openings for proper sizing and placement of door grille openings.

END OF SECTION 233713

SECTION 238126 - SPLIT SYSTEM AIR CONDITIONERS

PART 1 - GENERAL

1.1 SCOPE

A. This section contains specifications for split system air conditioning units for this project. Included are the following topics:

1.2 RELATED WORK

A. Section 23 05 15 – HVAC Valves and Piping Specialties

B. Section 23 05 29 – Hangers and Supports for HVAC Systems

C. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

D. Section 23 09 14 – Instrumentation and Control Devices for HVAC

E. Section 23 09 93 – Sequence of Operation for HVAC Controls

F. Division 26 – Electrical

1.3 REFERENCE

A. Applicable provisions of Division 01 govern work under this Section.

1.4 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.5 DESIGN CRITERIA

A. Units shall be certified in accordance with ARI Standard 210.

B. Units and remote electrically powered components shall contain a unit mounted, factory prewired terminal block. Electrical components shall be U.L. tested, and U.L. labeled.

C. The units (except for power and control wiring to remote condensing units, thermostats and other specialty control interlocking) shall be factory prewired within the unit cabinet and shall meet national, state and local codes. Wiring shall be numbered and connected to a numbered wiring terminal.

D. The entire split system air conditioning unit shall be furnished and installed with components and accessories required for a fully functional system. Verify field piping requirements with the Manufacturer.

1.6 SUBMITTALS

A. Submit for equipment specified under this section. Include data concerning sizes, dimensions, weights, heating capacities, materials of construction, ratings, electrical data, wiring diagrams, refrigerant piping diagrams, controls, options and manufacturers installation requirements, instructions and recommendations.

B. The Manufacturer's shop drawing submittal shall include complete component descriptive literature, detailed electrical wiring and refrigerant piping diagrams and drawings that have been specifically prepared for this project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Mitsubishi, Sanyo, Canatel, Daikin, or Carrier.

2.2 INDOOR UNIT

A. Steel frame and cabinet with neutral color, furniture quality exposed exterior panels; removable exterior panels for access for servicing, and built-in air in intake and discharge louvers. Unit shall include permanent, washable air filters. Filters shall be easily removable for cleaning.

B. Fans shall be vibration isolated, direct drive type.

C. Unit evaporator coil shall have copper tubes, with aluminum fins, refrigerant distributor, and a condensate drain pan with built-in condensate pump capable of providing a 10-foot lift for condensate removal.

2.3 OUTDOOR UNIT

A. Air-cooled, remote mounting, compressor-condensing unit.

B. Unit cabinet shall be zinc, or similarly coated with a corrosion resistant coating and have removable panels for service access.

C. Compressor shall be high efficiency, hermetic type with thermal overloads. Compressor shall have vibration isolators to keep sound to a minimum.

D. Condenser coil shall have copper tubes with aluminum fins.

E. Condenser fan shall be propeller type, with a totally enclosed, direct drive fan motor.

F. Condenser low ambient capacity control shall be capable of providing continuous unit cooling capability down to 0° F ambient outside temperature.

G. Outdoor unit shall contain a full charge of refrigerant and oil for the entire system.

H. Refrigeration system shall include external service valves on the outdoor unit for unit servicing, and a factory supplied, pre-insulated liquid and suction line kit for field installation.

2.4 UNIT ELECTRICAL AND CONTROLS

A. Units shall be complete with motor starters, relays, and control thermostat. Indoor unit fan shall have fan speed controller to allow for fan speed selection from three speeds.

B. Units shall have single point electrical connection (on each section) with electrical characteristics as specified on the equipment schedule, and shall allow either aluminum or copper main conductors to be connected to terminal block power connections.

C. Control thermostat shall be electronic, seven day programmable type with LCD display, auto-changeover control, set-up and set-back schedules, built-in compressor time delay and battery back-up.

PART 3 - EXECUTION

3.1 GENERAL

A. The entire system and components shall be installed and operated in strict accordance with the Manufacturer's instructions and recommendations.

B. Both the indoor and outdoor sections shall be mounted level.

3.2 INDOOR UNIT

A. Suspend the indoor unit from the building structure with hanger rods and spring vibration isolators.

B. Extend cooling coil condensate drain line from the unit condensate connection to the nearest clear water waste drain location.

C. Adjust the unit fan speed to provide proper unit operation, or as specified.

D. Furnish a fusible electrical disconnect switch with fuses to disconnect all electrical power to each indoor unit. EC will install.

3.3 OUTDOOR UNIT

A. Furnish a weatherproof fusible electrical disconnect switch with fuses to disconnect all electrical power to each outside unit E.C. will install.

B. Outdoor units shall be mounted on the roof on roof rail supports.

3.4 START-UP

A. Three copies of a written service report shall be submitted to the Engineer following the initial start-up. It shall be signed by the serviceman responsible for performing the startup and adjustment work. It shall indicate that installation is compete, indicate readings taken, and shall state that the unit has been placed in proper running condition as recommended by the unit manufacturer and within the intent of the Contract Documents.

END OF SECTION 238126

SECTION 238213 - TERMINAL HEATING UNITS (ELECTRIC)

PART 1 - GENERAL

1.1 SCOPE

A. This section includes specifications for electric heating terminal equipment. Included are the following requirements:

1.2 RELATED WORK

A. Section 23 05 13 – Common Motor Requirements for HVAC Equipment

B. Section 23 33 00 – Air Duct Accessories

C. Division 26 – Electrical

1.3 REFERENCE

A. Provisions of Division 01 govern work under this Section.

1.4 REFERENCE STANDARDS

A. UL standards for electrical equipment.

1.5 QUALITY ASSURANCE

A. Substitution of Materials: Refer to Division 01 and the General Conditions of the Contract, Article 3.

1.6 SUBMITTALS

A. Include dimensions, capacities, electrical data, materials of construction, ratings, weights, wiring diagrams, and appropriate identification for equipment in this section. Include color selection charts where applicable.

1.7 DESIGN CRITERIA

A. Electrical Equipment and heaters shall be UL listed for the service specified.

B. Electrical components and work must be in accordance with National Electrical Code.

C. Electrical heating units shall be rated for the voltage and phase as specified on the plan schedules or within the drawings.

D. All electrical items (except external control thermostats) shall be factory prewired to unit mounted electrical junction boxes and be enclosed within a control panel with numbered wiring terminals.

PART 2 - PRODUCTS

2.1 ELECTRIC UNIT HEATERS

A. Manufacturers
   1. Q Mark, Berko or Markel.

B. Unit Casing
   1. Steel with corrosion resistant coating finished in baked enamel with integral unit support points. Units shall have individually adjustable horizontal and vertical discharge louvers.

C. Heating Element
   1. Resistance type metal sheath finned tube in control steps as shown.

D. Fan & Motor
   1. Propeller type fan direct connected to a totally enclosed motor with internal motor overload protection and safety fan guard.

E. Controls
   1. Magnetic contactors for each control step, automatic resetting overheat cut-out, line voltage to low voltage control circuit transformer and a remote mounted, adjustable room thermostat with a 40° F to 80° F range.

2.2 ELECTRIC BASEBOARD

A. Manufacturers
   1. Q Mark, Berko or Markel.

B. Enclosure
   1. Formed steel with bottom front air inlet and top air outlet, corrosion resistant prime coat and a baked enamel finish coat. Provide units with joining strips, end caps, pedestal mounts, column enclosures and inside and outside corners for a complete installation. Provide blank sections of enclosure only where indicated.

C. Heating Element
   1. Low density, cool operating, finned, convective type, corrosion resistant heating element, designed and spaced for even distribution of air across the heating element, and installed to prevent noise of expansion and contraction. Exposed surfaces to touch shall not exceed 120° F.

D. Controls and electrical components
   1. Integral high temperature cut-out, wiring junction box with knockouts for wiring and an integral, adjustable [tamperproof] line voltage thermostat with return air, below element temperature sensor. [Provide each unit with a power relay with 24 volt operating coil or provide power relays to control the indicated quantities of electric baseboard heaters as shown on the drawings. Power relays shall be sized accordingly to control the indicated or required quantities of electric baseboard heaters.]

2.3 ELECTRIC CEILING/WALL HEATERS

A. Manufacturers
   1. Q Mark, Berko or Markel.

B. Enclosure
   1. Corrosion resistant 18 gauge steel for surface or recessed mounting as specified with louvered front panel with baked on enamel satin finish or anodized aluminum trim frame with anodized aluminum louvered front panel.

C. Heater and Fan
   1. Prewired assembly with propeller fan and direct connected motor and finned tube type corrosion resistant heating element, installed to prevent noise of expansion and contraction. The fan and motor shall be balanced and mounted for vibration free operation.

D. Controls
   1. Built-in fan motor delay switch, motor overload protection device, automatic reset high limit heater safety switch, non-fused electrical disconnect switch, transformers and integral adjustable thermostat.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install units in accordance with manufacturer's installation instructions.

B. Coordinate location of units with other trades for correct recess size for recessed units.

C. After installation, provide protective covers to prevent accumulation of dirt on units during balance of construction.

D. Providing required line and low voltage control wiring.

E. Protect finishes from damage during construction.

3.2 ELECTRIC UNIT HEATERS

A. Suspend units from building structure and as high as possible to maintain headroom beneath units.

3.3 ELECTRIC BASEBOARD

A. The baseboard heaters shall be securely mounted on the floor or against the wall surface in accordance with the Manufacturer's instructions.

3.4 ELECTRIC CEILING/WALL HEATERS

A. Install units at locations as specified on the drawings and as detailed.

B. The bottom of the heaters shall be mounted approximately 8 inches above the finished floor line. Securely mount the unit enclosure to the wall at the locations shown, except that due consideration and coordination shall be given to interferences with other construction.

C. Units shall be recessed or surface mounted as specified on the plan schedule.

END OF SECTION 238213

SECTION 260500 - COMMON ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable provisions of Division 00 and Division 01 shall govern Work under this Section.

1.2 WORK INCLUDED IN THE ELECTRICAL CONTRACT

A. The mention of an Article, operation or method requires that the Contractor shall provide same and perform each operation in accordance with the conditions stated. The Contractor shall provide material, labor, equipment and transportation to complete the project in compliance with the Contract Documents.

B. Work shall be installed in accordance with State and Local Inspection Authorities having jurisdiction together with the recommendations of the manufacturer whose equipment is to be supplied and installed under this Contract.

C. Before submitting a bid, each bidder shall examine the drawings relating to their work and shall become informed as to the extent and character of the work required and its relation to other work in the building.

D. The Contractor, in conjunction with the Architect's representative, shall establish exact locations of materials and equipment to be installed. Consideration shall be given to construction features, equipment of other trades and requirements of the equipment proper.

E. Materials shall be suitably stored and protected prior to installation and work shall be protected after installation, during construction and prior to acceptance.

F. The Contractor shall furnish scaffolding, rigging, hoisting and services necessary for delivery, erection and installation of equipment and apparatus required to be installed by the Contractor. This equipment shall be removed by the Contractor upon completion of the project.

G. Refer to General Requirement for temporary electrical service.

1.3 DEFINITIONS

A. The Owner. The individual who the Owner selects as the project representative.

B. The Architect.

C. The Engineer. Arnold & O'Sheridan, Inc., Consulting Engineers, Inc., Madison, Wisconsin.

D. Provide. Furnish, install and wire ready for service.

E. Exposed. Exposed to view in room, corridor or stairway.

F. Code. National, State and Local Electrical codes including OSHA requirements.

G. Substitution. Manufacturer or method other than those listed by name in these specifications, on the drawings, or in an addendum.

H. Signal voltage. NEC class 1, 2, or 3 remote control, signaling, or power limited circuits.

I. Low voltage. 50 to 600 volts.

1.4 ABBREVIATIONS

A. A/E: Architect or Engineer

B. ENGR: Engineer

C. NEC: National Electrical Code

D. NEMA: National Electrical Manufacturer's Association

E. NFPA: National Fire Protection Association

F. OSHA: Occupational Safety and Health Administration

G. UL: Underwriter's Laboratories

H. NECA: National Electrical Contractors Standards of Installation.

I. ANSI:American Society for testing Materials.

J. IEEE: Institute of Electrical and Electronic Engineers.

K. ASTM: American Society for testing Materials.

L. IPCEA: Insulated Power Cable Engineers Association.

M. ETL: Electrical Testing Laboratories.

1.5 PERMITS AND LICENSES

A. The Contractor shall prepare and submit applications and working drawings to authorities having jurisdiction over the project. Licenses and permits required shall be secured and paid for by the Contractor. This includes required submittals for the fire alarm system.

1.6 STANDARDS AND CODES

A. Work shall be installed in accordance with National, State, and Local codes, ordinances, laws, and regulations. Comply with applicable OSHA regulations.

B. Materials shall have a UL or ETL label where a UL or ETL Standard or test exists.

1.7 DIMENSIONS AND DEFINITE LOCATIONS

A. The drawings depicting electric work are diagrammatic and show, in their approximate location, symbols representing electrical equipment and devices. The exact location of equipment and devices shall be established in the field in accordance with instructions from the Architect as established by manufacturer's installation drawings and details.

B. The Contractor shall refer to shop drawings and submittal drawings for equipment requiring electrical connections to verify rough-in and connection locations.

C. Unless specifically stated to the contrary, no measurement of an electric drawing derived by scaling shall be used as a dimension to work by. Dimensions noted on the electric drawings are subject to measurements of adjacent and previously completed work. Measurements shall be performed prior to the actual installation of equipment.

1.8 DRAWINGS

A. The Contractor shall keep a detailed up-to-date record, of the manner and location in which installations are actually made, indexing each feeder, pull box and protective device. Upon completion of the project, the contractor shall modify the project electronic drawing and specification files to incorporate this information. Modified documents shall be turned over to the Owner in both electronic and hard paper copy formats. Record drawings shall also include:
   1. Locations of buried conduit or similar items. Include buried depth.
   2. Field changes of dimension or detail.
   3. Changes made by field order or change order.
   4. Details not on original contract drawings.
   5. Changes to circuit numbers.
   6. Junction box locations and conduit runs, with trade sizes indicated, for lighting, power, and electrical systems installed.

B. Master-slave light fixture ballasting arrangements.

C. As Built Drawings - See General Requirements - Division 1.

D. In the event of a conflict between the drawings and specifications, this Contractor shall base their bid on the greater quantity, cost or quality of the item in question, unless conflict is resolved by an addendum.

1.9 UTILITY CHARGES

A. Include utility fees and charges for temporary electrical service.

B. Include all Utility Charges in the base bid.

1.10 MATERIALS AND EQUIPMENT

A. Materials and equipment required shall be new.

B. Equipment supplied shall be based on materials and equipment of manufacturers specified. No substitutions are allowed except as permitted in this specification.

C. Items specified shall be the latest type or model produced by the manufacturer specified. If descriptive specification or model number is obsolete, substitute the current product.

1.11 SUBSTITUTIONS

A. Substitutions shall not be allowed. Where the Contractor wishes to use equipment or methods other than those listed by name, that equipment must be approved by the Engineer. To gain approval for equipment not listed, the Contractor shall submit the following to the Engineer for his review:
   1. Documentation from the equipment manufacturer indicating where this equipment meets and does not meet the specifications or drawings as written. This documentation shall state exceptions taken to the specification and the reasons for exceptions. Documentation relative to the request shall be submitted on the manufacturer's letterhead and signed by a representative of the manufacturer.
   2. Manufacturer's Cut Sheets: Cut sheets shall be originals as are contained in the manufacturer's catalog. Photocopies of these sheets will not be accepted for review. (Furnish 3 copies.)
   3. Lighting Fixtures: Request for substitutions shall include photometric test reports performed by an independent testing laboratory.

B. The Contractor shall provide samples of the proposed equipment for the Engineer's review, if requested by the Engineer.

C. The Contractor shall furnish other information or materials as requested by the Architect/ Engineer to establish equality.

D. The Contractor shall acknowledge that they have reviewed the submission criteria for the request by stamping the submission with a review stamp or acknowledgement by an accompanying letter.

E. Equipment and materials submitted for review without proper documentation shall be rejected without review.

F. Submittal, including samples, shall be received in the Engineer's office 10 business days prior to bidding.

G. Materials, equipment, or methods of installation other than those named, shall be in accordance with the general requirements and similar in composition, dimension, construction, capacity, finish and performance.

H. Contractors submitting equipment for approval shall include in their bids incidental costs that may result from the use of equipment. Costs shall include, but not be limited to, additional costs that may be incurred by other contractors whose scope of work is affected by use of the product. The Electrical Contractor shall be responsible for those costs even if they do not become evident until after bidding.

1.12 SUBMITTALS AND EQUIPMENT BROCHURES

A. Submit to Engineer for review, the manufacturer's shop drawings and equipment brochures in quantities determined by the Architect for the following:
   1.
   2. 26 05 19.1 - Metal Clad- type MC Cable
   3. 26 24 16 - Electrical Panelboards
   4. 26 27 26 - Wiring Devices
   5. 26 27 27 - Occupancy Sensors
   6. 26 27 28 - Motor and Circuit Disconnects
   7. 26 28 00 - Low Voltage Overcurrent Protective Devices
   8. 26 29 00 - Motor Starters
   9. 26 43 13 - Surge Arrestors
   10. 26 51 13 - Lighting Fixtures
   11. 26 51 13.1 – Lamps
   12. 26 51 13.2 – Ballasts

B. Submittals shall be submitted in advance of construction and installation so as to not cause delay in other Contractor's work.

C. Data submitted for Engineer's review shall be numbered consecutively, shall be noted to correlate with the electrical drawings and shall bear:
   1. The name and location of the project.
   2. The name of the Contractor.
   3. The date of submittal.
   4. The date of the drawings and the date of each correction and revision.
   5. If more than one type of lighting fixture (or other material) is on a submitted sheet, the proposed equipment shall be conspicuously checked with red pen by the Electrical Contractor.

D. Submittals for different systems and equipment bound separately by specification section and not bound by manufacturer. Submittals which contain different specification section systems bound together shall be returned unreviewed for resubmittal.

E. Where PDF files are submitted for review they shall conform to the following requirements:
   1. All electronic submittals shall be in PDF that meet all the following requirements:
      a. All electronic submittals shall be in an un-editable format, such as PDF. Files in editable formats shall not be utilized.
      b. All files shall be fully searchable using the reader “find” functionality. Scanned PDF submittals are acceptable, however, the scanner software used to create the PDF shall incorporate searchable image technology, which retains the original image of the scanned document but allows the reviewer to search for word strings.
      c. Files that contain data for more than one device or piece of equipment shall have a hyperlinked table of contents or shall utilize the bookmark functionality to allow the reviewer to jump directly to each submitted piece of equipment, without scrolling through the document.
      d. Bookmarks and Table of Contents items shall be labeled to correspond with the nomenclature in the construction documents.
      e. Each filename shall be in the following format “Spec # Spec Name Submittal Type.PDF“

F. Lighting Fixture shop drawings shall consist of a single submittal with all project light fixtures included. Submittals grouped by manufacturer shall not be accepted. The contractor shall be responsible for coordinating drawings from his various suppliers in order to comply with this requirement.

G. The Contractor shall examine submittals and equipment brochures prior to submission. The Contractor shall verify that the materials and equipment depicted properly fit into the construction. The Contractor shall also review previously completed work related to the installation of the equipment depicted to insure that it has been properly installed.

H. No materials or equipment subject to prior review by the Engineer shall be fabricated or installed by the Contractor, without approval. The Engineer's review of shop drawings shall not relieve the Contractor of responsibility for deviations from the requirements of the drawings and specifications, unless prior approval for deviations has been granted.

1.13 MAINTENANCE MANUALS

A. The Electrical Contractor shall assemble and submit to the Architect for subsequent submission to the Owner, three sets of a Manual of Operation and Maintenance for each of the electrical and communications systems.

B. Each manual shall consist of a loose leaf bound volume instructing the Owner's personnel in the use, operation and maintenance of the system in question. The manual shall cover phases of operation of the equipment and shall be illustrated with photographs, drawings, and wiring diagrams. Manuals shall accurately describe the operation, construction and adjustable features of the system and its component parts. The manual shall include an equipment parts listing to facilitate the ordering of spare and replacement parts.

C. If it is desired to provide maintenance manuals in PDF format, the contractor shall provide a written request prior to submitting the manuals indicating which equipment manuals they propose to provide in this format.

D. Each manual shall contain two sets of shop drawings depicting equipment as installed.

1.14 CLEANING AND PAINTING

A. Rubbish resulting from this work shall be removed and disposed of on a daily basis in manner as to be acceptable to the Architect.

B. The Contractor shall clean exposed iron work, the interior and exterior of cabinets and pull boxes, etc., and remove rubbish and debris resulting from the work.

C. Where painted surfaces of equipment have been damaged or rusted during construction, the Contractor shall repair and paint to match original finish.

D. Clean other equipment indicated in other sections of the specification for specific equipment.

1.15 TESTS AND ACCEPTANCE

A. The operation of the equipment and electrical systems does not constitute an acceptance of the work. The acceptance is to be made after the Contractor has adjusted his equipment and demonstrated that it fulfills the requirements of the drawings and the specifications.

B. After the work is completed and prior to acceptance, the Contractor shall conduct the following tests, tabulate data, date, sign and submit to the Engineer:
   1. Standard megger insulation test on each feeder.
   2. Ground resistance test.
   3. Clamp ammeter test on each feeder conductor with utilization equipment energized. The load current in each phase conductor of the feeder or the portion thereof supplying the panel shall not differ from the average connected load currents in the feeder conductors by more than 7½%. If the load current does differ by more than 7½%, the Contractor shall change phase loading to same or receive written approval from the Engineer that this is not required due to the nature of the load.

C. Upon completion of the installation, the Contractor shall furnish certificates of approval from authorities having jurisdiction. The Contractor shall demonstrate that work is in perfect operating condition, with raceway and conduit system properly grounded, wiring free from grounds, shorts, and that the entire installation is free from physical defects.

D. In the presence of the Engineer and the Owner, the Contractor shall demonstrate the proper operation of miscellaneous systems.

E. Perform other test as specifically stated in other sections of the specification for specific equipment.

1.16 Warranty

A. See General Conditions.

1.17 IDENTIFICATION

A. Junction and pullboxes smaller than 12” X 12” shall be identified by using a permanent marker on the coverplate indicating originating panelboard, voltage and circuit(s) or system served.

B. Branch wiring shall be color coded per industry standards. Where wires of different systems junction in a common box each cable shall be grouped with its own system and identified using tags or identification strips.

C. On 3-phase systems, each phase shall be identified at terminals using code markers.

D. Cover plates for control stations controlling remote equipment shall be engraved to identify the device being controlled.

E. Motor starters, remote control stations, shall be identified with engraved metal or engraved plastic nameplates fastened to the equipment with escutcheon pins. Nameplates shall be 1/8" 5 ply engraved metal or engraved plastic with ¼" white letters on a black background. Adhesive

cloth labels, similar to those manufactured by Brady Label Co., may be used on motor switches and controls only, indicating the number, designation, size and usage of the motor.

F. On the inside of coverplates for light switches, occupancy sensors, receptacles, and special purpose outlets, provide a permanent label identifying the panel and circuit number feeding the device. Adhesive plastic tape is permitted for this use.

G. On light fixtures at the wiring entrance point, provide a permanent label identifying the panel and circuit number feeding the fixture. Adhesive plastic tape is permitted for this use.

H. Refer to individual specification sections for more specific or additional identification requirements.

I. Provide a sign at main service disconnect indicating "Main Service Disconnect"

1.18 ACCESS PANELS

A. Access panels required by code or otherwise to electrical service equipment shall be supplied and installed by Electrical Contractor.

1.19 SPARE PARTS

A. Requirements for spare parts are outlines in individual specification sections. Spare parts shall be turned over, unopened, to the Owner as part of the maintenance manual submittal.

1.20 PREBID SURVEY

A. Before submitting his bid the Contractor shall tour the job site to review the following:
   1. The exact configuration of areas requiring demolition, temporary power, relocating, etc.
   2. Site conditions for material storage, staging areas, parking, etc.
   3. Problems with work sequence.

B. Conditions found that are not shown on the documents but that may affect the scope of the work shall be reported to the Engineer.

PART 2 - PRODUCTS

2.1 FIRESTOPPING

A. Fire stopping materials shall include, but not be limited to, mortars, sealants and caulks, putties, collars, intumescent wrap strips mastics, and firestop pillows. Materials and methods used shall be recognized by an independent testing agency and shall have flame and temperature ratings assigned by that agency.

B. Materials using solvents or those requiring hazardous waste disposal shall not be used.

C. The firestop assemblies shall meet fire test and hose stream test requirements of an independent testing agency.

D. Acceptable manufacturers.
   1. 3M Corporation or equivalent.

2.2 SLEEVES

A. Schedule 40 galvanized steel pipe.

2.3 ACCESS PANELS

A. Access panels shall be of size required to provide adequate access to equipment. Minimum size shall be 12" X 12" for hand access or 24" X 24" for body access.

B. Panels shall be as manufactured by Milcor or equivalent.

C. Panels shall include concealed hinges, cam type locking devices, and shall have a frame border type necessary for the particular wall or ceiling construction in which they are installed. Access panels shall be flush mounted, recessed frame type units. Access panels shall be prime coated steel, for field painting for general applications and stainless steel for use in toilet rooms, shower rooms, and similar wet locations.

D. Refer to architectural room finish schedule for wall and ceiling surfaces and finishes.

E. Panel construction shall be as follows:
   1. Minimum 16 gauge frame, not less than 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.

PART 3 - EXECUTION

3.1 FIRESTOPPING

A. Openings in fire rated construction and annular spaces around conduits, cable trays, and other penetrating items shall be protected in accordance with NEC article 300.21 and in accordance with the Wisconsin Administrative Code, Department of Commerce. The fire rating of the protective seal shall be at least that of the floor or wall into which it is installed, so that the original fire rating of the construction is maintained.

B. Wall or floor penetrations openings shall be as small as possible.

C. Openings and annular spaces required by code to be protected shall be protected whether specifically indicated on the plans or not.

D. Installation of materials and assemblies shall be in strict accordance with the manufacturer's instructions.

3.2 SLEEVES

A. Where conduits, cables trays, or other electrical raceways must pass through floors or walls that are to be constructed of poured in place concrete, the contractor shall provide sleeves in the formwork prior to the concrete pour. It shall be the Electrical Contractor's responsibility to provide sleeves for his work unless specifically indicated otherwise on the plans. Prior to installing the sleeves the contractor shall prepare drawings indicating the locations, quantities, sizes, and spacings of sleeves anticipated. The drawings shall be forwarded to the structural engineer for approval.

B. Floor sleeves shall extend a minimum of 2 inches above the finished floor.

END OF SECTION 260500

SECTION 260500 - GENERAL ELECTRICAL PROVISION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable provisions of Division 00 and Division 01 shall govern Work under this Section.

1.2 WORK INCLUDED IN THE ELECTRICAL CONTRACT

A. The mention of an Article, operation or method requires that the Contractor shall provide same and perform each operation in accordance with the conditions stated. The Contractor shall provide material, labor, equipment and transportation to complete the project in compliance with the Contract Documents.

B. Work shall be installed in accordance with State and Local Inspection Authorities having jurisdiction together with the recommendations of the manufacturer whose equipment is to be supplied and installed under this Contract.

C. Before submitting a bid, each bidder shall examine the drawings relating to their work and shall become informed as to the extent and character of the work required and its relation to other work in the building.

D. The Contractor, in conjunction with the Architect's representative, shall establish exact locations of materials and equipment to be installed. Consideration shall be given to construction features, equipment of other trades and requirements of the equipment proper.

E. Materials shall be suitably stored and protected prior to installation and work shall be protected after installation, during construction and prior to acceptance.

F. The Contractor shall furnish scaffolding, rigging, hoisting and services necessary for delivery, erection and installation of equipment and apparatus required to be installed by the Contractor. This equipment shall be removed by the Contractor upon completion of the project.

G. Refer to General Requirement for temporary electrical service.

1.3 DEFINITIONS

A. The Owner. The individual who the Owner selects as the project representative.

B. The Architect.

C. The Engineer. Arnold & O'Sheridan, Inc., Consulting Engineers, Inc., [Brookfield] [Madison], Wisconsin.

D. Provide. Furnish, install and wire ready for service.

E. Exposed. Exposed to view in room, corridor or stairway.

F. Code. National, State and Local Electrical codes including OSHA requirements.

G. Substitution. Manufacturer or method other than those listed by name in these specifications, on the drawings, or in an addendum.

H. Signal voltage. NEC class 1, 2, or 3 remote control, signaling, or power limited circuits.

I. Low voltage. 50 to 600 volts.

1.4 ABBREVIATIONS

A. A/E: Architect or Engineer

B. ENGR: Engineer

C. NEC: National Electrical Code

D. NEMA: National Electrical Manufacturer's Association

E. NFPA: National Fire Protection Association

F. OSHA: Occupational Safety and Health Administration

G. UL: Underwriter's Laboratories

H. NECA: National Electrical Contractors Standards of Installation.

I. ANSI:American Society for testing Materials.

J. IEEE: Institute of Electrical and Electronic Engineers.

K. ASTM: American Society for testing Materials.

L. IPCEA: Insulated Power Cable Engineers Association.

M. FM: Factory Mutual.

N. ETL: Electrical Testing Laboratories.

O. FIA: Factory Insurance Association.

1.5 PERMITS AND LICENSES

A. The Contractor shall prepare and submit applications and working drawings to authorities having jurisdiction over the project. Licenses and permits required shall be secured and paid for by the Contractor. This includes required submittals for the fire alarm system.

1.6 STANDARDS AND CODES

A. Work shall be installed in accordance with National, State, and Local codes, ordinances, laws, and regulations. Comply with applicable OSHA regulations.

B. Materials shall have a UL or ETL label where a UL or ETL Standard or test exists.

1.7 DIMENSIONS AND DEFINITE LOCATIONS

A. The drawings depicting electric work are diagrammatic and show, in their approximate location, symbols representing electrical equipment and devices. The exact location of equipment and devices shall be established in the field in accordance with instructions from the Architect as established by manufacturer's installation drawings and details.

B. The Contractor shall refer to shop drawings and submittal drawings for equipment requiring electrical connections to verify rough-in and connection locations.

C. Unless specifically stated to the contrary, no measurement of an electric drawing derived by scaling shall be used as a dimension to work by. Dimensions noted on the electric drawings are subject to measurements of adjacent and previously completed work. Measurements shall be performed prior to the actual installation of equipment.

1.8 DRAWINGS

A. The Contractor shall keep a detailed up-to-date record, of the manner and location in which installations are actually made, indexing each feeder, pull box and protective device. Upon completion of the project, the contractor shall modify the project electronic drawing and specification files to incorporate this information. Modified documents shall be turned over to the Owner in both electronic and hard paper copy formats. Record drawings shall also include:
   1. Locations of buried conduit or similar items. Include buried depth.
   2. Field changes of dimension or detail.
   3. Changes made by field order or change order.
   4. Details not on original contract drawings.
   5. Changes to circuit numbers.
   6. Junction box locations and conduit runs, with trade sizes indicated, for lighting, power, and electrical systems installed.

B. Master-slave light fixture ballasting arrangements.

C. As Built Drawings - See General Requirements - Division 1.

D. In the event of a conflict between the drawings and specifications, this Contractor shall base their bid on the greater quantity, cost or quality of the item in question, unless conflict is resolved by an addendum.

1.9 UTILITY CHARGES

A. Include utility fees and charges for temporary electrical service.

B. Utility costs for permanent service shall be paid by the Owner.

1.10 MATERIALS AND EQUIPMENT

A. Materials and equipment required shall be new.

B. Equipment supplied shall be based on materials and equipment of manufacturers specified. No substitutions are allowed except as permitted in this specification.

C. Items specified shall be the latest type or model produced by the manufacturer specified. If descriptive specification or model number is obsolete, substitute the current product.

1.11 SUBSTITUTIONS

A. Substitutions shall not be allowed. Where the Contractor wishes to use equipment or methods other than those listed by name, that equipment must be approved by the Engineer. To gain approval for equipment not listed, the Contractor shall submit the following to the Engineer for his review:
   1. Documentation from the equipment manufacturer indicating where this equipment meets and does not meet the specifications or drawings as written. This documentation shall state exceptions taken to the specification and the reasons for exceptions. Documentation relative to the request shall be submitted on the manufacturer's letterhead and signed by a representative of the manufacturer.
   2. Manufacturer's Cut Sheets: Cut sheets shall be originals as are contained in the manufacturer's catalog. Photocopies of these sheets will not be accepted for review. (Furnish 3 copies.)
   3. Lighting Fixtures: Request for substitutions shall include photometric test reports performed by an independent testing laboratory.

B. The Contractor shall provide samples of the proposed equipment for the Engineer's review, if requested by the Engineer.

C. The Contractor shall furnish other information or materials as requested by the Architect/ Engineer to establish equality.

D. The Contractor shall acknowledge that they have reviewed the submission criteria for the request by stamping the submission with a review stamp or acknowledgement by an accompanying letter.

E. Equipment and materials submitted for review without proper documentation shall be rejected without review.

F. Submittal, including samples, shall be received in the Engineer's office 10 business days prior to bidding.

G. Materials, equipment, or methods of installation other than those named, shall be in accordance with the general requirements and similar in composition, dimension, construction, capacity, finish and performance.

H. Contractors submitting equipment for approval shall include in their bids incidental costs that may result from the use of equipment. Costs shall include, but not be limited to, additional costs that may be incurred by other contractors whose scope of work is affected by use of the product. The Electrical Contractor shall be responsible for those costs even if they do not become evident until after bidding.

1.12 SUBMITTALS AND EQUIPMENT BROCHURES

A. Submit to Engineer for review, the manufacturer's shop drawings and equipment brochures in quantities determined by the Architect for the following:
   1.
   2. 26 05 19 - Low Voltage Wires, Cables, and Connectors
   3. 26 05 19.1 - Metal Clad- type MC Cable
   4. 26 24 16 - Electrical Panelboards
   5. 26 27 26 - Wiring Devices
   6. 26 27 27 - Occupancy Sensors
   7. 26 27 28 - Motor and Circuit Disconnects
   8. 26 28 00 - Low Voltage Overcurrent Protective Devices
   9. 26 29 00 - Motor Starters
   10. 26 51 13 - Lighting Fixtures
   11. 26 51 13.1 – Lamps
   12. 26 51 13.2 – Ballasts

B. Plans - Lighting Control Time Clocks,

C. Submittals shall be submitted in advance of construction and installation so as to not cause delay in other Contractor's work.

D. Data submitted for Engineer's review shall be numbered consecutively, shall be noted to correlate with the electrical drawings and shall bear:
   1. The name and location of the project.
   2. The name of the Contractor.
   3. The date of submittal.
   4. The date of the drawings and the date of each correction and revision.
   5. If more than one type of lighting fixture (or other material) is on a submitted sheet, the proposed equipment shall be conspicuously checked with red pen by the Electrical Contractor.

E. Submittals for different systems and equipment bound separately by specification section and not bound by manufacturer. Submittals which contain different specification section systems bound together shall be returned unreviewed for resubmittal.

F. Lighting Fixture shop drawings shall consist of a single submittal with all project light fixtures included. Submittals grouped by manufacturer shall not be accepted. The contractor shall be responsible for coordinating drawings from his various suppliers in order to comply with this requirement.

G. The Contractor shall examine submittals and equipment brochures prior to submission. The Contractor shall verify that the materials and equipment depicted properly fit into the

construction. The Contractor shall also review previously completed work related to the installation of the equipment depicted to insure that it has been properly installed.

H. No materials or equipment subject to prior review by the Engineer shall be fabricated or installed by the Contractor, without approval. The Engineer's review of shop drawings shall not relieve the Contractor of responsibility for deviations from the requirements of the drawings and specifications, unless prior approval for deviations has been granted.

1.13 MAINTENANCE MANUALS

A. The Electrical Contractor shall assemble and submit to the Architect for subsequent submission to the Owner, three sets of a Manual of Operation and Maintenance for each of the electrical and communications systems.

B. Each manual shall consist of a loose leaf bound volume instructing the Owner's personnel in the use, operation and maintenance of the system in question. The manual shall cover phases of operation of the equipment and shall be illustrated with photographs, drawings, and wiring diagrams. Manuals shall accurately describe the operation, construction and adjustable features of the system and its component parts. The manual shall include an equipment parts listing to facilitate the ordering of spare and replacement parts.

C. If it is desired to provide maintenance manuals in PDF format, the contractor shall provide a written request prior to submitting the manuals indicating which equipment manuals they propose to provide in this format.

D. Each manual shall contain two sets of shop drawings depicting equipment as installed.

1.14 CLEANING AND PAINTING

A. Rubbish resulting from this work shall be removed and disposed of on a daily basis in manner as to be acceptable to the Architect.

B. The Contractor shall clean exposed iron work, the interior and exterior of cabinets and pull boxes, etc., and remove rubbish and debris resulting from the work.

C. Where painted surfaces of equipment have been damaged or rusted during construction, the Contractor shall repair and paint to match original finish.

D. Clean other equipment indicated in other sections of the specification for specific equipment.

1.15 TESTS AND ACCEPTANCE

A. The operation of the equipment and electrical systems does not constitute an acceptance of the work. The acceptance is to be made after the Contractor has adjusted his equipment and demonstrated that it fulfills the requirements of the drawings and the specifications.

B. After the work is completed and prior to acceptance, the Contractor shall conduct the following tests, tabulate data, date, sign and submit to the Engineer:
   1. Standard megger insulation test on each feeder.

2. Ground resistance test.
3. Clamp ammeter test on each feeder conductor with utilization equipment energized. The load current in each phase conductor of the feeder or the portion thereof supplying the panel shall not differ from the average connected load currents in the feeder conductors by more than 7½%. If the load current does differ by more than 7½%, the Contractor shall change phase loading to same or receive written approval from the Engineer that this is not required due to the nature of the load.

C. Upon completion of the installation, the Contractor shall furnish certificates of approval from authorities having jurisdiction. The Contractor shall demonstrate that work is in perfect operating condition, with raceway and conduit system properly grounded, wiring free from grounds, shorts, and that the entire installation is free from physical defects.

D. In the presence of the Engineer and the Owner, the Contractor shall demonstrate the proper operation of miscellaneous systems.

E. Perform other test as specifically stated in other sections of the specification for specific equipment.

1.16 Warranty

A. See General Conditions.

1.17 IDENTIFICATION

A. Junction and pullboxes smaller than 12” X 12” shall be identified by using a permanent marker on the coverplate indicating originating panelboard, voltage and circuit(s) or system served.

B. Junction and pull boxes with dimensions 12” X 12” and larger shall be stenciled or provided with permanent labels as follows:
1. Lighting and Power Feeders and Branch Circuits - 120, 208, 277, 480. Add "EM" for emergency circuits, ex. 120EM
2. Medium Voltage Feeders - 5KV, 15KV, as applicable for system voltage
3. Clock - CLK
4. Voice/Data Communications - V/D COM
5. Fire Alarm - FA
6. Signal Voltage Lighting Controls - LVLC
7. Area of Rescue Assistance System - RA
8. Master Antenna Television System - MATV
9. Nurse Call System - NC
10. Building Paging System - PA
11. Electronic Card Key Access System - CA

C. Branch wiring shall be color coded per industry standards. Where wires of different systems junction in a common box each cable shall be grouped with its own system and identified using tags or identification strips.

D. On 3-phase systems, each phase shall be identified at terminals using code markers.

E. Cover plates for control stations controlling remote equipment shall be engraved to identify the device being controlled.

F. Motor starters, remote control stations, shall be identified with engraved metal or engraved plastic nameplates fastened to the equipment with escutcheon pins. Nameplates shall be 1/8" 5 ply engraved metal or engraved plastic with ¼" white letters on a black background. Adhesive cloth labels, similar to those manufactured by Brady Label Co., may be used on motor switches and controls only, indicating the number, designation, size and usage of the motor.

G. On the inside of coverplates for light switches, occupancy sensors, receptacles, and special purpose outlets, provide a permanent label identifying the panel and circuit number feeding the device. Adhesive plastic tape is permitted for this use.

H. On light fixtures at the wiring entrance point, provide a permanent label identifying the panel and circuit number feeding the fixture. Adhesive plastic tape is permitted for this use.

I. Refer to individual specification sections for more specific or additional identification requirements.

J. Provide a sign at service entrance equipment indicating type and location of on site emergency power sources per NEC 700-8 and 701-9.

K. Fire pump disconnect marking the disconnecting means shall be marked “Fire Pump Disconnecting Means.” The letter shall be at least 1 in. (25cm) in height and shall be visible without opening enclosure doors or covers.

L. Provide a sign at main service disconnect indicating “Main Service Disconnect”

1.18 ACCESS PANELS

A. Access panels required by code or otherwise to electrical service equipment shall be supplied and installed by Electrical Contractor.

1.19 SPARE PARTS

A. Requirements for spare parts are outlines in individual specification sections. Spare parts shall be turned over, unopened, to the Owner as part of the maintenance manual submittal.

1.20 PREBID SURVEY

A. Before submitting his bid the Contractor shall tour the job site to review the following:
   1. The exact configuration of areas requiring demolition, temporary power, relocating, etc.
   2. Site conditions for material storage, staging areas, parking, etc.
   3. Problems with work sequence.

B. Conditions found that are not shown on the documents but that may affect the scope of the work shall be reported to the Engineer.

PART 2 - PRODUCTS

2.1 FIRESTOPPING

A. Fire stopping materials shall include, but not be limited to, mortars, sealants and caulks, putties, collars, intumescent wrap strips mastics, and firestop pillows. Materials and methods used shall be recognized by an independent testing agency and shall have flame and temperature ratings assigned by that agency.

B. Materials using solvents or those requiring hazardous waste disposal shall not be used.

C. The firestop assemblies shall meet fire test and hose stream test requirements of an independent testing agency.

D. Acceptable manufacturers.
   1. 3M Corporation or equivalent.

2.2 SLEEVES

A. Schedule 40 galvanized steel pipe.

2.3 ACCESS PANELS

A. Access panels shall be of size required to provide adequate access to equipment. Minimum size shall be 12” X 12” for hand access or 24” X 24” for body access.

B. Panels shall be as manufactured by Milcor or equivalent.

C. Panels shall include concealed hinges, cam type locking devices, and shall have a frame border type necessary for the particular wall or ceiling construction in which they are installed. Access panels shall be flush mounted, recessed frame type units. Access panels shall be prime coated steel, for field painting for general applications and stainless steel for use in toilet rooms, shower rooms, and similar wet locations.

D. Refer to architectural room finish schedule for wall and ceiling surfaces and finishes.

E. Panel construction shall be as follows:
   1. Non-Security Areas: Minimum 16 gauge frame, not less than 18 gauge hinged door panel. Door locks shall be screwdriver operated for panels in general location applications and shall be key locked for public area applications.
   2. Secure Locations: Minimum 16 gauge frame with not less than 14 gauge hinged door panel. Door locks shall be locking type. Furnish and install locking devices in accordance with types specified in Division 11. See plans for secure locations.

PART 3 - EXECUTION

3.1 FIRESTOPPING

A. Openings in fire rated construction and annular spaces around conduits, cable trays, and other penetrating items shall be protected in accordance with NEC article 300-21 and in accordance with the Wisconsin Administrative Code, Department of Commerce Chapter 51.049. The fire rating of the protective seal shall be at least that of the floor or wall into which it is installed, so that the original fire rating of the construction is maintained.

B. Wall or floor penetrations openings shall be as small as possible.

C. Openings and annular spaces required by code to be protected shall be protected whether specifically indicated on the plans or not.

D. Installation of materials and assemblies shall be in strict accordance with the manufacturer's instructions.

3.2 SLEEVES

A. Where conduits, cables trays, or other electrical raceways must pass through floors or walls that are to be constructed of poured in place concrete, the contractor shall provide sleeves in the formwork prior to the concrete pour. It shall be the Electrical Contractor's responsibility to provide sleeves for his work unless specifically indicated otherwise on the plans. Prior to installing the sleeves the contractor shall prepare drawings indicating the locations, quantities, sizes, and spacings of sleeves anticipated. The drawings shall be forwarded to the structural engineer for approval.

B. Floor sleeves shall extend a minimum of 2 inches above the finished floor.

END OF SECTION 260500

SECTION 260502 - ELECTRICAL DEMOLITION AND ALTERATION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.2 JOB CONDITIONS

A. Owner has performed much of the required demolition work. EC shall examine the documents and field verify the demo work that is already complete. EC is responsible for any additional electrical demo as required by this specification, as shown on the plans and as required to complete new work.

B. Demolition work shall be scheduled at periods and times acceptable to the Owner.

C. Refer to demolition Section 02 41 23 of specifications for areas and equipment being remodeled.

D. Prior to demolition or alteration of structures, the following shall be accomplished:
   1. Owner release of structure.
   2. Disconnection of electrical power to equipment and circuits removed or affected by demolition work.
   3. Electrical services rerouted or shut off outside area of demolition.
   4. Coordinate sequencing with Owner and other Contractors.
   5. Survey and record condition of existing facilities to remain in place that may be affected by demolition operations.
   6. Notify utilities prior to razing operations to permit them to disconnect and remove or relocate equipment that served existing facilities.
   7. Contractor shall dispose of obsolete material.
   8. Contractor shall notify Engineer of existing code violations observed during the course of performing his work. If corrective action needs to be taken that changes the scope of the work, corrective action to proceed only after approved change order.

PART 2 - PRODUCTS
Not used.

PART 3 - EXECUTION

3.1 REMOVAL

A. Remove or relocate conduit, wire, boxes, fixtures, and electrical equipment that are in the way of construction.

B. Reconnect circuits and equipment to be continued in service.

C. Provide temporary wiring to equipment that is to remain in operation during demolition and whose power will be interrupted as a result of demolition.

D. Remove electrical equipment released from service as a result of construction.

E. Do not reuse removed electrical equipment except as specifically shown on the drawings.

F. Where the plans require existing equipment to be removed or relocated, removal shall include equipment associated with the device. Associated equipment shall include but not be limited to coverplates, backboxes, conduit, fittings, de-energized conductors. In instances where a device is removed but active conductors remain in the backbox and the box is mounted in a wall which is remaining, the backbox may remain and a blank coverplate provided. If removal of the box is specifically indicated on the plans the active conductors shall be intercepted at convenient, accessible locations and rerouted to allow existing box to be removed. When boxes are removed from existing walls which remain, it shall be the Electrical Contractor's responsibility to fill in openings and sand flush with adjacent surfaces. The General Contractor shall be responsible for finish work unless specifically indicated otherwise on the plans.

3.2 DISPOSAL

A. Dispose of equipment that is removed unless specifically indicated on the drawings.

B. Raceway, conductors, boxes, cabinets and supporting devices shall become the property of the Contractor and shall be removed from the site and disposed of by the Contractor.

C. The Contractor shall tour demolition areas with the Owner to determine the status of other equipment to be removed during demolition. Equipment that is to be salvaged for reuse shall be removed by the Contractor and transported to a designated storage area on the site. The Owner shall be responsible for removal of salvaged equipment from the storage area.

D. Contractor, at his option, may install new conductors in existing raceways provided that the raceways are in place and are properly sized and supported. Existing conduits that are removed from their existing location shall not be reinstalled.

3.3 LIGHTING FIXTURE BALLAST DISPOSAL

A. The contractor shall inspect ballasts in light fixtures removed as part of this project and take the actions described below.
   1. Ballasts labeled as "NON PCB'S" or "NO PCB'S" shall be handled as described in other sections of these specifications which describe demolition or salvage materials handling. If the PCB content is not stated on the ballast label, the ballast shall be handled as a PCB ballast.
   2. PCB ballasts shall have the wires clipped off and the ballasts placed in US DOT approved type 17C or type 17H barrels and placed in storage in a location within the building as designated by the Owner. The Contractor shall provide to the Owner, in typewritten form, a total count of these ballasts and where they are stored.
   3. These ballasts are not to be removed from the work site by the Contractor.

4. The Contractor shall label and mark the PCB storage barrels with EPA approved PCB labels and shall mark the storage area with signs, marks, and lines to meet the regulations of Wisconsin Code NR 157.
5. The Contractor shall provide approved PCB absorbent materials to be stored immediately adjacent to the barrel storage area. Do not place loose absorbent material in the barrels.
6. When the ballast demolition is completed and PCB ballasts are placed in barrels ready to be picked up for disposal, the Contractor shall notify the Owner in writing so the Owner can make arrangements for pick up and disposal of the PCB ballasts.

3.4 LIGHTING FIXTURE LAMP DISPOSAL

A. The Contractor shall be responsible for the proper removal and recycling of existing fixture lamps being removed from service in accordance with EPA and State of Wisconsin DNR requirements.

B. The Contractor shall be responsible for arranging for recycling of lamps by a licensed waste lamp and bulb recycler. The cost for recycling of removed lamps shall be included in the Contractor's bid.

C. The Contractor shall carefully package removed lamps to prevent breakage. The Contractor shall store waste lamps in a secure area, either in the container that the lamps are shipped in or in other ways so as to eliminate breakage. Both the lamp storage area and individual containers shall be labeled as hazardous waste. Store lamps in covered containers to prevent lamps from being broken as a result of other debris being placed on top of them.

3.5 ASBESTOS REMOVAL

A. Work involved with asbestos removal, disposal or abatement shall not be considered as part of this project. Work in this regard shall be the responsibility of the Owner. If this Contractor shall discover the presence of asbestos material he shall cease work immediately and notify Owner architect and Engineer of condition.

3.6 ALTERATIONS

A. The Contractor shall be responsible for work of other trades to facilitate installation of electrical work in the existing building.

B. Work required by Electrical Contractor which is normally performed by other trades shall be done under direction and at the expense of Electrical Contractor.

END OF SECTION 260502

SECTION 260504 - INSPECTION AND TESTING OF ELECTRICAL EQUIPMENT

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section includes the required cleaning, repair, adjustment, calibration, maintenance and testing of electrical equipment, as specified herein. This applies only to new electrical and existing electrical equipment being furnished, modified, worked on or serviced by this contractor for this project.

1.2 RELATED WORK

A. Applicable provisions of Division 1 govern work under this Section.

PART 2 - PRODUCTS

A. Not Used.

PART 3 - EXECUTION

3.1 GENERAL INSPECTION AND CLEANING OF Electrical EQUIPMENT

A. Review for physical damage and abnormal mechanical and electrical conditions.

B. items found to be out of tolerance, or defective as a result of the required testing, shall be reported to owner and engineer. Procedure for repair and/or replacement will be outlined. After appropriate corrective action is completed the item shall be re-tested.

C. Compare equipment nameplate information with the latest single line diagram and report discrepancies.

D. Verify proper auxiliary device operation and indicators.

E. Check tightness of accessible bolted electrical joints. Use torque wrench method.

F. Make a close examination of equipment and remove shipping brackets, insulation, packing, etc. that may not have been removed during original installation.

G. Make a close examination of equipment and remove dirt or other forms of debris that may have collected in existing equipment or in new equipment during installation.

H. Clean Equipment:
   1. Loosen attached particles and vacuum them away.
   2. Wipe insulators with a clean, dry, lint free rag.

3. Clean insulator grooves.
4. Review equipment anchorage.
5. Review equipment and bus alignment.
6. Check heater elements for operation and control.
7. Lubricate nonelectrical equipment per manufacturer's recommendations.

3.2 GROUNDING SYSTEMS

A. Review the ground system for adequate termination at devices.

3.3 Panelboards (LOW VOLTAGE)

A. Visual and Mechanical Inspection:
   1. Review for physical, electrical and mechanical conditions. Re-torque bolted connections.
   2. Compare equipment nameplate information with latest single line diagram and report discrepancies.
   3. Review for proper alignment, anchorage and grounding
   4. Doors, panels and sections shall be inspected for paint, dents, scratches, and fit.
   5. Review cleanliness

B. Clean switchboard enclosure using the following methods:
   1. Loosen attached particles and vacuum them away.
   2. Wipe porcelain with a clean, dry, lint-free rag.
   3. Clean insulator grooves.
   4. Vacuum inside of switchgear enclosure
   5. Lubricate per manufacturer's recommendations.

C. Active components shall be exercised and cleaned where possible.

D. Indicating devices shall be inspected for proper operation.

3.4 CABLES

A. Visual and Mechanical Inspections:
   1. Review exposed sections for physical damage.
   2. Verify cable is supplied and connected in accordance with single line diagram.
   3. Review for shield grounding, cable support and termination.
   4. If cables are terminated through window type C.T.'s make an inspection to verify that neutrals and grounds are properly terminated for normal operation of protective devices.
   5. Review for visual jacket and insulation condition.
   6. Visible cable bends shall be checked against ICEA or manufacturer's minimum allowable bending radii -- 12 times the diameter for tape shielded cables.
   7. Review for proper fireproofing in common cable areas.
   8. There shall be NO tests performed on existing cable without specific direction from the Consulting Engineer.

B. Electrical Tests -- Below 600 Volts:
   1. Secondary cables from the substation transformers to the secondary switchboards shall be subjected to insulation tests using a 500 vdc megger.
   2. Visually review cables, lugs, connectors and other components for physical damage and proper connections
   3. Check cable connectors for tightness (with a torque wrench) and clearances. Torque test conductor and bus terminations to manufacturer's recommendations.
   4. Check for proper grounding resistance at services and at transformers. Resistance shall be 2 ohms maximum.
      a. - Above 600 volts:

3.5 LIGHT FIXTURES

A. Check the bonding and proper lamping. Verify that recessed fixtures are installed with hold down clips. Confirm operation of the fixture with the proper switch or sensor.

3.6 OCCUPANCY SENSORS

A. Confirm operation of the sensor per the manufacturers spec.

3.7 BATTERY PACK EMERGENCY LIGHTING

A. Verify the operation per the manufacturers spec and run the diagnostic steps. Confirm proper grounding and location.

END OF SECTION 260504

SECTION 260519 - LOW VOLTAGE WIRES, CABLES AND CONNECTORS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Application requirements of Division 0 and Division 1 shall govern work under this Section.

1.2 SCOPE

A. Provide wires, cables and connectors as specified herein.

B. Provide branch wiring and feeder systems to serve lighting, receptacles, motors, and other equipment loads.

C. The terms “feeders” and “branch circuits” as used in this section are as defined in NEC Article 100.

1.3 RELATED WORK

A. Section 26 05 33 - Conduits

B. Section 26 27 26 - Wiring Devices

C. Section 26 05 26 - Grounding

1.4 QUALITY ASSURANCE

A. Reference Standards of the following associations:
   1. National Electrical Contractor's Association (NECA) - Standard of Installation
   2. Insulated Cable Engineers Association (ICEA)

PART 2 - PRODUCTS

2.1 CONDUCTORS

A. Copper conductor only.

B. Conductor insulation shall be rated 600 volts minimum. Insulation color for low voltage (secondary feeders and branch circuits) conductors shall vary to depict the type of conductor. Colors shall be as indicated elsewhere in this section and as required by code.

C. Single conductor #10 AWG size and smaller for general use wiring may be stranded or solid conductors at the contractor’s option, provided with type THWN insulation. Stranded

conductors accessible with the use of compression (crimp) connectors. Minimum size shall be #12 AWG on 208 volt systems and #12 AWG for 480 volt systems. Conductors with dual rated insulations are approved provided one of the ratings is THWN.

D. Single conductor #8 AWG and larger for general use wiring shall be stranded configuration with type THWN insulation. Conductors with triple rated insulations are approved provided the ratings include one of the ratings that are listed.

E. Conductors installed in wet locations and areas with high humidity shall be type XHHW-2 or USE. Wet locations shall include, but not be limited to, conduits installed in contact with the earth and underground electrical ductbanks.

F. Conductors shall not be installed at temperatures below the manufacturer's minimum installation temperature.

G. Unless specifically indicated otherwise, conductor sizes indicated on the plans are based on the ampacities listed for conductors rated at 75 degrees C.

H. All conductors, whether stranded or solid, shall be terminated using approved methods.

I. Install 90˚c conductor in high ambient pent. Mechanical room, utility rooms and exterior installation.

2.2 JOINTS, TAPS AND SPLICES

A. CONDUCTORS NO. 10 AWG AND SMALLER
   1. 3M Scotch-lok compression type solderless connectors with plastic cover.

B. JOINTS, TAPS, AND SPLICES IN CONDUCTORS NO 8 AWG AND LARGER
   1. Solderless compression type connectors, tool and die applied, of a type that will not loosen (Non Reversing) under vibration or normal strains. Burndy "Hy-Dent" type or equivalent.

2.3 TAGS AND LABELS

A. BRANCH CONDUCTOR LABELS
   1. Sleeve type wrap around adhesive markers with factory printed circuit numbers.

B. FEEDER CONDUCTOR LABELS
   1. Metal tags or flame-resistant adhesive label tags at the Contractor's option. Label shall include conductor source, voltage, and load/equipment served.

2.4 RUBBER INSULATING ELECTRICAL TAPE

A. Scotch 3M model 23, 30 mil tape.

B. Plymouth #2117, 30 mil tape.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's written instructions and in accordance with recognized industry practices.

B. Run wire and cable in conduit, unless otherwise indicated on drawings.

C. Do not draw conductors into conduits until building is enclosed and watertight and until work that may cause conductor damage has been completed.

D. Voltage drop for branch circuits and feeder circuit combined shall not exceed requirements of NEC Article 215.

E. Examine areas and conditions under which conductors are to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of work.

F. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 JOINTS, TAPS AND SPLICES

A. Each tap, joint, or splice in conductors No. 8 AWG and larger shall be taped with two half-lap layers of vinyl plastic electrical tape and a finish wrap of color coding tape, where required by code.

B. Cable splices shall be made only in distribution and junction boxes.

3.3 WIRE AND CABLE IDENTIFICATION

A. TAGS AND LABELS
   1. Install tags and or/labels on conductors and cables in junction boxes, pullboxes, wireways, wiring gutters of panels, and other accessible locations. Labels and tags shall contain information under “products” for branch circuit conductors and feeder conductors.
   2. Conductor phase identification. Different conductor insulation colors and electrical tape colors shall be used to identify the different phases of conductors in a given circuit and to identify the neutral and ground conductors. Painted identification is not acceptable. Provide color identification on conductors at accessible locations. Requirements of the Code regarding conductor identification shall always be followed where applicable. In general, colors shall be as follows:
      a. 120/208 Volt Systems Neutral Conductor - Solid White: Provide additional markings for neutral conductors in the same raceway.
      b. 120/208 Volt Systems A-Phase, B-Phase, and C-Phase Unswitched Legs: Solid black, solid red and solid blue respectively. Different colors shall be used to identify switched legs.
      c. Ground Conductors - Solid Green: Provide additional markings for ground conductors in the same raceway.

3. For additions to existing buildings, existing conductor color-coding schemes shall be followed unless in conflict with the codes. If no logical color-coding scheme exists, color-coding indicated above shall be followed.

3.4 FIXTURE WIRES

A. Use conductor with insulation rated for current, voltage, and temperature to which conductor is subjected. Conductors used as fixture wires shall be insulated with materials of the type recognized by the National Electrical Code, Article 402.

B. Minimum wire size shall be selected as defined in NEC Article 240 for the branch circuit overcurrrent device ampacity and conductor length involved.

C. Insulation rated for operation at 90 degrees C. minimum for lighting fixtures with integral ballast, mogul base sockets, quartz lamps, or otherwise where subject to excessive temperatures.

D. Fixture wiring shall be unspliced between branch circuits and lampholders (or ballasts) and unspliced between ballasts and lampholders.

3.5 FEEDER INSTALLATION

A. Install in accordance with manufacturer's written instructions, and in accordance with recognized industry practices.

B. Extend feeders at full capacity from origin to termination.

C. Where feeder conductors are run in parallel, conductors shall be of same length, same material, circular- mil area, insulation type, and terminated in same manner.

D. Where parallel feeder conductors are run in separate raceways, each raceway shall have same physical characteristics.

E. Feeder conductors in switchboards, panelboards, pullboxes, gutters, and other open wiring spaces shall be bundled by feeder using plastic tie wraps at intervals not greater than 3’ on center.

3.6 BRANCH CIRCUIT CONDUCTORS

A. Install branch circuits and switched circuits to comply with the circuiting, switching, and functions shown on the drawings.

B. Conductors shall be size 12 AWG minimum (unless otherwise noted) for branch circuit wiring, including motor circuits.

C. Conductor shall increase the size of branch wiring one size (i.e., from #12 AWG to #10 AWG) where the distance from the panel to the center of the load is more than 100 Feet long for 120V. circuits and 200 feet ;long for 277V. circuits.

D. Provide individual neutral conductors for branch circuits serving isolated ground receptacles and computer equipment. (No common neutrals for these circuits.)

E. Route branch circuits and switch legs as dictated by construction, these specifications, or instruction from Engineer.

F. Size conduit, outlet boxes, and other raceway system components in accordance with NEC requirements as minimum.

G. Circuit numbers as shown on drawings are for Contractor to plan his wiring and for estimating purposes and are not necessarily the exact circuit numbers to be used in that panel for that particular load. Exact circuit numbers for each load are to be selected by the Contractor at his option. Balanced load on panelboard bus is to be determining factor in arrangement of circuits. Panelboards average load shall not differ from phase to phase by ± 7½%.

3.7 MOTOR AND EQUIPMENT BRANCH WIRING

A. Furnish and install motor circuits in accordance with schedules on drawings and code requirements, from source of supply to associated motor starter, and from starter to motor terminal box, including necessary and required intermediate connections.

B. Conductor and conduit size for motor branch circuits if shown on drawings are sized for motor requirement only. Control wiring is not included in conduit sizes shown on the drawings.

C. Motors shall have proper conductor sizes in accordance with NEC requirements and nameplate ratings. Contractor is responsible for verification of ratings of motors and installing proper branch circuits.

D. Obtain manufacturer's wiring diagrams and shop drawings for equipment requiring electrical connections.

E. Check drawings and specifications of other divisions of work for equipment and work which shall be included.

F. Motor connections shall be made by compression type connectors using proper tools and fittings.

END OF SECTION 260519

SECTION 260519.1 - METAL CLAD (TYPE MC) CABLES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Drawings and General Provisions of Contract, General and Supplementary Conditions, and Division 1 Specifications apply to Work specified in this Section.

1.2 SCOPE

A. Provide an alternate bid for the use type MC cable under certain instances and locations as identified in this section of the specifications. Alternate bid shall clearly state where MC Cable will be used.

B. Type MC Cable may only be used concealed in finished areas, and shall not be routed exposed in unfinished spaces. The National Electrical Code, along with State and Local supplements, shall also further govern the restrictions for the use of type MC cables. See the execution portion of these specifications for additional restrictions and requirements for the use of type MC Cable.

1.3 RELATED WORK AND REQUIREMENTS

A. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

B. Section 26 05 26 - Grounding

1.4 QUALITY ASSURANCE

A. National Electrical Contractor's Association (NECA) Standard of Installation.

B. National Electrical Code (NEC) Including State and local supplements.

C. Underwriters Laboratory Standard UL 1569.

PART 2 - PRODUCTS

2.1 CONSTRUCTION

A. Type MC cable shall be furnished with a steel corrugated jacket, with stranded copper conductor rated 90 deg. C (THHN/XHHW) with a maximum voltage rating of 600 V.

B. Minimum size conductor shall be #12 AWG. Grounding conductors shall be the same size as current carrying conductors contained in the cable assembly.

C. The conductor assembly shall be covered with an overall Mylar/Polypropolene tape covering the conductor assembly.

D. Type MC cable assemblies shall be provided with a separate green insulated grounding conductor.

2.2 MANUFACTURERS

A. MC Tuff as manufactured by AFC.

B. Approved equals.

PART 3 - EXECUTION

3.1 RESTRICTIONS

A. Type MC cable shall not be used under the following conditions:

B. The use of MC cable shall be limited to a one or two circuit application only with not more than three current carrying conductors. Circuit runs containing three or more circuits shall be routed in non-flexible conduit. Home runs to panel boards home runs shall be routed in non-flexible metallic conduit (EMT, IMC or Rigid) up to the first device on the run.

C. Cable shall be fastened to or supported from building structure and shall not be attached to the ceiling suspension system as a means of support. Cable shall be supported at interval mandated via article 334 of the National Electrical Code and applicable amendments.

D. Provide red anti-shorting bushings on the ends of each single run of cable entering a box or cabinet.

E. Type MC cable shall not be used when crossing smoke walls.

F. MC cable shall be used and installed only where allowed per NEC and where approved by the AHJ.

END OF SECTION 260519.1

SECTION 260519.4 - MOTOR WIRING

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable provisions of Division 0 and Division 1 shall govern work in this Section.

1.2 SCOPE

A. Provide connections and wiring to motors as shown in the motor wiring and special purpose outlets schedules, on the drawings and in other divisions of the specifications and as specified herein.

1.3 RELATED WORK AND REQUIREMENTS

A. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

B. Section 26 29 00 - Motor Starters

PART 2 - PRODUCTS

NOT USED.

PART 3 - EXECUTION

3.1 GENERAL

A. This Contractor shall examine the drawings and specifications of the other trades to determine the requirements for motor disconnect switches, fused disconnect switches and motor starters. In each case, the Contractor shall install required disconnect switches, fused disconnect switches and starters. The Electrical Contractor shall provide code required disconnect switches not specifically supplied by others.

B. Unless otherwise indicated on the drawings or elsewhere in these specifications, motors shall be furnished by others.

C. Motors shall be set in place and the associated motor starters and controllers shall be turned over to the Electrical Contractor for installation.

D. Control wiring, regardless of voltage, is the responsibility of the Electrical Contrator. The Electrical Contractor shall extend the 120 volt circuit to the control transformers and make 120

volt transformer connections. Control transformers shall be supplied by HVAC Contractor. Location of control transformers shall be in close proximity of the equipment.

E. Review the HVAC and plumbing specifications and provide line voltage wiring and connections to controls and auxiliary equipment specified as to be provided by the Electrical Contractor or Division 26.

END OF SECTION 260519.4

SECTION 260526 - GROUNDING

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.2 SCOPE

A. Provide material, labor and incidentals necessary for the installation of a code compliant grounding system.

1.3 RELATED WORK

A. Section 26 05 00 - General Electrical Provisions

B. Section 26 05 43 - Underground Electrical Ductwork

C. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

1.4 APPLICABLE CODES

A. National Fire Protection Association (NFPA), NFPA-70 - National Electrical Code (NEC) and Wisconsin amendments thereto.

B. Local Codes and Ordinances.

1.5 REFERENCE STANDARDS

A. Conform to the standards of the National Electrical Contractors Association (NECA), Standard of Installation.

PART 2 - PRODUCTS

2.1 GROUND CLAMPS

A. Ground clamp fittings shall be interlocking clamp type fabricated from high strength corrosion-resistant metal with high strength silicon bronze U-bolt, nuts, and lock washers.

2.2 GROUND RODS

A. Thick copper covering inseparably welded to a strong steel core.

B. ¾” diameter minimum.

C. Ten feet long minimum.

2.3 GROUND WIRES

A. Copper only.

B. Size as shown on drawings, or required by NEC.

C. No. 6 AWG minimum.

2.4 GROUND BUSSES

A. Copper only.

B. Cross section shall be ¼” X 2”, lengths shown on the plans or as required to accommodate ground connections.

PART 3 - EXECUTION

3.1 GENERAL

A. Ground electrical systems and equipment required by code, utility, local ordinances, and to requirements herein.

B. Install separate code rated grounding conductors to special equipment and activity areas required by code.

C. Bond metallic piping systems and service equipment required by NEC.

D. Cable connections and joints shall be non-reversible compression connected or thermo-welded.

3.2 SYSTEM GROUND

A. Attach grounding electrode conductor to point ahead of water meter or service shut-off valve.

B. Water piping system ground shall be augmented by 2 NEC grounding electrodes so as to achieve an effective ground resistance required by code and as shown on the plans. Building steel shall be used where available.

C. Drive ground rods to a depth 4” below finished grade.

D. Grounding electrode conductor shall be continuous without splice from nearest building grounding electrode. Ground to service equipment.

E. Install bonding jumper around water meter.

F. Attach non-ferrous metal tag to warn against removal at grounding electrode connections.

G. Make connections to ground electrodes with molded exothermic weld process or non-reversible compression connectors.

H. Provide ground from transformer location to grounding electrode system. This conductor shall be used to ground secondary side neutral, case and core in accordance with grounding requirements for a separately derived system.

3.3 EQUIPMENT GROUND

A. Bond metallic conduits, supports, cabinets, and other equipment to provide an electrically continuous equipment ground from service to outlet boxes.

B. Ground wire shall be bonded at equipment and at first junction box of conduit system on line side of conduit to the system.

C. Install separate ground conductors in pvc raceway.

D. Install grounding conductors to permit shortest path from equipment to ground. When grounding conductor runs through metallic conduit, bond to conduit at entrance and exit with a bolted clamp.

E. Ground neutral at service only.

F. Install a separate equipment grounding conductor in each conduit containing feeder conductors.

G. Install a green equipment grounding conductor in conduits serving receptacles and special purpose outlets.

H. Provide dedicated equipment grounding conductors with circuits serving isolated ground receptacles. Isolated ground conductors shall have a green jacket with a yellow stripe. Provide isolated ground bus in distribution equipment serving equipment with isolated ground requirements.

I. Green ground bar in panels, where required to be similar to neutral bar, except tinted green and bonded to panel tub.

J. Connections shall be accessible for inspection and checking. No insulation shall be installed over ground connections.

K. Ground connection surfaces shall be cleaned and connections shall be made so that it is impossible to move them.

L. Attach grounds permanently before permanent building service is energized.

M. Attach ground wire neatly and firmly to walls.

3.4 ELECTRICAL AND TELECOM ROOM GROUND BUSSES

A. Provide in telecom room as required to accommodate equipment used.

B. Minimum bus length shall be 24”.

C. Mount to walls with insulated standoffs.

D. At splice points, splice bus shall overlap busses being spliced by a dimension twice the width of the bus being spliced. Splice bus shall be connected to each bus with a minimum of two splice bolts.

E. Bus splice bolts shall utilize belleview washers.

3.5 FIELD QUALITY CONTROL

A. Contractor shall make ground resistance measurements. Measure in normally dry conditions, not less than 48 hours after rainfall. Submit measurements to Engineer upon request.

END OF SECTION 260526

SECTION 260529 - SUPPORTING DEVICES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.2 SCOPE

A. Provide equipment for the support of electrical equipment as detailed or indicated on the drawings and as specified herein.

1.3 APPLICABLE STANDARDS AND CODES

A. National Electrical Contractors Association (NECA), Standard of Installation.

B. National Electrical Manufacturers Association (NEMA).

C. American National Standards Institute (ANSI).

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Kindorf.

B. Midland-Ross Corp.

C. Steel City/Midland-Ross Corp.

D. Unistrut.

E. B-Line.

F. Power-Srut.

2.2 GENERAL

A. Metal supporting devices shall be zinc galvanized or cadmium plated steel or malleable iron.

2.3 LIGHTING FIXTURE SUPPORT

A. Items including (but not limited to) stems, hickeys, bar hangers, and clips required to securely attach fixtures to ceilings or walls.

B. Studs and structural support for fixture outlet and ceiling support.

C. Fixture grid hangers for mounting surface fluorescent units to exposed grid ceiling.

D. Drilled expansion insert type anchors rated for load and application requirements including (but not limited to) sleeve anchors, lag shields, and plastic anchors.

E. Provide auxiliary supports so that fixtures can be drawn up tightly, cannot be tilted or rotated, and not be affected by vibrations.

2.4 SUPPORT STRUCTURES

A. Rack supports of galvanized steel channel sections with adequate feet to allow secure mounting.

B. Weld sections, do not use bolts.

2.5 MOUNTING PANELS

A. Size mounting panels to mount necessary equipment, of ¾” exterior grade plywood as specified on drawings.

B. Provide mounting panels for surface mounted electrical cabinets and enclosures for electrical equipment.

C. Provide uniform mounting panels as far as practical. Preferred sizes being 12” X 18”, 18” X 24”, 18” X 30”, and 24”. X 30”.

2.6 CONDUIT SUPPORTS

A. Continuous slot or T-slot galvanized steel concrete insert channel.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install hangers, supports, and anchors only after structural work, where work is to be installed, has been completed. Correct inadequacies including (but not limited to) proper placement of inserts, anchors, and other building structural attachments.

B. Examine areas and conditions under which equipment and associated components are to be installed and notify Architect, in writing, of conditions detrimental to proper and timely

completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.

C. Determine that ceiling channel system is adequately supported to receive and support lighting fixtures. Where deemed inadequate, do not install fixtures until additional support is provided.

3.2 LIGHTING FIXTURES

A. Install channel supports across main grid runners or grid supports, securely tied down or anchored for fixtures and devices mounted in suspended ceiling systems so as not to cause tile to sag and so that fixture or device cannot be lifted, rotated, or displaced. Provide additional support of ceiling grid or tees at those locations where tiles and ceiling grid sags.

B. Install grid troffer support clips in accordance with NEC 410-16(c).

3.3 INSTALLATION OF BUILDING ATTACHMENTS

A. Install building attachments at required locations within concrete or on to structural steel or raceway and equipment support.

B. Install additional building attachments where support is required for additional concentrated loads.

C. Install concrete inserts before concrete is placed.

3.4 INSTALLATION OF ANCHORS

A. Install anchors at proper locations to prevent stresses from exceeding those permitted by ANSI B31 and to prevent the transfer of loading and stresses to connected equipment.

B. Installation methods shall be in conformity with the manufacturer's recommendations for maximum holding power, but in no case shall the depth of hole be less than four bolt diameters. Minimum distance between the center of expansion anchor and an edge of exterior corner of concrete shall be not less than 4½ times the diameter of the hole in which it is installed.

3.5 SUPPORT OF CONDUIT

A. Fasten conduit to structural parts of building in a manner acceptable to Engineer.

B. Do not use perforated hanger iron.

C. See Section 26 05 33.

D. Install concrete insert channel, with spacings as recommended by manufacturer. Install with anchor and caps, insert joiner clips and closer seals.

E. Support conduit as follows:
   1. Single Conduit Runs:
      a. Vertical Surfaces: Galvanized, heavy duty, sheet steel straps; back straps to be provided for exposed conduit and conduit on exterior walls.
      b. Horizontal Surfaces: Galvanized, heavy duty, 2 hole steel pipe straps.
   2. Multiple Conduit Runs:
      a. Vertical Surfaces: Horizontal or vertical rack channel with conduit straps.
      b. Horizontal Surfaces: Single or double rack channel trapeze, with conduit straps and supported with threaded hanger rods.
   3. Conduits Passing Between Floors and Through Roof:
      a. 1¼" and larger conduit runs passing through floors shall be supported at each floor with riser pipe clamps.
      b. Conduit extending through roof shall pass through a ceiling box at roof lines.
      c. Provide 14-gauge minimum copper box with watertight soldered seams and flanged to serve as pitch pocket for each conduit.
      d. Conduit and pitch pocket shall be installed in advance of roofing work.

3.6 VERTICAL CABLE SUPPORT

A. Conductors in vertical raceways shall be supported using cable supports. Locate supports so that each 25' length of conductor in a vertical raceway is supported.

END OF SECTION 260529

SECTION 260533 - CONDUITS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Drawings and General Provisions of Contract, General and Supplementary Conditions, and Division 1 Specifications, apply to this Section

1.2 SCOPE

A. Provide conduit systems for power wiring and communications systems as specified. Flexible, modular-wiring systems shall not be used.

1.3 RELATED WORK AND REQUIREMENTS

A. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

B. Section 26 05 26 - Grounding

1.4 QUALITY ASSURANCE

A. National Electrical Contractor's Association (NECA) Standard of Installation.

B. National Electrical Code (NEC) including local supplements.

PART 2 - PRODUCTS

2.1 CONDUIT FITTINGS - GENERAL

A. Fittings for metal raceways shall be steel, and shall be zinc galvanized or cadmium plated.

B. Fittings for PVC raceways shall be of the type recommended by the raceway manufacturer.

C. Do not use aluminum or die cast fittings.

D. Do not use malleable iron.

E. Do not use running threads.

F. Do not use indentor type fittings.

G. Box connector bushings shall have insulated throats. Integral grounding lugs shall be provided where required by code or detailed on the drawings and elsewhere in the specifications.

H. Termination bushings for conduits that terminate in free air, as at cable trays, communications backboards, in electrical vaults, and in electrical manholes.

I. For conduits carrying conductors rated 50 volts and below and where no ground connection is required. Termination bushings may be push-on, non-metallic, insulating type as manufactured by Arlington Industries, Inc. Equivalent products by other manufacturers are acceptable.

J. For conduits carrying conductors rated 50 volts and below where a ground connection is required provide termination bushings with insulated throats and integral grounding lugs.

K. For conduits carrying conductors rated 51 volts and above. Termination bushings shall have insulated throats. Integral grounding lug shall be provided where required by code or required on the drawings and elsewhere in the specifications.

2.2 GALVANIZED RIGID CONDUIT (GRC) AND INTERMEDIATE METAL CONDUIT (IMC)

A. Manufactured lengths, heavy wall, rigid steel conduit, protected inside and out by hot-dipped galvanized or electro-galvanized coating.

B. Minimum conduit size shall be ½ inch.

C. Connectors and couplings.
   1. Threaded.
   2. Liquid tight.

2.3 ELECTRICAL METALLIC TUBING (EMT)

A. Standard lengths and size.

B. Minimum conduit size shall be ½ inch.

C. Connectors and couplings. Compression type. With steel bodies and steel nuts. (Cast fittings NOT acceptable).

2.4 POLYVINYL CHLORIDE CONDUIT (PVC)

A. Standard lengths and sizes.

B. Minimum size ½ inch with the exception that the minimum size conduit for underground site lighting circuits shall be 1 inch.

C. Schedule 40 or 80, heavy wall rigid plastic (PVC) conduit manufactured to NEMA TC-2 standards, UL listed, and as required by NEC. Sunlight resistant.

D. Rated for 90 degrees C. cable.
   1. Connectors and couplings.
   2. Schedule 40 or 80, to match conduit.
   3. Expansion Fittings: PVC material, Carlon series E945 or equivalent.
   4. Expansion Straps: PVC material, Carlon series E978 or equivalent.

2.5 PVC COATED RIGID METAL CONDUIT

A. Galvanized rigid conduit with external coating of 40 mil (0.1 mm) thick polyvinyl chloride. Conduit must be hot dipped galvanized inside and out including threads. The PVC coating bond to the galvanized steel conduit shall be stronger than the tensile strength of the coating itself.

B. Fittings and Conduit Bodies: Threaded type, material to match conduit. PVC coated fittings and couplings shall have specially formed sleeves to tightly seal to conduit PVC coating. The sleeves shall extend beyond the fitting or coupling a distance equal to the pipe outside steel diameter or two inches (50 mm) whichever is greater.

2.6 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Galvanized spiral strip flexible steel.

B. Standard conduit sizes.

C. Heavy wall, sunlight resistant, PVC jacket.

D. Minimum size ½ inch.

E. Connectors and couplings.
   1. Liquid tight.
   2. Grounding type.
   3. Suitable for wet locations.
   4. Tapered threaded hub.
   5. Non-metallic materials.

2.7 FLEXIBLE METAL CONDUIT

A. Galvanized spiral strip flexible steel.

B. Standard conduit sizes.

C. Minimum size ½ inch with the exception that 3/8 inch diameter may be used to serve individual lighting fixtures installed in a suspended accessible ceiling system.

D. Connectors and couplings.
   1. Threaded.
   2. Grounding type.
   3. Insulated throat.
   4. Two screw clamp type with locknuts.
   5. Externally Secured.

2.8 EXPANSION FITTINGS

A. Copper bonding jumper, Crouse-Hinds Type XJ.

2.9 Expansion/deflection fittings

A. Copper bonding jumper, Crouse-Hinds Type XD.

2.10 CONDUIT BODIES

A. Galvanized or cadmium plated.

B. Threaded hubs.

C. Removable cover, with gasket.

D. Corrosion-resistant screws.

2.11 SEALS

A. Link Seal type as manufactured by Thunderline Corporation.

PART 3 - EXECUTION

3.1 GENERAL

A. Requirements.
1. Seal conduits that run through different temperature or atmospheric conditions to prevent condensation or moisture from entering electrical equipment and devices.
2. Install wall entrance seal where conduits or direct burial conductors pass through foundation walls below grade.
3. Install conduit expansion fittings with bonding jumper in following locations:
   a. Conduit runs which cross a structural expansion joint.
   b. Conduit runs where movement perpendicular to axis of conduit may be encountered.
4. Locate junction boxes, conduit bodies, and other access covers so as to be accessible to electrical wiring.
5. Cut joints shall be square, reamed smooth, and drawn up tight.
6. Keep conduit plugged, clean, and dry during construction. Before wire pulling begins, pull cleaning plug through conduits to clear of dirt, oil, moisture, and other debris.
7. Install #12 AWG pull wire in empty conduit.
8. Cap spare conduits.
9. Route conduit runs above suspended acoustical ceilings so as not to interfere with ceiling tile removal.
10. Route conduits (including conduits routed above ceilings) parallel to or at right angles with lines of the building construction and structural members except conduit runs routed concealed in poured-in-place concrete floor slabs may be run in a direct line from source to load.
11. Make bends and offsets without kinking or destroying smooth bore of conduit. Arrange bends and offsets in parallel conduits to present a neat symmetrical appearance.

12. Conduit runs that extend through areas of different temperature or atmospheric conditions shall be sealed, drained, and installed in a manner that prevents drainage of condensed or entrapped moisture into cabinets, and equipment enclosures.
13. Conduits shall be routed at least 12" from parallel to steam lines, hot water pipes, flues, or high temperature piping or ducts shall not be closer than 12 inches and not be closer than 12 inches clear when crossing same.
14. Conduit shall not be routed over boiler, incinerator, or other high temperature equipment.
15. Where conduits must cross or follow the same path as water, steam or other fluid piping, electrical conduits shall be installed above, not below, piping.
16. Install bushings with ground lugs and integral plastic linings at equipment with open-bottom conduit entrances.
17. Feeder conduits shall contain only those conductors constituting a single feeder circuit.
18. Feeder conduits shall follow most accessible routes, concealed in construction in finished areas, exposed to the minimum temperature gradient and to minimum temperature fluctuation.
19. Feeder conduits shall not be routed in conduit floor slabs.
20. Confine feeder conduit to insulated portions of building, unless otherwise specified.
21. Trapped feeder conduit runs without facilities for continuous drainage are not acceptable.

3.2 CONDUIT LOCATION REQUIREMENTS

A. Interior conduits for wiring systems rated 50 to 600 volts shall be electrical metallic tubing (EMT). Exceptions to the requirements stated above are as follows:
   1. Conduits in poured concrete construction shall be IMC or GRC regardless of size.
   2. Flexible conduit where required by other paragraphs in this section.
   3. Unless otherwise restricted by codes.
   4. Conduits installed in hazardous locations shall be GRC. See floor plans for hazardous locations.
   5. Conduits in corrosive locations shall be PVC coated GRC. See floor plans for corrosive locations.
   6. Conduits in security locations shall be IMC or GRC. See floor plans for security locations.
   7. Conduits in wet locations shall be IMC or GRC. See floor plans for areas to be treated as wet location.

B. Interior conduits for wiring systems rated 0 to 50 volts shall be electrical metallic tubing (EMT). Exceptions to the requirements stated above are as follows:
   1. Conduits in poured concrete construction shall be IMC or GRC regardless of size.
   2. Flexible conduit where required by other paragraphs of this section.
   3. Unless otherwise restricted by codes.
   4. Conduits installed in hazardous locations shall be GRC. See floor plans for hazardous locations.
   5. Conduits in corrosive locations shall be PVC coated GRC. See floor plans for corrosive locations.
   6. Conduits in security locations shall be IMC or GRC. See floor plans for security locations.
   7. Conduits in wet locations shall be IMC or GRC. See floor plans for areas to be treated as wet location.

C. Exterior underground conduits (conduits beyond the building footprint) in contact with the earth and shall be heavy wall schedule 40 PVC except where the conduits pass through the building walls. For conduit runs that pass through the building envelope horizontally and below grade, the first 5 feet of the run from the exterior face of the building wall below grade shall be galvanized rigid conduit. This requirement shall apply for conduits that exit building basement walls that are below the adjacent grade. Where conduits pass through poured concrete walls, the EC shall install metal sleeves prior to the walls being poured. Space between conduits and sleeves shall be sealed with interlocking rubber seals.

D. Interior underground conduit runs are defined as those conduits in contact with the earth, below basement floor slabs or below slabs on grade, within the building footprint, where the runs penetrate the floor slabs vertically. These conduits shall be schedule 40 heavy wall PVC except as follows:
   1. Where specifically indicated otherwise on the plans.
   2. Galvanized rigid conduit elbows shall be used where these conduit runs penetrate the floor slab so that there is no exposed PVC within the building.
   3. Conduit runs that exit the building vertically through a basement or grade level floor slab and then extend beyond the building footprint, transitioning to an exterior underground conduit run, are not required to be GRC for the 5 feet beyond where they cross the building footprint.

E. Conduits containing only electrical service bare copper grounding conductors shall be schedule 40 HW PVC.

F. Conduit connections at motors, transformers, and other equipment that vibrates:
   1. Flexible metal conduit between 18 inches and 3 feet long for conduit connections at equipment that vibrates.
   2. Liquid-tight flexible metal conduit where flexible connections are required and where conduit is exposed to moisture, dirt, fumes, oil, corrosive atmosphere. Locate so it is least subject to physical abuse. Corrosive areas are identified on the floor plans.
   3. Use double locknuts and insulated bushings with threads fully engaged.

G. Conduit connections at ceiling recessed light fixtures. Provide flexible steel conduit whips between an independent junction box mounted above ceiling and the recessed ceiling mounted lighting fixtures. Allow for positioning of equipment to tile increments. Maximum length of whip shall be six feet.

H. Install conduct expansion fittings for all conduits crossing expansion joists.

3.3 BURIED UNDERGROUND CONDUIT

A. Exterior underground buried conduits shall be buried at a depth of not less than 30 inches below grade.

B. Provide conduits or ducts terminating below grade with means to prevent entry of dirt or moisture.

C. Underground conduits shall slope 1/8 inch per foot for proper drainage. Conduits shall drain toward manholes and junction boxes, not the electrical equipment.

D. Install wall entrance seal where conduits or direct burial conductors pass through foundation walls below grade.

E. Provide a watertight conduit system where installed underground, or where embedded in concrete.

3.4 FLEXIBLE CONDUITS

A. Install fittings designed for use with flexible liquid-tight conduit to ensure continuity of ground throughout the fittings and conduit and prevent entrance of moisture.

3.5 CONCEALMENT

A. Unless specifically noted otherwise, conduits shall be routed concealed in finished spaces and shall not be visible at any point within the finished space or from the building's exterior. This requirement also applies to new conduits installed in existing construction.

B. At the contractor's option, conduits may be installed below slabs on grade.

C. Conduits may be routed exposed in mechanical equipment rooms and utility rooms.

3.6 SUPPORTS

A. Raceways installed concealed in the stud space of hollow, stud and drywall partitions shall be fastened to steel studs with spring steel clips. Clips shall be utilized as intended by the manufacturer and installed per the manufacturer's instructions. Conduit supports utilizing tie wires shall not be used.

B. Interior surface mounted conduits attached to walls:
   1. Raceways 1 ¼" diameter and smaller. One hole support straps.
   2. Raceways 1 ½" diameter and larger. Two hole straps.
   3. Light gauge steel framing fastened to wall surface with conduits fastened to steel framing using two piece conduit clamps.

C. Interior surface mounted conduits attached to underside of structural ceilings and roofs:
   1. Two hole support straps.
   2. Light gauge steel framing fastened to ceiling surface with conduits fastened to steel framing using two piece conduit clamps.
   3. Where underside of roof structure consists of steel trusses, joists, beams, etc., spring steel clips for supporting raceways will be allowed. Clips shall be utilized as intended by the manufacturer and installed per the manufacturer's instructions.

D. Interior conduit runs suspended from the underside of structural ceilings and roofs:
   1. Single Conduit Runs: Threaded rod fastened to structure with conduit attached to rod utilizing steel, yoke type support.
   2. Multiple Conduit Runs: Horizontal light gauge steel framing suspended from structure with threaded rods, minimum two per frame, in a trapeze configuration. Conduits fastened to steel framing using two piece conduit clamps.

E. Exterior, wall mounted, surface raceways. Cast zinc, one hole strap with back plate to stand raceway off wall surface 3/8” minimum.

F. Provide riser clamps around conduits 1-1/4 inch or larger that are routed between floors.

G. Conduits shall not be supported by, or attached to the suspension systems for dropped ceiling systems unless specifically detailed on the drawings.

H. Secure conduits in place with malleable corrosion-proof alloy straps or hangers.

I. The use of perforated strapping as a conduit hanging method is not acceptable.

J. The use of tie wires to support conduits is not acceptable.

3.7 FIRESTOPPING

A. Provide firestopping at conduit penetrations through fire rated construction in accordance with Section 26 05 00.

3.8 CUTTING AND PATCHING

A. Provisions for openings, holes, and clearances through walls, floors, ceilings, and partitions shall be made in advance of construction.

B. Provide cutting, patching and painting necessary for the installation of electrical systems.

C. Where conduits need to penetrate concrete or masonry construction install 22 gauge galvanized steel pipe sleeves, 1 inch larger in diameter than the conduit being installed. Sleeves shall extend 2 inches above the floor slab or wall penetrated. Install sleeves before walls or slabs are poured or constructed.

D. Provide drawings indicating size and location of anticipated floor sleeves for the installation of electrical conduits.

3.9 ADJUSTMENT AND CLEANING

A. Restore damaged areas on PVC jacketed, rigid conduit with spray type touch-up coating compound or as recommended by manufacturer.

END OF SECTION 260533

SECTION 260533.1 - ELECTRICAL BOXES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.2 SCOPE

A. Provide electrical boxes in accordance with this specification.

1.3 RELATED WORK

A. Section 26 05 33 - Conduits

B. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

C. Section 26 27 26 - Wiring Devices

D. Section 26 05 29 - Supporting Devices

E. Section 26 05 26 - Grounding

1.4 QUALITY ASSURANCE

A. Reference Standards of the National Electrical Contractors Association (NECA), Standard of Installation.

PART 2 - PART 2 - PRODUCTS

2.1 INTERIOR WALL OUTLET BOXES - FLUSH MOUNTED

A. Stamped steel, four inch square, 2-1/8" deep minimum, with square corners. Provide with raised device rings, height to match wall finish thickness. Mounting accessories. Larger width boxes shall be provided for ganging requirements indicated on plans.

2.2 INTERIOR WALL OUTLET BOXES - SURFACE MOUNTED - DRY LOCATION

A. Stamped steel, four-inch square, 2-1/8" deep, with round corners. Provide rounded corner raised box covers with openings for devices being installed. Refer to section 16111 for restrictions on exposed conduit systems.

2.3 INTERIOR WALL OUTLET BOXES - SURFACE MOUNTED - DAMP OR WET LOCATION

A. Cast malleable iron with threaded conduit hubs. Two inches deep minimum. Internal mounting ears. Boxes shall be coated with electroplated zinc, a dichromate coating, and an aluminum polymer enamel finish. Refer to Section 26 05 33 for restrictions on exposed conduit systems.

2.4 EXTERIOR WALL OUTLET BOXES - SURFACE MOUNTED

A. Cast malleable iron with threaded conduit hubs. Two inches deep minimum. Internal mounting ears. Boxes shall be coated with electroplated zinc, a dichromate coating, and an aluminum polymer enamel finish. Refer to section 16111 for restrictions on exposed conduit systems.

2.5 CEILING BOXES - FLUSH MOUNTED - FOR SURFACE AND PENDANT LIGHT FIXTURES

A. Dropped ceiling construction. Stamped steel four-inch octagon box set flush with finished surface, with 3/8 in. fixture stud.

B. Cast in place concrete construction. Stamped steel four inch octagonal, galvanized concrete boxes, having a minimum depth of 3 in., with 3/8 in. fixture stud.

2.6 ELECTRICAL BOXES IN CORROSIVE LOCATIONS

A. PVC coated cast steel boxes compatible with conduit system installed. Coating shall cover both interior and exterior surfaces. See floor plans for identification of corrosive areas.

2.7 SPECIAL BOXES

A. Provide special boxes fabricated by the manufacturer of fixtures and other devices where standard outlets are not applicable.

2.8 GENERAL PURPOSE JUNCTION AND PULL BOXES

A. Fabricate from code gauge galvanized steel, with covers held in place by corrosion resistant machine screws.

B. Size shall conform to code requirements for number of conduits and conductors entering and leaving box.

C. Provide with welded seams, where applicable, and equip with corrosion-resistant nuts, bolts, screws, and washers.

D. Provide safety chain between cover and enclosure for boxes 24” or larger.

E. Boxes to be sized per NEC 314.

2.9 WEATHERPROOF JUNCTION AND PULL BOXES

A. Stainless steel or cadmium plated malleable iron cast type with threaded hubs, cast cover, and neoprene gasket.

2.10 BETWEEN STUD BOX SUPPORT BRACKETS

A. Stamped and fabricated steel bracket designed to support 4" or 4-11/16" electrical boxes between wall studs.

B. Manufactured by Erico, RBS series or equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install electrical boxes, in compliance with NEC requirements, in accordance with the manufacturer's written instructions and with recognized industry practices.

B. Seal conduit at entrance to weatherproof boxes for interior and exterior locations exposed to weather or moisture.

C. Install knockout closures to cap unused knockout holes where blanks have been removed.

D. Locate boxes to provide access to electrical wiring. Relocate boxes rendered inaccessible by the installation of work by other trades.

E. Secure boxes rigidly to the substrate upon which they are being mounted, or solidly embed boxes in concrete or masonry. Do not support from conduit.

F. Set boxes, in concealed conduit runs, flush with wall surfaces, with or without covers.

G. Do not install boxes back to back or through wall. Offset outlet boxes on opposite sides of wall a minimum 12 inches.

H. Set outlet boxes parallel to construction, securely mounted and adjusted to set true and flush with the finished surface.

I. Do not burn conduit holes, use knock-out punches, or hole saws.

J. Use "no-bolt" studs where required.

K. Use handy boxes only where specifically detailed on the drawings.

L. Boxes shall be sized per code to accommodate the number and size of conduit entrances to the box and to accommodate the number of conductors, splices, fittings within the box. Do not use box extensions to create additional volume to meet NEC requirements for the number of conductors contained in a box.

3.2 EXPOSED OUTLET AND JUNCTION BOXES

A. Install weatherproof outlet and junction boxes outdoors and in areas where drawings show weatherproof (WP) wiring devices.

3.3 INTERIOR OUTLET BOX ACCESSORIES

A. Provide outlet box accessories for each installation, including but not limited to: mounting brackets, wallboard hangers, extension rings, fixture studs, cable clamps, and metal straps for supporting outlet boxes. Accessories shall be compatible with outlet boxes being used and meeting requirements of individual wiring situations.

3.4 LIGHTING FIXTURE OUTLET BOXES

A. Securely mount with bar type hangers spanning structural members to support weight of fixture.

B. Do not support from conduit.

C. Equip with 3/8 inch fixture studs and tapped fixture ears, for surface mounted or pendant mounted lighting fixtures. Fixture studs shall be provided for mounting of lighting fixtures exceeding 25 lbs. in weight. Fixture studs shall be attached through knockouts at the top of the box.

D. Provide additional attachments from structure for outlet boxes supporting lighting fixtures weighing in excess of 25 lb.

3.5 OUTLET BOX LOCATIONS

A. Locate flush mounted wall boxes in corner of nearest brick or block to keep cutting to a minimum.

B. Location of outlets and equipment as shown on drawings is approximate, and exact location is to be verified and shall be determined by:
   1. Construction or code requirements.
   2. Conflict with equipment of other trades.
   3. Equipment manufacturer's drawings.

C. Where receptacles and communications outlets are shown grouped next to each other on the drawings, the boxes for these outlets shall be mounted next to each other and shall not be located according to stud spacings. The Contractor shall utilize between stud box supports to assist in mounting boxes proximal to one another on a consistent spacing between wall studs.

D. Minor modification in the location of outlets and equipment is considered incidental up to a distance of 10 feet, provided the change in location is requested prior to rough-in.

E. Mounting heights for devices and equipment to be measured from finished floor to centerline of device.

END OF SECTION 260533.1

SECTION 260541 - UNDERGROUND ELECTRIC SERVICE

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable provisions of Division 00 and Division 01 shall govern work in this Section.

1.2 SCOPE

A. Provide facilities for an underground electrical service.

1.3 RELATED WORK

A. Section 26 05 33 - Conduits

B. Section 26 05 26 - Grounding

C. Section 26 01 26 - Electrical System Testing

1.4 QUALITY ASSURANCE

A. Reference the local electrical utility's Service Rules and Regulations.

1.5 SUBMITTALS

A. Submit shop drawings of service entrance equipment for approval by Electrical Utility before submitting drawings to Engineer.

PART 2 - PRODUCTS

2.1 ELECTRIC SERVICE

A. Electric service characteristics for this project shall be as shown on drawings.

PART 3 - EXECUTION

3.1 PREPARATION

A. CONFIRMATION OF ELECTRIC SERVICE
   1. Consult with Electric Utility to verify service information specified herein and shown on drawings before submitting bid.

B. METERING
   1. Consult with Electric Utility regarding service entrance requirements and metering equipment.
   2. Install metering equipment and empty conduit for metering conductors to meet standards and requirements of Electric Utility.

C. ELECTRIC UTILITY CHARGES
   1. Include in Base Bid the Electric Utility charges for incoming underground electrical service.

3.2 SERVICE INSTALLATION

A. The service installation shall comply with the latest applicable standards of the utility. Refer to the current electrical service installation manuals.

B. The Contractor shall meet with the electric utility prior to rough-in to review and coordinate the installation of the electrical service and verify existing conditions and special requirements. EC is required to meet all Utility Requirement for the new service.

END OF SECTION 260541

SECTION 262416 - ELECTRICAL PANELBOARDS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.2 SCOPE

A. Provide panelboards as shown on the drawings and as specified herein.

1.3 RELATED WORK

A. Section 26 05 00 - General Electrical Provisions

B. Section 26 28 00 - Low Voltage Overcurrent Protective Devices

C. Plans - Panel Schedule

1.4 SUBMITTALS

A. Shop drawings.
   1. Cabinet dimensions, nameplate nomenclature, electrical ratings, and breaker type listing.
   2. Product data sheets with installation instructions.

B. Operating and Maintenance manuals.
   1. Field quality control test results.
   2. Operating and maintenance data.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Do not store panelboards exposed to weather.

B. Protect panelboards against damage from work of other trades.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Use of a manufacturer's name and model or catalog number is for the purpose of establishing standard of quality and general configuration desired:
   1. Square D, Eaton/Cutler-Hammer, General Electric, Siemens

2.2 PANELBOARD UL LISTED SHORT CIRCUIT INTEGRAL EQUIPMENT RATINGS

A. 208Y/120V lighting panels. 10,000 RMS symmetrical amperes minimum or as shown on drawings. Equivalent to Square D type NQOD.

2.3 PANELBOARD CONSTRUCTION

A. Main breaker or main lugs only, per panelboard schedule.

2.4 BUSSING

A. Plated copper phase bussing.

B. Plated copper neutral bus with terminals.

C. Copper equipment grounding bus with terminals.

D. Distributed phase sequence type.

E. Ratings per panelboard schedule, 100-amp minimum.

2.5 PANEL CABINETS

A. Code gauge galvanized steel.

B. Minimum 20" wide.

C. Minimum 5¾" deep.

D. Height as required to accommodate breakers and spaces indicated on plans and code required gutter space.

E. Gutters adequate for wire size used, 4” minimum.

2.6 PANEL FRONTS

A. Dead front safety type.

B. Concealed adjustable trim clamps.

C. Code gauge steel with rust inhibiting primer and baked enamel finish. Cover thickness shall not be less than the requirements indicated the listing for UL 50.

D. Panel front cover shall have piano hinge to allow access to wiring gutters with out removal of panel trim. Hinged trim held in place with screw fasteners. Door shall be built into trim, which allows access to breakers as well as to hinged trim screw fasteners. Breaker access door shall have the following features:
   1. Concealed hinge.

2. Flush stainless steel cylinder tumbler type locks with spring loaded door pulls.
3. Locks for all job panels keyed alike.

E. Steel frame circuit directory holder with directory cards on inside face:
1. Clear plastic cover.
2. Typewritten descriptions.

2.7 BREAKER BRANCH PANELBOARDS

A. Conform to Section 26 28 00.

B. UL Class A ground fault circuit protection (GFI) as shown on drawings.

C. UL listed terminals for type and temperature rating of wire utilized. Anti-turn solderless type.

D. Circuit breaker construction for NQOD panels shall bolt on to panel bussing.

2.8 NAMEPLATES

A. Engraved laminated plastic type.

B. Letters $^{3}/_{16}$" high.

C. White letters on black background.

D. Verify panelboard designation with the owner's representative.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine area to receive panelboard to assure adequate clearance for panelboard installation.

B. Monitor construction of other trades so that no material is installed over the top or in front of the switchboard in violation of code required working clearances.

C. Start work only after unsatisfactory conditions are corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.

B. Flush mount, surface mount, install on equipment rack or in MCC as specified on drawings and schedules.

C. Support panel cabinets independently to structure with no weight bearing on conduits.

D. Install recessed panelboards to allow cover to be drawn tight against wall to provide neat appearance. Verify wall thickness to accommodate panel depth.

E. Install panelboards so top breaker is not higher than 6 ft-0 in. above floor.

F. Adjacent panel cabinets shall be of same size and mounted in horizontal alignment.

G. Install in each panelboard a typewritten directory accurately indicating rooms and equipment being served.

H. Attach nameplates. Nameplates for panels in public areas shall be attached to the inside face of the cover. Nameplates for panels in equipment rooms and other non-public areas shall be attached to the outside face of the cover.

I. Provide (2) one inch spare branch conduits for flush panelboards. Conduits shall be provided between panel cabinet and attic space.

3.3 FIELD QUALITY CONTROL

A. Balance load among feeder conductors.

B. Unbalance shall not exceed ± 7½% of computed average load per phase.

C. Energize each circuit and check for correct function.

3.4 ADJUSTMENT AND CLEANING

A. Adjust doors and operating mechanisms for free mechanical movement.

B. Tighten lugs and bus connections.

C. Thoroughly clean enclosure inside and outside of dust and debris before final acceptance.

D. Sand, prime and paint scratched or marred surfaces to match original finish.

END OF SECTION 262416

SECTION 262702 - EQUIPMENT CONNECTIONS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 01 shall govern work in this section.

1.2 DESCRIPTION

A. Provide power and selected control wiring for equipment including (but not limited to):
   1. HVAC motors, panels and equipment.
   2. Plumbing motors, panels and equipment.

B. Coordinate equipment requirements with the various Contractors and Owner. Review the drawings and specifications to determine extent of wiring, starters, devices, and other equipment required.

1.3 RELATED WORK AND REQUIREMENTS

A. Section 26 05 33 - Conduits

B. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

C. Section 26 27 28 - Motor and Circuit Disconnects

PART 2 - PRODUCTS

A. NOT USED.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Wherever possible, match conductors of the electrical connection for proper interface between the electrical supply and the installed equipment.

B. Review equipment submittals prior to installation and electrical rough-in. Verify location, size, and type of connections. Coordinate details of equipment connections with supplier and installer.

C. Use wire and cable with insulation suitable for temperatures encountered in heat-producing equipment.

D. Cover splices with electrical insulation equivalent to, or of a higher rating than, insulation on the conductors being spliced.

E. Prepare wire by cutting and stripping covering insulation properly to ensure a uniform and neat appearance where wires are terminated.

F. Trim wires to be as short as practicable and arrange routing to facilitate inspection, testing, and maintenance.

G. Provide flexible conduit for electrical equipment connections where subject to movement and vibration.

H. Provide liquid-tight flexible conduit for connection of motors and for other electrical equipment where subject to movement and vibration and one or more of the following conditions:
   1. Exterior location:
      a. Moist or humid atmosphere where condensate can be expected to accumulate.
      b. Subject to water spray.
      c. Subject to dripping oil, grease or water.

I. Install cord set where connection with attachment plug is indicated, specified, or required.

J. Provide suitable strain-relief clamps for cord connections to outlet boxes and equipment connection boxes.

K. Make wiring connections in control panel or in wiring compartment of pre-wired equipment in accordance with manufacturer's instructions. Provide interconnecting wiring where indicated.

L. Install disconnect switches, controllers, control stations and control devices such as limit switches and temperature switches as indicated. Connect with conduit and wiring as indicated.

3.2 HVAC AND PLUMBING CONNECTIONS

A. Provide power wiring including circuitry carrying electrical energy from panelboard or other source through starters and disconnects to motors or to packaged control panels. Packaged control panels may include disconnects and starters and overcurrent protection. Provide wiring between packaged control panels and motors. Include starters disconnects and overload protection if not included in packaged control panels.

B. Provide connection to variable frequency drives (VFD) (furnished by others) to include wiring from the drive to the motors and interconnecting of included isolation transformers. VFD and transformer setting by Division 23.

C. Provide 120 volts to each temperature control panel.

D. Unless otherwise specified, electrical motors and control devices including (but not limited to) aquastats, float and pressure fan powered VAV boxes, switches, electropneumatic switches,

solenoid valves and damper motors requiring mechanical connections shall be furnished, installed and wired by Contractor supplying the devices.

E. Each motor terminal box shall be connected with a maximum 18" piece of liquid-tight flexible nonmetal conduit to a fixed junction box. A green wire run through the flexible conduit shall interconnect the motor frame and the rigid conduit system. Use Liquidtight flexible non-metal conduit for connections.

F. Check for proper rotation of each motor.

END OF SECTION 262702

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.2 SCOPE

A. Provide wiring devices generally consisting of switches and receptacles on the drawings and as specified herein.

1.3 RELATED WORK

A. Section 26 05 33.1 - Electrical Boxes

1.4 SHOP DRAWING SUBMITTALS

A. Listing of brand names and types of materials proposed for use.

B. Nameplate nomenclature.

C. Electrical ratings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Use of a manufacturer's name and model or catalog number is for purpose of establishing standard of quality and general configuration desired only:
   1. Cooper Wiring Devices
   2. Hubbell Wiring Device Div.
   3. Pass and Seymour, Inc.
   4. Crouse-Hinds
   5. Leviton
   6. General Electric

2.2 GENERAL

A. Provide factory-fabricated, NEMA specification grade wiring devices in type, color, and electrical rating for service indicated.

B. Provide wiring devices of one manufacturer.

C. Wiring devices for use with stranded conductor shall have a clamping type terminal that can be physically tightened. The clamping device shall not be a spring type of clamp.

D. EC shall coordinate final color with Architect prior to submitting shop drawings or ordering equipment.

2.3 TOGGLE SWITCHES

A. GENERAL USE LIGHTING SWITCHES
   1. 20 amp toggle type. Pass and Seymour Cat. No. 20AC1 Switches controlling equipment, the operation of which is not evident from the switch position, shall include flush neon pilot light in conjunction with proper switch. Each switch shall include engraved plate to identify equipment being controlled. (White letters on black, 1/8 in. high minimum.) Provide a two-gang switch plate. Mount toggle switch in one opening, red neon pilot light in the other. Light shall be Pass and Seymour Cat. No. 2151RED or equivalent.

2.4 RECEPTACLES

A. All receptacles shall be extra heavy duty grade receptacles.

B. GENERAL USE DUPLEX RECEPTACLES
   1. NEMA type 5-20R, grounding type, 20 amp, 120 volt rating. Pass and Seymour Cat. No. 5262. Where a single duplex receptacle is wired to a dedicated 20 ampere, 120 volt circuit, provide NEMA type 5-20R grounding type 20 ampere receptacles. Pass and Seymour Cat. No. 5362

C. SPECIAL PURPOSE RECEPTACLES
   1. As shown on drawings and schedules.

D. GROUND FAULT CIRCUIT INTERRUPTER DUPLEX RECEPTACLES
   1. Leviton model number 7899-I with LED indicator light. Device must meet UL year 2003 listing requirements for GFCI receptacles.

E. DAMP AND WEST LOCATIONS
   1. All 15 and 20A 125 and 250 volt receptacles shall be listed “weather resistant type (WR)” per NEC 406.8.

2.5 WIRING DEVICE PLATES AND COVERS

A. Provide wall plates for wiring devices, with ganging, cutouts and metal screws for securing plates to devices. Screw heads colored to match finish of plate.

B. Plates for flush mounted devices shall be of thermoplastic nylon, non-combustible, mar-proof thermosetting material, minimum 0.100" thick. Color of plates shall be coordinated with Architect .

C. Plates for flush mounted devices shall be coordinated with Architect

D. Plates in door frames shall be Pass and Seymour/Sierra narrow "SNK" multiple opening type no. 430 stainless steel.

E. Plates for surface mounted Type FS or FD boxes: Type FSK galvanized steel covers.

F. Plates for surface mounted 4 inch square boxes: ½ inch raised galvanized steel covers.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which wiring devices are to be installed and notify Engineer, in writing, of conditions detrimental to proper and timely completion of work.

B. Do not proceed with work until unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.

B. Do not install devices until after wall finishes (wall covering, painting, wallpaper,) have been applied. Outlets installed prior to walls being finished and used for construction power shall be replaced at the time of substantial completion.

C. Before installing receptacles and switches, clean electrical boxes of dirt and debris.

D. Do not use terminals on wiring devices (hot or neutral) for feed-through connections, looped or otherwise. Make circuit connections via wire connectors and pigtails.

E. Install gasket plates for devices or system components having light emitting features, as switches with pilot lights. Where installed on rough textured surfaces, seal plates with black self-adhesive poly-foam.

F. Ground receptacles with an insulated green ground wire from device ground screw to a bolted outlet box connection. Route a continuous green equipment grounding conductor with branch circuit conductors serving isolated ground receptacles. Terminate the equipment ground on the ground bus in panelboards.

G. Stranded conductor terminating on wiring devices shall be terminated in a clamping terminal and not on the screw terminal.

H. Provide a layer of electrical tape around the perimeter sides of each wiring device so that the terminations are insulated.

I. Where GFI protected receptacles are indicated on the plans, each receptacle indicated shall be a GFI receptacle. Standard receptacles protected with an upstream GFI receptacle are not permitted.

3.3 FIELD QUALITY CONTROL

A. Provide operational testing for all devices.

B. Test receptacles with Hubbell 5200, Woodhead 1750, or equal, for correct polarity, proper ground connection, and wiring faults.

END OF SECTION 262726

SECTION 262727 - OCCUPANCY SENSORS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 00 and Division 01 shall govern work in this section.

1.2 SCOPE

A. Provide occupancy sensors for the automatic control of the lighting in building spaces as shown on the drawings and as specified herein.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Watt Stopper,

B. Hubbell/Unenco ,

C. Sensor Switch.

D. Listing of a manufacturer does not guarantee approval. Manufacturers must meet requirements listed below to be considered acceptable.

E. All occupancy sensors shall be hardwired type; battery type shall not be permitted. All devices shall be WHITE

2.2 WALL MOUNTED (Wall Switch Type)

A. The sensor shall use dual technology, passive infrared and passive acoustic sensing for detecting room occupancy. The unit shall fit in/on a standard single gang switch box and require only two wires and a grounded box for operation.

B. Rated capacity: 600 watts minimum at 120 volts, 60 Hz; 1000 watts minimum at 277 volts, 60 Hz

C. Sensitivity shall be user adjustable or self adjusting type.

D. The delay timer shall be adjusted 20 minutes by the contractor in the field. The sensor shall have a test mode for performance testing.

E. The off switch shall have manual override for positive off and automatic on.

F. The test LED shall indicate motion.

G. The area of coverage shall be approximately 180 degrees by 35-40 feet.

H. The unit shall have a five year warranty.

2.3 CEILING MOUNTED

A. The sensor shall use dual technology, passive infrared and passive acoustic sensing or ultrasonic technology for detecting room occupancy. The unit shall fit in/on a standard octagon box.

B. Ceiling mounted sensor shall have built-in photocell/daylight override option to keep lights off if enough ambient light is present – refer to symbol list on the plans.

C. Sensing device may be separate from switching relay. Switching relay shall include control power transformer. Power transformer/switching relays are not shown on plans. Provide in quantities as required and locate above accessible ceilings near sensing device. Relay contacts shall have a rated capacity of 20 amps at 120 or 277 volts, for fluorescent lamps.

D. Sensitivity shall be user adjustable or self adjusting type.

E. The delay timer shall be adjusted to 20 minutes by the contractor in the field. The sensor shall have a test mode for performance testing.

F. The coverage area shall be 360 degrees by approximately 15 feet radius when mounted at 9 foot height (for passive infrared technology) or 20' height (for dual technology sensors)

G. The sensor shall have provisions, such as masking, to block out problem areas.

H. Occupancy sensors shall have an auxiliary normally open contact to tie in to the building automation system for indication of the space being occupied or unoccupied. The contact should fail closed for occupied mode –(coordinate with Mechanical engineer.)

I. Sensitivity and time delay settings shall be initially set for maximum sensitivity and longest time delay.

J. Weatherproof Occupancy Sensors (plan designation "WP" where applicable)

K. Minimum operating temperature: minus 40 degree F.

L. Corrosion resistant form moisture.

M. Test LED to indicate motion.

N. The unit shall have a five year warranty.

2.4 CEILING/CORNER WITH BRACKET

A. The sensor shall use dual technology, passive infrared and passive acoustic sensing for detecting room occupancy. The unit shall fit in/on a standard octagon box.

B. When ceiling mounted at ten feet AFF, the sensor shall have asymmetric, forward throw, long range coverage 90'-0" from the device. The sensor shall have provisions, such as masking to block out problem areas.

C. Sensing device may be separate from switching relay. Switching relay shall include control power transformer. Power transformer/switching relays are not shown on plans. Provide in quantities as required and locate above accessible ceilings near sensing device. Relay contacts shall have a rated capacity of 20 amps at 120 or 277 volts, for fluorescent lamps.

D. The sensitivity shall be adjustable.

E. The delay timer shall be adjusted to 20 minutes by the contractor in the field. The sensor shall have a test mode for performance testing.

F. The test LED shall indicate motion.

G. The unit shall be UL or ETL approved.

H. The color shall be white.

I. Provide with manufacturer's supplied ceiling mounting bracket and associated swivel mounting bracket.

J. The unit shall have a three year warranty.

K. Sensors shall have an auxiliary normally open contact to tie in to the building automation system for indication of the space being occupied or unoccupied. The contact should fail closed for *occupied mode. (Coordinate with mechanical Engineer)*

L. The coverage area shall be 120 degrees with a 40 foot radius when mounted on a 20 foot ceiling.

M. The sensor shall have provisions, such as masking, to block out problem areas.

N. Sensitivity and time delay settings shall be initially set for maximum sensitivity and longest time delay.

PART 3 - EXECUTION

3.1 GENERAL

A. Occupancy sensors are to control the lighting fixtures in the rooms shown on the drawings. Adjust the sensitivity to reduce nuisance operation.

B. Low voltage wiring for this system may be installed exposed above accessible ceilings or in wall cavities. Cable installed in return plenum areas shall be plenum rated. Exposed cable shall be supported at 5 foot minimum intervals using bridal clamps or tie wraps.

C. Ceiling mounted occupancy sensors and adjustable wall mounted occupancy sensors have circuit switching relay packs that are separate from the sensors. These relay packs are not shown on the

floor plans. They are to be located above accessible ceilings in the areas served and are to be provided in the quantities required to achieve the control requirements indicated on the floor plans.

END OF SECTION 262727

SECTION 262728 - MOTOR AND CIRCUIT DISCONNECTS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.2 SCOPE

A. Provide disconnect switches for the disconnection of motorized equipment and other equipment required by the national and state electrical codes and as specified herein. Code required disconnects shall be provided for all equipment unless included with equipment provided by others. EC to examine entire set of drawings and provide all required disconnects, whether shown or not on the electrical drawings. Verify requirements with other trades.

1.3 RELATED WORK

A. Section 26 05 26 - Grounding

B. Section 26 28 00 - Low Voltage Overcurrent Protective Devices

C. Section 26 05 19.4 - Motor Wiring

D. Section 26 29 00 - Motor Starters

1.4 SHOP DRAWING SUBMITTALS

A. Enclosure dimensions, nameplate nomenclature, electrical ratings, and fuse and breaker type listing.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Do not store exposed to weather.

B. Protect against damage from work of other trades.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. General Electric, Siemens, Square D, Eaton/Cutler-Hammer.

2.2 DISCONNECT RATINGS

A. UL listed short circuit rating. 200,000 RMS amps with Class R fuses.

2.3 SAFETY SWITCH CONSTRUCTION

A. Twenty Amp, one pole, non-fusible.
   1. Toggle type operator.
   2. Toggle guard capable of locking switch in the on or off position.
   3. Rated 1HP at 120 volts AC.

B. Switches for 250 volt or 600 volt equipment
   1. NEMA heavy duty Type HD.
   2. Horsepower rated or as indicated on drawings
   3. Dual cover interlock.
   4. Visible blades.
   5. Provisions for control circuit interlock.
   6. Pin type hinges.
   7. Tin plated copper current carrying parts.
   8. Quick make and break operator mechanism.
   9. Handle attached to box, not cover.
   10. Handle position indication, ON in up position and OFF in down position.
   11. Padlock provisions for up to three padlocks in OFF position.
   12. UL listed lugs for type and size of wire specified.
   13. Spring reinforced fuse clips for Type R fuses where fusible disconnect is indicated or required.
   14. Provisions for insulated neutral.
   15. Disconnect feeder grounding kit.
   16. Service listed.

2.4 ENCLOSED CIRCUIT BREAKER CONSTRUCTION

A. Dual cover interlock.

B. External trip indication.

C. Provisions for control circuit interlock.

D. Padlock provisions for up to three padlocks in OFF position.

E. Handle attached to box, not cover.

F. Handle position indicates ON, OFF, or TRIPPED.

G. Provisions for insulated or grounded neutral.

2.5 ENCLOSURES

A. Indoor. NEMA 1 code gauge steel with rust inhibiting primer and baked enamel finish.

B. Outdoor. NEMA 3R code gauge zinc coated steel with baked enamel finish or NEMA 4 when indicated on drawings.

C. Corrosive Areas and Kitchen Spaces. NEMA 4X Type 304 stainless steel with brushed finish.

D. Hazardous areas. NEMA 7/9 cast, copper free, aluminum alloy.

2.6 NAMEPLATES

A. Engraved laminated plastic type. Identify specific name of equipment served.

B. Letters 3/16" high.

C. White letters on black background.

D. Identify per equipment controlled.

2.7 SPARE FUSES

A. Furnish owner with our complete set (3) of spare fuses each with each size or type (e.g. Fen,30A,45A etc.)

A. Provide spare fuse enclosure sized for single fuses. Locate in Electrical room.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide disconnect switches for loads required by code. Review HVAC and Plumbing specifications to determine what equipment is furnished with disconnect switches. Install disconnect switches whether furnished under this contract or not. It is the Electrical Contractor's responsibility to determine the need for a disconnect switch requirements for each specific load. The contractors shall include in their bid code required disconnect switches whether indicated on the drawings or not.

B. Provide label on inside of disconnect cover identifying the types of fuses to be used.

3.2 GROUNDING

A. If disconnect concentric knockouts are used, the contractor shall provide a grounding bushing or other means to insure ground continuity. Concentric knockouts are not listed for grounding continuity.

B. If disconnect is utilized as service disconnect. Provide service grounding kit, label as service disconnect and provide UL Listing for service disconnect.

3.3 INSPECTION

A. Examine area to receive disconnect for adequate clearance for installation.

B. Start work only after unsatisfactory conditions are corrected.

3.4 INSTALLATION

A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.

B. Locate disconnect switches as shown on drawings or required by NEC.

C. Install on equipment support where feasible, or anchor firmly to wall or structural surface.

D. Provide control circuit interlock required by NEC.

3.5 ADJUSTMENT

A. Adjust covers and operating mechanism for free mechanical movement.

B. Verify overcurrent protection to provide proper operation and compliance with NEC.

C. Tighten wire and cable connections.

D. Thoroughly clean enclosure inside and outside of dust and debris before final acceptance.

E. Touch up scratched or marred surfaces to match original finish.

END OF SECTION 262728

SECTION 262800 - LOW VOLTAGE OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 00 and Division 01 shall govern work in this section.

1.2 SCOPE

A. Provide overcurrent devices of the sizes and interrupting ratings as shown on the drawings and as specified herein.

1.3 RELATED WORK AND REQUIREMENTS

A. Section 26 24 13 - Low Voltage Switchboards

B. Section 26 24 16 - Electrical Panelboards

C. Section 26 29 00 - Motor Starters

D. Section 26 05 04 – Inspection and Testing of Electrical Equipment

1.4 SUBMITTALS

A. SHOP DRAWINGS
1. Device dimensions, nameplate nomenclature and electrical ratings.
2. Product data sheets with installation instructions.
3. Time current characteristics curves for each size and type of device.

B. OPERATING AND MAINTENANCE DATA
1. As specified in Section 26 05 00.
2. Manufacturer's instructions for replacing parts, performing cleaning, and operating and maintaining circuit breakers.
3. Repair parts lists.

C. TEST REPORTS
1. Report of field tests.
2. Record of circuit breaker settings.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. FUSES
1. Bussmann, Gould Shawmut, and Little Fuse

B. MOLDED CASE CIRCUIT BREAKERS
1. Square D, Eaton/Cutler-Hammer, Siemens, and General Electric.

C. FUSIBLE CUBE FUSE
1. Bussmann, or approved equal.

2.2 250 VOLT FUSE TYPES

A. Class RK-1, one end rejection or to fit mountings specified. 0-600 ampere, 200,000 ampere interrupting rating. Equivalent to Bussmann Low-Peak. LPN-R, dual element, time delay with short circuit protection for motor, transformer, welder, feeder and main service protection.

2.3 SPARE FUSES

A. Provide 100% spare (minimum of three) of each type and rating of installed fuses.

B. Copy 26 27 28 2.07B.

2.4 BRANCH CIRCUIT PANEL CIRCUIT BREAKERS

A. Thermal and magnetic protection.

B. Single-handle common trip, two and three poles (handle ties not acceptable).

C. Bolt-on type.

D. Quick make and break toggle action.

E. Handle trip indication.

F. Handle position indication, ON in up position, OFF in down position, and TRIPPED centered.

G. UL listed for type and temperature rating of wire specified.

H. UL listed short circuit rating (integrated equipment rating):
1. Up to 240V: 10,000 RMS symmetrical amperes minimum.
2.

I. UL SWDL switching duty on 120V circuits where loads are panel switched.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized industry practices.

B. Overcurrent protection devices by same manufacturer.

C. Circuit breakers shall be factory installed in enclosures.

D. Verify all breakers are tightened to manufactures recommended torque values.

E. Fuses shall not be installed until equipment is ready to be energized.

3.2 ADJUSTMENT

A. Adjustable settings on circuit breakers shall be set to provide selective coordination, proper operation and compliance with NEC. Follow manufacturer’s recommendations and set all breakers as required

3.3 FIELD QUALITY CONTROL

A. Test and permanently record the following:
   1. Fuses.
   2. Equipment nameplate requirement.
   3. Actual fuse rating.

B. Circuit Breakers:
   1. Nameplate data.
   2. Actual trip setting.

END OF SECTION 262800

SECTION 262900 - MOTOR STARTERS

PART 1 - GENERAL

1.1 SCOPE

A. The work under this section includes manual motor starters, magnetic motor starters, combination magnetic motor starters and motor control centers.

1.2 RELATED WORK

A. Applicable provisions of Division 1 shall govern work under this Section.
   1. Section 26 05 19 - Low Voltage Wires, Cables and Connectors
   2. Section 26 28 13 - Low Voltage Overcurrent Protective Devices
   3. Section 26 05 19.4 – Motor Wiring
   4. Section 26 01 26 - Electrical System Testing
   5. Motor Wiring Schedule on the drawings
   6. Section 26 05 29 –Supporting Devices.

1.3 COORDINATION WITH OTHER TRADES

A. Motors:
   1. In general, all electric motors required for this installation will be supplied with equipment, apparatus and/or appliances covered under other sections of the specifications.
   2. All motors shall conform to the following description unless otherwise noted or required.
   3. Refer to drawings in each case in order to verify voltage characteristics required.

B. Equipment:
   1. All building utility motors such as fans, pumps, overhead doors, etc., together with certain "controlling equipment" for same, except motor starters and related apparatus, will be furnished under other sections of the specifications and delivered to the building site unless specifically noted otherwise. The above mentioned "controlling equipment" pertains to electrical thermostats, electro-pneumatic and pneumatic-electric and detection devices, or any other device not purely electrically operating in nature.
   2. The starters for these motors shall be furnished and installed by the Electrical Trade unless noted otherwise.
   3. The Electrical Trade shall set and connect all specified starting equipment, install all power conduits and wiring and shall furnish and make all connections from starting equipment to motors as required to leave the apparatus in running condition.

C. Wiring Connections:
   1. Furnish branch circuits for all motors to the starting equipment and then to the motors, complete with all control wiring for automatic and remote control where required or noted. Conduits to motors shall terminate in the conduit fittings on the motors, the final

connection being made with liquid-tight flexible, non-metal conduit. Conductors between starter/VFD and motor shall be XHHW.

2. Provide all necessary labor and material to completely connect all electrical motors and controls (where required) in connection with the building utility equipment, including fans, pumps, overhead door operators, etc.
3. All conduits and wiring required for control work from the holding coil circuit of the starter, including the furnishing and installation of control devices such as auxiliary contacts, control relays, time delay relays, pilot lights, selector switches, alternators, etc., shall be provided and installed by other trades unless otherwise indicated.

D. Power Branch Circuits:
1. Wire sizes for branch circuits not specifically called for on drawings or in specifications shall be based on 125 percent of the full load current of the motor unless the voltage drop of motor branch circuits exceeds 1-1/2 percent from the distribution panel to the motor; in which case, voltage drop shall govern wire sizes. A power factor of 80 percent shall be used for motors in such calculations.

1.4 REFERENCES

A. ANSI/NEMA ICS 6 - Enclosures for Industrial Controls and Systems.

B. ANSI/UL 198E - Class R Fuses.

C. NEMA AB 1 - Molded Case Circuit Breakers.

D. NEMA ICS 2 - Industrial Control Devices, Controllers, and Assemblies.

E. NEMA KS 1 - Enclosed Switches.

F. NEMA PB 1 - Panelboards.

G. NEMA PB 1.1 - Instructions for Safe Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less.

1.5 SUBMITTALS

A. Indicate on shop drawings, front and side views of motor control center enclosures with overall dimensions. Include conduit entrance locations and requirements; nameplate legends; size and number of bus bars per phase, neutral and ground; electrical characteristics including voltage, frame size and trip ratings, withstand ratings, and time-current curves of all equipment and components.

B. Provide product data on motor starters and combination motor starters, relays, pilot devices, and switching and overcurrent protective devices.

C. Submittal shall include a schedule that lists which starter, by model number, is intended to be provided for each motor with tag number for proposed use.

1.6 OPERATION AND MAINTENANCE DATA

A. All operations and maintenance data shall comply with the submission and content requirements specified under section 16010 GENERAL REQUIREMENTS.

B. Manufacturer's printed instructions for replacing parts, performing cleaning and operating and maintaining motor starters.

C. Repair parts list.

D. Field quality control test results.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle in accordance with manufacturer's written instructions. Lift only with lugs provided for the purpose. Handle carefully to avoid damage to motor control center components, enclosure, and finish.

1.8 SPARE PARTS

A. Keys: Furnish two (2) each to Owner.

B. Provide three (3) spares of each size and type fuse used. Provide enclosure for spare fuses.

C. Fuse Pullers: Furnish one fuse puller to Owner.

D. Provide space fuse enclosure sized for single fuses. Locate in Electrical Room.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. Allen Bradley, Cutler-Hammer/Westinghouse/Eaton, Square D, General Electric, and Siemens.

B. Starters shall be by one manufacturer

2.2 MANUAL MOTOR STARTERS

A. Manual Motor Starter: NEMA ICS 2; size as shown on Drawings. AC general-purpose Class A manually operated full-voltage controller for induction motors rated in horsepower, with overload protection, red (Run) pilot light and toggle operator.

B. Starter inoperative, unless thermal unit is in position.

C. Provisions for resetting starter after overloads trip the starter.

D. Enclosure: NEMA Type: As required by NEC

E. Provide manufacturer's equipment ground kit in all starter enclosures.

2.3 MAGNETIC MOTOR STARTERS

A. Magnetic Motor Starters: NEMA ICS 2; AC general-purpose Class A magnetic controller for induction motors rated in horsepower; size 00 minimum.

B. Full Voltage Starting: Non-reversing type.

C. Reduced Voltage Starting: Solid-state type, trip current rating shall be adjustable. The overload shall be self-powered, provide phase loss and phase unbalance protection, have a permanent tamper guard and be ambient insensitive. The overload shall have a mechanical test function.

D. Make sure specifications and drawings for two (2) speed motors (single winding or double (2) windings) match mechanical specifications. Provide information in motor schedule on what type of 2-speed starter and six (6) pole disconnect is required.

E. Two Speed Starting: Two speed, [one] [two] winding, [constant torque] [variable torque] [constant horsepower] type. Provide integral time delay transition between SLOW – FAST and FAST - SLOW speeds. Provide compelling relay to ensure start in SLOW.

F. Size: NEMA ICS 2; size as shown on Drawings, size 0 minimum.

G. Coil Operating Voltage: 120 volts, 60 Hz.

H. Overload Protection: bimetal or melting alloy.

I. Starter inoperative, unless thermal unit is in position.

J. Provisions for resetting starter after overloads trip the starter.

K. Enclosure: NEMA Type: [1.] [3R.] [4.] [12.] [As indicated on the drawings.]

L. Provide manufacturer's equipment ground kit in all starter enclosures.

M. Auxiliary Contacts: NEMA ICS 2; two each field convertible contacts in addition to seal-in contact.

N. Selector Switches: NEMA ICS 2; HAND/OFF/AUTO in front cover.

O. Indicating Lights: NEMA ICS 2; LED Push-to-test type. RUN: red in front cover.

P. Indicate on the Drawings the requirement for on-time delay relays for motors (10 HP and larger) connected to emergency generators.

Q. Relays: NEMA ICS 2; Provide on-time delay (0-60 sec) relays as indicated on the Drawings.

R. Provide phase loss protection relay with each motor starter, with contacts to de-energize each motor starter.

S. Control Power Transformers: Each magnetic starter shall have a dual fused primary and a single fused 120V secondary control transformer, sized for the load, 100 VA minimum. Additionally, the X2 terminal of the control transformer shall be grounded.

T. Combination Motor Starters: Combine motor starters with fusible switch]disconnect in common enclosure.

U. Select the proper disconnecting means to match the above paragraph. Delete the types not used on this project.

2.4 CONTROLLER OVERCURRENT PROTECTION AND DISCONNECTING MEANS

A. Nonfusible Switch Assemblies: NEMA KS 1; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position.

B. Fusible Switch Assemblies: NEMA KS 1; quick-make, quick-break, load interrupter enclosed knife switch with externally operable handle. Provide interlock to prevent opening front cover with switch in ON position. Handle lockable in OFF position. Fuse Clips: [Designed to accommodate Class R fuses.

C. Disconnects shall include provision for padlocking in the "off" position.

2.5 FUSES

A. Fuses 600 Amperes and Less: Dual element, time delay, 250volt, UL Class RK 1 Interrupting Rating: 200,000 rms amperes.

2.6 NAMEPLATES

A. Engraved laminated plastic.

B. Letters 3/16” high.

C. White letters on black background.

D. Identify motors as to load served not motor numbers.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine area to receive motor starter for adequate clearance for motor starter installation.

B. Start work only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install in accordance with manufacturer's written instructions, applicable requirements of NEC and NECA's "Standard of Installation," and in accordance with recognized practices.

B. Install on equipment rack, in MCC, or mounted firmly to wall of structural surface. Refer to plumbing plans or heating, ventilating and air conditioning plans for starter locations.

C. Select and install heater elements in motor starters to match installed motor characteristics.

D. Motor Data: Provide neatly typed label inside each motor starter enclosure door identifying motor served, nameplate horsepower, full load amperes, code letter, service factor, and voltage/phase rating.

3.3 FIELD QUALITY CONTROL

A. Megger check of phase-to-phase and phase-to-ground insulation levels.

B. Do not megger check solid state equipment.

C. Test for continuity between line and load terminals and between control terminals.

D. Operational check.

E. Test each motor and permanently record following information:
   1. Motor identification as to the load served.
   2. Nameplate data.
   3. Overload relay equipment.
   4. Protective relay setting.
   5. Voltage and current phase readings.
   6. Direction of rotation.

3.4 ADJUSTMENT AND CLEANING

A. Adjust covers and operating mechanisms for free mechanical movement.

B. Tighten wire and cable connections.

C. Verify over current protection thermal unit size with motor nameplate to provide proper operation and compliance with NEC.

D. Clean interior of enclosure.

E. Touch up scratched or marred surfaces to match original finish.

END OF SECTION 262900

SECTION 265113 - LIGHTING FIXTURES

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable provisions of Division 00 and Division 01 shall govern work in this Section.

1.2 SCOPE

A. Provide and install lighting fixtures and related accessories as shown on the drawings and as specified herein.

1.3 RELATED WORK

A. Section 26 05 19 - Low Voltage Wires, Cables and Connectors

B. Section 26 05 29 - Supporting Devices

C. Section 26 05 26 - Grounding

D. Section 26 51 13.1 - Lamps

E. Section 26 51 13.2 - Ballasts

1.4 QUALITY ASSURANCE

A. Comply with the requirements of the following regulatory agencies:
   1. National Fire Protection Association (NFPA) Chapter 70 - National Electric Code (NEC) and Wisconsin Amendments thereto.
   2. Underwriters' Laboratories, Inc. (UL).

B. Conform to the standards of the following agencies:
   1. National Electrical Manufacturers Association (NEMA).
   2. Certified Ballast Manufacturers Association (CBM).
   3. American National Standards Institute (ANSI), Standard C82.1.

1.5 SHOP DRAWING SUBMITTALS

A. Submit manufacturer's printed data on lighting fixtures.

B. Submit fixture shop drawings in booklet form with index and a separate sheet for each fixture, assembled in luminaire "type" alphabetical order with specified fixture and accessories clearly indicated on each sheet.

C. Shop drawings for project light fixtures shall be submitted to the Engineer as a single submittal. It shall be the Contractor's responsibility to combine drawings from his different distributors to produce a single submittal to the Engineer. Partial submittals will be rejected without review. Partial resubmittals of rejected fixtures are permitted.

D. Where the fixture requires a ballast for proper operation, cut sheets of the ballast shall be included with the shop drawings on a fixture by fixture basis.

E. Where indicated on the Lighting Fixture Schedule, the contractor shall provide operating light fixture samples for review to accompany the fixture shop drawings. Samples shall remain on the construction site during construction and fixtures delivered shall be of identical manufacture as the samples. Contractor shall include in his bid, purchase of samples and storage on site during construction. After completion of project these samples shall be given to Owner as spares.

F. Submit a copy of UL test report if requested by Engineer. Include the following information as a minimum:
   1. Dimensional information.
   2. Description of the fixture construction.
   3. Recommended lamps for use in that particular fixture.
   4. Photometric test reports.
   5. Warnings regarding special requirements regarding the use of the lighting fixture.

PART 2 - PRODUCTS

2.1 LIGHTING FIXTURES

A. Provide lighting fixtures of the size, type, and rating indicated in "Lighting Fixture Schedule" with lamps, lampholders, reflectors, ballasts, starters, wiring and other equipment.

B. Fixture catalog numbers do not necessarily include all accessories required for the installation. Catalog numbers used in the Lighting Fixture Schedule are used to designate the fixture series, size and lamping requirements. Refer to the lighting fixture schedule notes for additional requirements.

C. Gasketing material for use in lighting fixtures shall be vinyl, neoprene or other non-aging type material.

D. Provide proper trim for each fixture for the various types of ceiling being installed throughout project. Provide the necessary plaster frames, fixture ends, caps, suspension units, mounting brackets, and other auxiliary parts required.

2.2 FLUORESCENT FIXTURES

A. Fabricate of sheet steel, die-formed to provide rigidity.

B. The color finish of each surface or pendant mounted lighting fixture is to be verified with the Architect at the time of shop drawing review.

C. Lens panels for fluorescent troffers shall be framed and be equipped with hinge and latch. Equip frames and louvers with retaining means to support frame during relamping.

D. Fluorescent rapid start fixtures, 40W and smaller, shall incorporate a grounded metal starting aid such as reflector or ballast channel strip, at least 1 inch wide over full length of lamp and within maximum ½ inch distance from lamp per ANSI C82.1.

E. Fixture ballast case temperature shall not exceed 90 degrees C.

F. At his option, contractor may provide a multi-lamp ballast in one fluorescent light fixture that drives lamps both in the fixture where the ballast is located and another light fixture. This is known as a "master-slave" ballast arrangement. This arrangement is acceptable provided the following requirements are met:
   1. The light fixture switching and circuiting arrangements shown on the plans shall not be deviated from.
   2. Project as-built drawings shall be marked up to reflect the master/slave ballasting arrangements as installed. As-builts shall identify fixture ballast locations and shall identify which lamps are driven by which ballasts.

G. All fluorescent fixtures shall be be provided with integral disconnecting means in accordance with the National Electrical Code Article 410.

2.3 LENSES

A. Plastic fixture lenses and diffusers, 100% virgin acrylic material. Lenses minimum .125 average thickness.

2.4 STEMS

A. Where stems are furnished by fixture manufacturer, he shall verify length prior to releasing for shipment.

B. Where stems are furnished by Contractor, he shall verify length prior to installation.

C. Suspended fixtures shall have swivel type aligner hangers in ceiling outlet boxes.

D. Exit fixtures shall be installed so that line of sight is not obstructed.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which lighting fixtures are to be installed and notify Engineer in writing of conditions detrimental to proper and timely completion of work.

B. Do not proceed with work until unsatisfactory conditions have been corrected.

C. Verify ceiling system compatibility with recessed fixture mounting before releasing the order for manufacture.

3.2 INSTALLATION

A. Install lighting fixtures of types indicated where shown on drawings and at indicated heights.

B. Install in accordance with manufacturer's written instructions.

C. Fasten fixtures securely to indicated structural support members.

D. Install pendant fixtures plumb.

E. Provide proper bushings for wire entrances. Ground fixture chassis to conduit system.

F. Coordinate with trades so lighting fixtures are properly aligned with items including, but not limited to diffusers, grilles, and speakers. If necessary, relocate fixtures so there is no conflict with other equipment.

G. Mount stem mounted fixtures with swivel aligners and stem lengths. Verify stem lengths.

H. Make fixture holes for wire entrance with knock-out punches or hole saw, remove burrs. Do not cut holes with tin snips.

I. Joints between recessed fixtures and ceiling shall be light-tight.

J. Recessed lighting fixtures which are installed in a rough textured ceiling surface whereby light may be emitted between fixture frame and ceiling surface shall have black self-adhesive polyfoam gasketing installed around inside edges of frame to prevent light leaks.

K. Care shall be taken in placement of outlets and surface-mounted fixtures to maintain alignment, spacings, layout, and general arrangement shown on drawings. Contractor may vary these dimensions slightly in order to clear obstructions. Major changes in the arrangement require acceptance by Engineer.

L. Install tandem fixtures in continuous rows providing that finished appearance conforms to appearance of individual units.

M. Align and plumb rows of light fixtures.

N. Mount wall and ceiling fixtures independent and secure so that they are not dependent on finish for support and cannot be rotated or displaced.

O. Maintain clearances required in Section 410.66 or the NEC. Notify Engineer of conflicts prior to rough-in.

3.3 FIXTURE SUPPORTS

A. See Section 26 05 29 for fixture support items, including but not limited to, as devices procedures, and retaining clips.

B. Surface or pendant mounted lighting fixtures weighing in excess of 25 pounds shall be securely supported to the outlet box through the use of a fixture stud. The stud shall attach to the box through a knockout in the top of the box. Fixture support shall not be solely dependant on the ears of the box.

C. Securely attach outlet boxes to the building structure either directly to the structure or through the use of a threaded rod or steel channel.

3.4 ADJUST AND CLEAN

A. Clean lighting fixtures of dirt and debris prior to acceptance. Cleaning shall include lamps, reflectors, lenses, louvers and exposed trims and housings.

B. Protect installed fixtures from damage during the construction period.

C. Aim adjustable fixtures to satisfaction of Engineer. Adjustable exterior lighting fixtures shall be aimed after dark.

D. Remove conspicuous trade labels.

3.5 FIELD QUALITY CONTROL

A. At time of Substantial Completion, replace lamps in lighting fixtures which are observed to be noticeably dimmed after Contractor's use and testing, as judged by Engineer.

3.6 PRODUCT STORAGE AND HANDLING

A. Handle lighting fixtures carefully to prevent breakage, denting, and scoring finish.

B. Do not install damaged lighting fixtures.

C. Do not repair damaged fixtures; replace and return damaged units to equipment manufacturer for repair.

D. Store lighting fixtures in a clean, dry space. Store in original cartons and protect from dirt, physical damage, weather, and construction traffic.

3.7 JOB CONDITIONS

A. Contractor shall determine that ceiling suspension system is adequately supported to receive and support the lighting fixtures. Where deemed inadequate, do not install fixtures until additional support has been provided.

B. Verify local codes and ordinances that may pertain to installation and aiming of exterior fixtures. Notify Engineer prior to Bid time if problems are encountered.

END OF SECTION 265113

SECTION 265113.1 - LAMPS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 0 and Division 1 shall govern work in this section.

1.2 SCOPE

A. The Contractor shall furnish and install the initial fill of lamps for lighting fixtures. Lamps shall be of size and type as called for in the lighting fixture schedule and as recommended by the fixture manufacturer. Where scheduled lamp types differs from that recommended by the manufacturer, the Contractor shall furnish lamps as recommended by the lighting fixture manufacturer.

1.3 RELATED WORK

A. Section 26 51 13.2 - Ballasts

B. Section 26 51 13 - Lighting Fixtures

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. General Electric Co., Philips, and Sylvania.

B. Special Manufacturers as noted on the lighting fixture schedule.

2.2 FLUORESCENT LAMPS

A. Fluorescent lamps to be the color designation as specified in the lighting fixture schedule.

B. Rapid start lamps shall be siliconized at the factory.

C. 4'-0" and 3'-0" rapid start lamps installed in interior heated locations shall be energy saving type. Rapid start lamps installed in unheated spaces or areas with low ambient temperatures (60 degrees F or less) shall be standard 400 ma lamps.

PART 3 - EXECUTION

3.1 DELIVERY AND STORAGE

A. Lamps shall be new and delivered to the job in sealed cartons and protected from dirt and dust during storage on the project.

3.2 INSTALLATION

A. Lamps shall be taken directly from the cartons and installed in the fixtures with special care so that they do not become dusty and are not soiled in the process.

B. Contractor shall use gloves when handling MR16 and other quartz glass lamps to keep body oils from getting on lamps.

3.3 SEASONING LAMPS FOR DIMMING

A. It shall be the Electrical Contractors responsibility to season all lamps that are controlled with dimmers. This typically requires that lamps operate at 100% brightness for at least 100 hours. This requirement shall be verified with lamp and dimmer equipment manufacturer of the specific equipment being used on this project.

3.4 REPLACEMENT

A. Lamps not functioning properly at substantial completion of the project or lamps where light output is noticeably reduced, shall be replaced by the Contractor.

3.5 WARRANTY

A. LED Lamps shall have a minimum of (5) year warranty with a $10 replacement labor allowance.

END OF SECTION 265113.1

SECTION 265113.2 - BALLASTS

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

A. Applicable requirements of Division 00 and Division 01 shall govern work in this section.

1.2 SCOPE

A. Provide ballasts for fluorescent and high intensity discharge lighting fixtures as shown on the drawings and as specified herein.

1.3 RELATED WORK

A. Section 26 51 13.1 - Lamps

B. Section 26 51 13 - Lighting Fixtures

1.4 QUALITY ASSURANCE

A. Ballasts shall have the following approvals/certifications:
   1. Certified Ballast Manufacturer's (CBM) Approval
   2. Underwriters Laboratories (UL) Approval
   3. Electrical Testing Laboratory (ETL) Certified

1.5 SHOP DRAWING SUBMITTALS

A. Where a light fixture requires a ballast for proper operation, cut sheets of the ballast shall be included with the light fixture shop drawings on a fixture by fixture basis.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. HIGH FREQUENCY ELECTRONIC FLUORESCENT BALLASTS
   1. Universal.
   2. Advance.
   3. Osram/Sylvania.

B. Ballasts shall comply with UL requirements with regards to thermal protection. Each ballast shall be equipped with thermal sensitive devices that will de-activate the ballast in the event higher than normal operating temperatures occur within the ballast. Internal protective devices shall be automatic resetting.

C. Ballasts shall comply with applicable ANSI/IEEE standards/guides for harmonic distortion and line voltage transient protection.

D. Electronic ballasts shall be UL listed, Class P, Type 1, with best available audible noise rating (Class A for all electronic ballasts).

E. Ballasts shall not contain PCB's.

F. The manufacturer shall provide written warranty against defects in material or workmanship, including replacement, for five years from date of manufacturer.

G. Ballasts shall be manufactured in an ISO 9001 Certified Facility. Manufacturer shall have been building ballasts for at least fifteen years.

H. Ballasts shall be labeled with manufacturer's name, part number, supply voltage, lamp type, amperage draw for each lamp type and UL listing.

I. Multiple acceptable dimmers and ballast manufacturers are listed in these specifications. Not every dimming ballast manufacturer listed is compatible with every dimming system manufacturer listed. The Electrical Contractor shall verify the compatibility between the dimmers selected and the dimming ballasts selected and shall document verification as part of shop drawing submittals

2.2 HIGH FREQUENCY ELECTRONIC BALLASTS FOR LINEAR FLUORESCENT LAMPS (SCHEDULE DESIGNATION "A")

A. Ballasts for T8, fluorescent lamps shall be universal voltage programmed start electronic ballasts.

B. Ballasts shall operate from 60 or 50 Hz input source of +/- 10% nominal ballast line voltage.

C. Ballast nominal line voltage shall be universal 120-277 volt.

D. Ballasts shall have input power factor above 98%. Ballast factor shall be 0.88 or higher for single lamp operation.

E. Ballasts shall operate lamps at an output frequency of 20 to 35 kilohertz with no detectable flicker.

F. Ballasts shall guarantee to deliver normal lamp life and light output according to lamp manufacturer's publications.

G. Ballast shall provide for a minimum lamp starting temperature of 0 degrees F.

H. Ballasts shall comply with FCC and NEMA limits governing EMI and RFI interference and shall not impede the operation of the other electrical equipment.

I. Ballast shall have Total Harmonic Distortion of less than 10%.

J. Ballast crest factor shall be 1.5 or less.

K. Operating temperature shall not exceed 60 degrees C. on the case during normal operation. Minimum lamp starting temperature shall be -18 degrees C/0 degrees F

PART 3 - EXECUTION

3.1 GENERAL

A. Contractor shall verify compatibility of electronic type fluorescent ballasts with the specific lamp to be supplied.

B. For installation of the Hi/Low Electronic Metal Halide ballasts follow manufacturer wiring diagram.

C. Ballasts judged to be noisy shall be replaced.

3.2 WARRANTY

A. In the event of ballast failure during warranty period, the manufacturer of the MH electronic ballast shall offer up to $25 replacement labor allowance.

B. Other ballast shall have a minimum of three (5) years warranty with $10 replacement labor allowance.

C. LED drivers shall have a minimum of (5) year warranty with a $25 replacement labor allowance.

END OF SECTION 265113.2

SECTION 312000 - EARTH MOVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Preparing subgrades for slabs-on-grade.
2. Drainage course for concrete slabs-on-grade.
3. Excavating and backfilling trenches for utilities and pits for buried utilities.

B. Related Sections:
1. Division 01 Section "Temporary Facilities and Controls" for temporary controls, utilities, and support facilities; also for temporary site fencing if not in another Section.
2. Divisions 21, 22, 23, 26, 27, 28, and 33 Sections for installing underground mechanical and electrical utilities and buried mechanical and electrical structures.

1.3 DEFINITIONS

A. Backfill: Soil material or controlled low-strength material used to fill an excavation.

1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
2. Final Backfill: Backfill placed over initial backfill to fill a trench.

B. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.

C. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.

D. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.

E. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.

1. Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.

2. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.

F. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.

G. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.

H. Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of the following manufactured products required:
   1. High Density EPS.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified testing agency.

B. Material Test Reports: For each soil material proposed for fill and backfill as follows:

   1. Classification according to ASTM D 2487.
   2. Laboratory compaction curve according to ASTM D 698.

C. Pre-excavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by earth moving operations. Submit before earth moving begins.

1.6 QUALITY ASSURANCE

A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E 329 and ASTM D 3740 for testing indicated.

1.7 PROJECT CONDITIONS

A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.

   1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
   2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

B. Improvements on Adjoining Property: Authority for performing earth moving indicated on property adjoining Owner's property will be obtained by Owner before award of Contract.

1. Do not proceed with work on adjoining property until directed by Architect.

C. Utility Locator Service: Notify One Call for area where Project is located before beginning earth moving operations.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.

1. Liquid Limit: $\leq$ 45.
2. Plasticity Index: $\leq$ 20.

C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.

1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
2. Bidders should assume that on-site soils are unsatisfactory soils for backfill within the building footprint and against grade beams.

D. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.

E. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and 0 to 5 percent passing a No. 8 sieve.

F. Sand: ASTM C 33; fine aggregate.

2.2 High Density Expanded Polystyrene

A. Expanded-Polystyrene Board Insulation: ASTM D6817, 0.90-lb/cu. ft. density, 15-psi.

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.

B. Protect and maintain erosion and sedimentation controls during earth moving operations.

C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.

1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

B. Classified Excavation: Excavate to subgrade elevations.

3.4 EXCAVATION FOR UTILITY TRENCHES

A. Excavate trenches to indicated gradients, lines, depths, and elevations.

B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.

C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.

3.5 BACKFILL

A. Place and compact backfill in excavations promptly, but not before completing the following:

1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
2. Surveying locations of underground utilities for Record Documents.
3. Testing and inspecting underground utilities.
4. Removing concrete formwork.
5. Removing trash and debris.
6. Removing temporary shoring and bracing, and sheeting.
7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.6 UTILITY TRENCH BACKFILL

A. Place backfill on subgrades free of mud, frost, snow, or ice.

B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

3.7 EXPANDED POLYSTYRENE FILL

A. Install EPS blocks in layers with abutting edges and ends and with the long dimension of each block at right angles to blocks in each subsequent layer. Offset joints of blocks in successive layers. Install where new floor slab is within 3 feet of exterior wall.

B. Install EPS connectors at each layer of foam to resist horizontal displacement according to manufacturer's written instructions.

C. Cover EPS with vapor barrier prior to placing concrete.

3.8 SOIL MOISTURE CONTROL

A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.

1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.9 COMPACTION OF SOIL BACKFILLS AND FILLS

A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

B. Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:

1. Under structures and building slabs, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.

3.10 GRADING

A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.

1. Provide a smooth transition between adjacent existing grades and new grades.
2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

B. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.11 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

A. Place drainage course on subgrades free of mud, frost, snow, or ice.

B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabs-on-grade as follows:

1. Install subdrainage geotextile on prepared subgrade according to manufacturer's written instructions, overlapping sides and ends.
2. Place drainage course 6 inches or less in compacted thickness in a single layer.
3. Place drainage course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
4. Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698.

3.12 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:

1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
2. Determine that fill material and maximum lift thickness comply with requirements.
3. Determine, at the required frequency, that in-place density of compacted fill complies with requirements.

B. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

C. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:

1. Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of building slab, but in no case fewer than three tests.
2. Grade Beam Backfill: At each compacted backfill layer, at least one test for every 100 feet or less of wall length, but no fewer than two tests.
3. Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length, but no fewer than two tests.

E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.13 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.

3.14 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000

SECTION 321216 - ASPHALT PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:
   1. Hot-mix asphalt patching.
   2. Hot-mix asphalt paving.

B. Related Sections:

   1. Division 31 Section "Earth Moving" for aggregate subbase and base courses and for aggregate pavement shoulders.
   2. Division 32 Section "Concrete Paving Joint Sealants" for joint sealants and fillers at paving terminations.

1.3 DEFINITION

A. Hot-Mix Asphalt Paving Terminology: Refer to ASTM D 8 for definitions of terms.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with materials, workmanship, and other applicable requirements of City of Dubuque for asphalt paving work.

   1. Review methods and procedures related to hot-mix asphalt paving including, but not limited to, the following:

      a. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
      b. Review condition of subgrade and preparatory work.
      c. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
      d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store pavement-marking materials in a clean, dry, protected location within temperature range required by manufacturer. Protect stored materials from direct sunlight.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not apply asphalt materials if subgrade is wet or excessively damp, if rain is imminent or expected before time required for adequate cure, or if the following conditions are not met:

1. Prime Coat: Minimum surface temperature of 60 deg F.
2. Tack Coat: Minimum surface temperature of 60 deg F.
3. Slurry Coat: Comply with weather limitations in ASTM D 3910.
4. Asphalt Base Course: Minimum surface temperature of 40 deg F and rising at time of placement.
5. Asphalt Surface Course: Minimum surface temperature of 60 deg F at time of placement.

B. Pavement-Marking Paint: Proceed with pavement marking only on clean, dry surfaces and at a minimum ambient or surface temperature of 55 deg F for water-based materials, and not exceeding 95 deg F.

PART 2 - PRODUCTS

2.1 AGGREGATES

A. General: Use materials and gradations that have performed satisfactorily in previous installations.

B. Coarse Aggregate: ASTM D 692, sound; angular crushed stone, crushed gravel, or cured, crushed blast-furnace slag.

C. Fine Aggregate: ASTM D 1073 sharp-edged natural sand or sand prepared from stone, gravel, cured blast-furnace slag, or combinations thereof.

1. For hot-mix asphalt, limit natural sand to a maximum of 20 percent by weight of the total aggregate mass.

D. Mineral Filler: ASTM D 242 rock or slag dust, hydraulic cement, or other inert material.

2.2 ASPHALT MATERIALS

A. Asphalt Binder: AASHTO M 320 or AASHTO MP 1a, PG 64-22.

B. Prime Coat: ASTM D 2027, medium-curing cutback asphalt, MC-30 or MC-70.

C. Prime Coat: Asphalt emulsion prime coat complying with Iowa DOT requirements.

D. Tack Coat: ASTM D 977 emulsified asphalt, or ASTM D 2397 cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Water: Potable.

2.3 MIXES

A. Hot-Mix Asphalt: Dense, hot-laid, hot-mix asphalt plant mixes approved by authorities having jurisdiction and complying with the following requirements:

1. Provide mixes with a history of satisfactory performance in geographical area where Project is located.
2. Base Course: HMA 300K, ½", PG 64-22.
3. Surface Course: HMA 300K, ½", PG 64-22.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that subgrade is dry and in suitable condition to begin paving.

B. Proceed with paving only after unsatisfactory conditions have been corrected.

3.2 PATCHING

A. Hot-Mix Asphalt Pavement: Saw cut perimeter of patch and excavate existing pavement section to sound base. Excavate rectangular or trapezoidal patches, extending 12 inches into adjacent sound pavement, unless otherwise indicated. Cut excavation faces vertically. Remove excavated material. Recompact existing unbound-aggregate base course to form new subgrade.

B. Tack Coat: Apply uniformly to vertical surfaces abutting or projecting into new, hot-mix asphalt paving at a rate of 0.05 to 0.15 gal./sq. yd..

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

C. Patching: Partially fill excavated pavements with hot-mix asphalt base mix and, while still hot, compact. Cover asphalt base course with compacted, hot-mix surface layer finished flush with adjacent surfaces.

3.3 SURFACE PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Ensure that prepared subgrade is ready to receive paving.

B. Herbicide Treatment: Apply herbicide according to manufacturer's recommended rates and written application instructions. Apply to dry, prepared subgrade or surface of compacted-aggregate base before applying paving materials.

1. Mix herbicide with prime coat if formulated by manufacturer for that purpose.

C. Prime Coat: Apply uniformly over surface of compacted unbound-aggregate base course at a rate of 0.15 to 0.50 gal./sq. yd.. Apply enough material to penetrate and seal but not flood surface. Allow prime coat to cure.

1. If prime coat is not entirely absorbed within 24 hours after application, spread sand over surface to blot excess asphalt. Use enough sand to prevent pickup under traffic. Remove loose sand by sweeping before pavement is placed and after volatiles have evaporated.
2. Protect primed substrate from damage until ready to receive paving.

D. Tack Coat: Apply uniformly to surfaces of existing pavement at a rate of 0.05 to 0.15 gal./sq. yd..

1. Allow tack coat to cure undisturbed before applying hot-mix asphalt paving.
2. Avoid smearing or staining adjoining surfaces, appurtenances, and surroundings. Remove spillages and clean affected surfaces.

3.4 COMPACTION

A. General: Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. Compact hot-mix paving with hot, hand tampers or with vibratory-plate compactors in areas inaccessible to rollers.

1. Complete compaction before mix temperature cools to 185 deg F.

B. Repairs: Remove paved areas that are defective or contaminated with foreign materials and replace with fresh, hot-mix asphalt. Compact by rolling to specified density and surface smoothness.

C. Erect barricades to protect paving from traffic until mixture has cooled enough not to become marked.

3.5 INSTALLATION TOLERANCES

A. Pavement Thickness: Compact each course to produce the thickness indicated within the following tolerances:

1. Base Course: Plus or minus 1/2 inch.
2. Surface Course: Plus 1/4 inch, no minus.

3.6 DISPOSAL

A. Except for material indicated to be recycled, remove excavated materials from Project site and legally dispose of them in an EPA-approved landfill.

END OF SECTION 321216