

OXFORD COMMUNITY SCHOOLS

OXFORD HIGH SCHOOL
TOILET ROOM RENOVATION
745 NORTH OXFORD ROAD
OXFORD, MICHIGAN

Project Manual

IDS Project No. 22154-1000

April 24, 2023
Bids

Project Manual

Oxford Community Schools Oxford High School Toilet Room Renovation Oxford, Michigan

INTEGRATED design SOLUTIONS

architecture engineering interiors & technology

1441 w long lake road, suite 200
troy, michigan 48098

5211 cascade road se, suite 300
grand rapids, michigan 49546

248.823.2100, fax 248.823.2200
www.ids-michigan.com

IDS Project No. 22154-1000

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Not Applicable

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SECTION 00 1113 – ADVERTISEMENT FOR BIDS

DATE: April 24, 2023

PROJECT: Oxford Community Schools
Oxford High School
Toilet Room Renovation
Oxford, Michigan

OWNER: Oxford Community Schools
10 North Washington
Oxford, Michigan, 48371

ARCHITECT: Integrated Design Solutions, LLC
Architecture, Engineering, Interiors & Technology

1441 W. Long Lake Road, Suite 200
Troy, MI 48098

5211 Cascade Road, SE, Suite 300
Grand Rapids, Michigan 49546

(248) 823-2100
www.ids-michigan.com

BIDS RECEIVED: Until 1:00 PM local time on May 10, 2023, the Owner will receive sealed Bids for the Work as set forth in the Bidding Documents at:

Oxford Community Schools
Administration Building
10 N. Washington
Oxford, MI, 48371

Bids will be publicly opened at 1:30 PM on May 10, 2023, at the Oxford Community Schools Administration Building.

The Bidding Documents will be on file, available for download from the Oxford Schools FTP site, on and after April 24, 2023.

Bidding Documents shall be available electronically only (no hard copy) from IDS. While documents may be available from other sources, IDS cannot guarantee that other sources will post all updates as they are issued.

Oxford Schools FTP site: http://cloud.ids-troy.com/bids/bids/oxford/toilet_renovation/

Bidders are responsible to periodically check the IDS Oxford Schools FTP site for possible addenda.

A prebid conference is scheduled for May 3, 2023, at 4:00 PM local time. All interested Bidders are invited to attend. Bidders shall meet at Oxford High School (Front Lobby). 745 N. Oxford Rd, Oxford, MI 48371.

Each Bid shall be accompanied by a Bid Security in the form of a certified check, cashier's check, money order or bid bond made payable to Oxford Community Schools in an amount not less than five percent (5%) of the base bid as a Bid guarantee.

Each bid shall be accompanied by the Familial Disclosure Statement in compliance with MCL.380.1267 (see Section 00 4500). The bid proposal must be accompanied by a sworn and notarized statement disclosing Familial Relationship that exists between the bidder or any employee of the bidder and any member of the Board of Education of the School district, or the Superintendent of the School district. The School district will not consider a bid Proposal that does not include this sworn and notarized Disclosure Statement.

Each bid shall be accompanied by the Affidavit of Compliance – Iran Economic Sanctions Act in compliance with Michigan Public Act No. 517 of 2012 (see Section 00 4510). The bid proposal must be accompanied by a sworn and notarized statement certifying that the Bidder (including its officers, directors, and employees) is not an “Iran linked Business” within the meaning of the Iran Economic Sanctions Act. The School district will not consider a bid Proposal that does not include this sworn and notarized Disclosure Statement.

The successful Bidder shall provide a Performance Bond and a Labor and Material Payment Bond covering the faithful performance of the Contract and payment of all obligations arising there under, each in the amount of one hundred percent (100%) of the contract amount. The cost of such bonds shall be included in the Bid.

The bid security of Bidders under consideration will be returned ten (10) days after execution of the Contract by the Owner. The amount of the bid security shall be forfeited to the Owner if the successful Bidder fails to enter into a contract and furnish required bonds and insurance certificates within ten (10) days after award of Contract.

Withdrawal of any Bid is prohibited for a period of sixty (60) days after the actual date of the opening thereof.

The Owner reserves the right to reject any or all Bids, either in whole or in part, to reject a Bid not accompanied by the required bid security or by other data required by the Bidding Documents or to reject a Bid which is any way incomplete or irregular and to waive informality and irregularity in the bids and in the bidding.

Each Bidder agrees to waive any claim it has or may have with the Owner, the Architect and their respective employees, arising out of or in connection with the administration, evaluation, or recommendation of any bid.

The Owner reserves the right to accept Alternates in any order or combination and to determine the low Bidder on the basis of the sum of the base bid and the Alternates accepted.

The Owner reserves the right to negotiate with any Bidder without rebidding the project in whole or in part.

The Owner reserves the right to award the Contract to whomever it may elect.

END OF INVITATION TO BID

SECTION 00 2100 - INSTRUCTIONS TO BIDDERS

1. DEFINITIONS

- A. Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Invitation to Bid, Instruction to Bidders, the Bid Form and other bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between Owner and Contractor, General Conditions of the Contract for Construction, Supplementary and other Conditions, Specifications, Drawings and Addenda issued prior to execution of the Contract.
- B. Addenda are written or graphic instruments issued by the Architect prior to the execution of the Contract, which modify or interpret the Bidding Documents by additions, deletions, clarifications or corrections.
- C. A Bidder is a person or entity who submits a Bid.
- D. A Bid is a complete and properly signed proposal to do the work for the sums stipulated there in submitted in accordance with the Bidding Documents.
- E. The Base Bid is the amount stated in the Bid for which the Bidder offers to perform the work as described in the Bidding Documents as the base, to which work may be added to or deleted from, for the amounts stated in the Alternates.
- F. An Alternate is an amount stated in the Bid Form to be added to or deducted from the amount of the Base Bid if the described Alternate is accepted.
- G. A Unit Price is an amount stated in the Bid as a price per unit of measurement for materials, equipment or services or a portion of the work as described in the Bidding Documents.

2. SECURING BIDDING DOCUMENTS

- A. Bidding Documents may be obtained from Integrated Design Solutions, LLC, upon conditions set forth in the Invitation to Bid.
- B. Bidding Documents remain the property of the Architect.

3. PREPARATION AND SUBMISSION OF BIDS

- A. Bids shall be submitted on forms bound in the Project Manual of the Bidding Documents.
- B. All blanks on the Bid Form must be filled in by typewriter or by hand in ink.
- C. Amounts shall be expressed in both words and figures. In case of a discrepancy the amount stated in words shall govern.
- D. Alterations by erasure or interlineations must be initialed by the Bidder.
- E. All Alternates must be bid. If no change in the Base Bid is required, enter "No Change".

- F. Submit the Bid, along with the bid security and any other documents required to be submitted with the Bid, to the Owner, and deliver to the address given in the Invitation to Bid on or before the day and hour set for receipt of the Bids.
1. Enclose each Bid in a sealed opaque envelope bearing the title of the Work, OXFORD HIGH SCHOOL TOILET ROOM RENOVATION, the name of the Bidder, and the date and hour of the Bid opening, with the notation "SEALED BID ENCLOSED".
 2. Do not change the wording of the Bid Form, and do not add words to, or delete words from the Bid Form.
 3. Unauthorized conditions, limitations, or provisions attached to the Bid will be cause for rejection of the Bid.
 4. Submit only duplicate signed copies of the Bid.
 5. It is the sole responsibility of the Bidder to see that his bid is received on time.
 6. Telephonic, telegraphic, facsimile (fax), or e-mail Bids or telephonic, telegraphic, facsimile (fax) or e-mail modification of a Bid will not be considered.
 7. Bids received after the time fixed for receiving them will not be considered and will be returned to the Bidder unopened.
 8. Properly identified Bids received on time will be privately opened. The Owner reserves the right to keep all information concerning such bids confidential.
 9. Properly identified Bids received on time will be publicly opened and read aloud. A bid tabulation summary will be available.
- G. The Bidder in submitting a Bid represents that:
1. The Bidder has read and understands the Bidding Documents, including the Drawings, Specifications, and other proposed Contract Documents.
 2. The Bid is made in compliance with the Bidding Documents.
 3. The Bidder has visited the site of the Work and become informed as to existing conditions and limitations under which the Work is to be performed and included in their Bid a sum to cover the cost necessary to perform the Work as set forth in the Bidding Documents. No allowance will be made to a Bidder because of a lack of such examination or knowledge.
 4. The Bid is based upon materials, equipment and systems required by the Bidding Documents without exception and without substitutions.

4. FAMILIAL DISCLOSURE STATEMENT

- A. Each Bid shall be accompanied by the Familial Disclosure Statement in compliance with MCL.380.1267. The Bid proposal must be accompanied by a sworn and notarized statement disclosing Familial Relationship that exists between the bidder or any employee of the bidder and any member of the Board of Education of the School district, or the Superintendent of the School district. The school district will not consider a Bid Proposal that does not include this sworn and notarized Disclosure Statement.

5. IRAN ECONOMIC SANCTIONS ACT AFFIDAVIT OF COMPLIANCE

- A. Each Bid shall be accompanied by the Iran Economic Sanctions Act Affidavit of Compliance in compliance with Michigan Public Act No. 517 of 2012. The Bid proposal must be accompanied by a sworn and notarized statement hereby certifies, represents and warrants that the Bidder (including its officers, directors and employees) is not an "Iran Linked Business" within the meaning of the Iran Economic Sanctions Act, Michigan Public Act No. 517 of 2012 (the "Act"), and that in the event Bidder is awarded a Contract as a result of the aforementioned Advertisement for Bids, the Bidder will not become an "Iran Linked Business" at any time during the course of performing under the Contract..

6. BID SECURITY AND BONDS

- A. Each bid shall be accompanied by a certified check, cashier's check, money order or bid bond made payable to Oxford Community Schools in an amount not less than five percent (5%) of the Base Bid as a proposal guarantee. Bid Bond shall be provided by a company licensed to do business in the State of Michigan.
- B. The successful Bidder shall provide a Performance Bond and a Labor and Material Payment Bond, covering the faithful performance of the Contract and payment of all obligations arising there under, each in the amount of one hundred percent (100%) of the contract amount. Bonds shall be provided by a company licensed to do business in the State of Michigan. The cost of such bonds shall be included in the Bid.
- C. Each bid shall indicate, in the space provided in the Bid Form, the cost of a Performance Bond and a Labor and Material Payment Bond covering the faithful performance of the Contract and payment of all obligations arising there under, each in the amount of one hundred percent (100%) of the contract amount. Should the Owner elect to require bonds, the cost shall be reimbursed by change order to the Contractor by the Owner.
- D. The Bidder shall deliver the required bonds to the Owner not later than three days following the date of execution of the Contract. If the Work is to be commenced prior thereto in response to a letter of intent, the Bidder shall, prior to commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished and delivered in accordance with this paragraph.
- E. Should the Bidder refuse to enter into a Contract or fail to furnish such bonds, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty.
- F. The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either the Contract has been executed and bonds have been furnished or the specified time has elapsed so that the Bid may be withdrawn, or all Bids have been rejected.

7. MODIFICATIONS AND WITHDRAWAL OF BIDS

- A. A Bidder may not modify, withdraw, or cancel a Bid, for a period of, sixty (60) days following the time and date designated for receipt of Bids, and by submitting a Bid each Bidder shall so agree.
- B. A Bidder may withdraw their Bid, either personally or by written request, at any time prior to the scheduled time for receipt of bids. A withdrawn Bid may be resubmitted up to the date and time designated for receipt of Bids.
- C. Prior to the time and date for receipt of Bids, a Bidder may modify a Bid by notice to the party receiving Bids, at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date and time stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be worded as not to reveal the amount of the original Bid.

8. CONSIDERATION OF BIDS

- A. The Owner reserves the right to reject any or all Bids submitted either in whole or part, to reject a bid not accompanied by the required Bid security or by other data required by the Bidding Documents or to reject a Bid which is in any way incomplete or irregular and to waive informality and irregularity in the Bids and in the Bidding.
- B. The Owner reserves the right to accept alternates in any order or combination and to determine the low Bidder based on the sum of the Base Bid and the alternates accepted.
- C. The Owner reserves the right to negotiate with any Bidder without rebidding the project in whole or in part.

- D. The Owner reserves the right to award the Contract to whomever it may elect.

9. EXECUTION OF AGREEMENT

- A. The successful Bidder will be required to execute AIA Standard Abbreviated Form of Agreement Between the Successful Bidder will be required to execute an Owner Purchase Order.
- B. The Bidder to whom the Contract is awarded shall, within five (5) calendar days after notice of award and receipt of Agreement forms from the Owner, sign and deliver required copies to the Owner.
- C. At or prior to delivery of the signed Agreement, the Bidder to whom the Contract is awarded shall deliver to the Owner those Certificates of Insurance required by the Owner.
- D. The Owner shall approve Bonds and Certificates of Insurance before the successful Bidder may proceed with the Work. Failure or refusal to provide Bonds or Certificates of Insurance in a form satisfactory to the Owner shall subject the successful Bidder to loss of time from the allowable construction period equal to the time of delay in furnishing the required material.

10. INTERPRETATION OF CONTRACT DOCUMENTS PRIOR TO BIDDING

- A. Bidders shall study and compare the Bidding Documents with each other, shall examine the site and local conditions and if in doubt as to the true meaning of any part of the Bidding Documents, or finds discrepancies, inconsistencies, ambiguities, or errors in or omissions from any part of the Bidding Documents, the Bidder may submit to the Architect a written request for interpretation thereof not later than seven days before bids will be opened. The person submitting the request shall be responsible for its prompt delivery.
- B. Interpretation, connection, or changes to the proposed Contract Documents will be made only by Addendum. Explanations, interpretations, corrections, or changes of the Bidding Documents by any other method will not be binding.

11. ADDENDA

- A. Addenda will be transmitted to all who are known by the Architect to have received a complete set of Bidding Documents.
- B. Copies of Addenda will be made available for inspection wherever Bidding Documents are on file.
- C. Addenda will be issued no later than four (4) days prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which postpones the date for receipt of Bids.
- D. Each Bidder shall ascertain prior to submitting his bid that he has received all Addenda issued and shall acknowledge their receipt on the Bid Form.

12. SUBSTITUTIONS

- A. No substitutions will be considered prior to receipt of Bids unless a written request for approval has been received by the Architect at least ten (10) days prior to the date for receipt of Bids. Such request for substitutions shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, samples, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment, or other portions of the Work, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.
- B. If the Architect approves a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum.

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

13. TAXES

- A. All Bids shall include all applicable taxes, including social security unemployment, and sales or use taxes, and any other taxes specifically levied on the work or on wages by local, city, state, or federal government, except real property taxes on the site. Bids shall also include all premiums, assessments, and other like payments, charges, and costs incidental to the work covered by the Bidding Documents.

14. PERMITS AND FEES

- A. All Bids shall include costs of all applicable permits and fees.

15. TIME OF COMPLETION

- A. The Bidder, if awarded the Contract, agrees to complete the Work on or before the Contract Completion Date stated in the Bid Form.

16. EQUAL OPPORTUNITY

- A. The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex, or national origin. The Contractor shall take affirmative action to ensure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.
- B. The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

17. POST BID INFORMATION

- A. Bidders to whom Contract award is under consideration shall submit to the Architect, upon request a properly executed AIA Document A305, Contractor's Qualification Statement.

END OF SECTION 00 2100

SECTION 00 4100 - BID FORM

OWNER: Oxford Community Schools
10 North Washington
Oxford, Michigan 48371

PROJECT: Oxford Community Schools
Oxford High School
Toilet Room Renovation
Oxford, Michigan

ARCHITECT: Integrated Design Solutions, LLC
Architecture, Engineering, Interiors & Technology

1441 W. Long Lake Road, Suite 200
Troy, Michigan 48098

5211 Cascade Road, SE, Suite 300
Grand Rapids, Michigan 49546

(248) 823-2100
(248) 823-2200 fax

NAME OF BIDDER: _____

ADDRESS: _____

TELEPHONE: _____

FAX NO: _____

EMAIL: _____

BID

Pursuant to and in compliance with your Invitation to Bid Instructions to Bidders and other documents relating thereto, the undersigned proposes and agrees to furnish equipment, materials, and labor and perform all work necessary to complete the Contract for the Oxford Community Schools Toilet Room Renovation in accordance with the Drawings and Specifications prepared by Integrated Design Solutions, LLC and agrees to accept payment as herein provided.

TOILET ROOM RENOVATION BASE BID

Lump sum bid for all work specified and shown on the Drawings, as indicated for base bid

Dollars (\$_____).

NOTE: The amount shall be shown in both words and figures. In case of a discrepancy, the amount shown in words shall govern.

ALTERNATES

The foregoing Base Bid may be increased or decreased by the amounts herein quoted for Alternates specified in Section 01 2300. The following alternate prices shall include all charges for labor, material, and equipment, bonds, overhead and profit, general conditions, supervision, insurance, taxes, and incidental expenses.

Alternate No. 1 - Toilet Room Renovations: Provide all demolition and new work associated with the renovation of toilet rooms M142 and M143 as indicated on Drawings and Specifications.

Add/Deduct

_____ Dollars (\$_____).

Alternate No. 2 - Toilet Room Renovations: Provide all demolition and new work associated with the renovation of toilet rooms R132 and R135 as indicated on Drawings and Specifications.

Add/Deduct

_____ Dollars (\$_____).

Alternate No. 3 – 2023 Summer Construction: All demolition and new work associated with the renovation of toilet rooms D141 and D142, as indicated on Drawings and Specifications, to be completed during the Summer of 2023 (in lieu of Summer 2024) by August 18, 2023.

Add/Deduct

_____ Dollars (\$_____).

VOLUNTARY ALTERNATES

The undersigned offers the following voluntary alternates to the products/manufacturers/systems specified. Provide a complete description of each Voluntary Alternate and indicate the Price to be added to or deducted from the Base Bid for each item. Attach additional pages if required to explain each Voluntary Alternate. The Owner is under no obligation to accept any voluntary alternates.

Voluntary	Alternate	No.	1
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Add/Deduct _____ Dollars (\$_____).

TAXES

The Bidder shall include in his Bid and shall pay all applicable Federal, State and local taxes of whatever character and description.

BID SECURITY

Accompanying this Bid is a certified check, cashier's check, money order or bid bond (cross out those not applicable) made payable to Oxford Community Schools in the amount of five percent (5%), of Base Bid, which shall be retained by the Owner as liquidated damages if the undersigned fails to execute the contract within ten (10) days of award of the Contract.

ADDENDA

The undersigned acknowledges the receipt of the following addenda:

Addendum No.	_____	Dated	_____	Addendum No.	_____	Dated	_____
Addendum No.	_____	Dated	_____	Addendum No.	_____	Dated	_____
Addendum No.	_____	Dated	_____	Addendum No.	_____	Dated	_____

TIME OF COMPLETION

Oxford Community Schools is seeking to define the schedule for completion based on the best value and Bidder's availability to complete the scope of work based on the following District priorities:

The undersigned agrees to substantially complete the Project by August 16, 2024.

WITHDRAWAL OF BIDS

The undersigned agrees that his Bid shall not be withdrawn for a period of sixty (60) days after the date set for receipt of Bids.

SIGNATURE AND LEGAL STATUS OF BIDDER

Signed and sealed this _____ day of _____, 20____.

(Individual, Partnership, Corporation)

State of Incorporation

Affix Corporate Seal

By:

(Authorized Signature of Bidder)

(Print or Type Name of Bidder)

Title

Business Address

NOTE: Please submit one original and one copy of this form and retain one copy for your file

END OF BID FORM

SECTION 00 4500 - FAMILIAL DISCLOSURE STATEMENT

1. The undersigned, the Owner or Authorized Officer of _____ ("the Bidder"), pursuant to the familial disclosure requirement provided in the Advertisement for Bids and Instructions to Bidders, hereby represent and warrant, except as provided below, that no familial relationships exist between the Bidder or any employee of the _____ Public Schools and any member of the Board of Education of the School District or the Superintendent of the School District.
2. List any Familial Relationships:

BIDDER:

Name of Bidder

By: _____

Its: _____

STATE OF MICHIGAN)
)ss.
COUNTY OF _____)

This instrument was acknowledged before me on the ____ day of _____, 20____, by
_____.

_____, Notary Public
_____, County, Michigan
My Commission Expires: _____
Acting in the County of: _____

This form must accompany the Bid.
Failure to submit this form with the Bid will result in the Bid being disqualified.

**SECTION 00 4510
AFFIDAVIT OF COMPLIANCE – IRAN ECONOMIC SANCTIONS ACT**

MICHIGAN PUBLIC ACT NO. 517 OF 2012

The undersigned, the owner or authorized officer of _____ (the "Bidder"), pursuant to the compliance certification requirement provided in the _____ (the "School District") Advertisement for Bids, hereby certifies, represents and warrants that the Bidder (including its officers, directors and employees) is not an "Iran Linked Business" within the meaning of the Iran Economic Sanctions Act, Michigan Public Act No. 517 of 2012 (the "Act"), and that in the event Bidder is awarded a Contract as a result of the aforementioned Advertisement for Bids, the Bidder will not become an "Iran Linked Business" at any time during the course of performing under the Contract.

The Bidder further acknowledges that any person who is found to have submitted a false certification is responsible for a civil penalty of not more than \$250,000.00 or 2 times the amount of the Contract or proposed Contract for which the false certification was made, whichever is greater, the cost of the School District's investigation, and reasonable attorney fees, in addition to the fine. Moreover, any person who submitted a false certification shall be ineligible to bid on an Advertisement for Bids for three (3) years from the date that it is determined that the person has submitted the false certification.

BIDDER:

Name of Bidder

By: _____

Its: _____

STATE OF MICHIGAN)

)ss.

COUNTY OF _____)

This instrument was acknowledged before me on the _____ day of _____, 20____, by

_____.

, Notary Public

_____ County, Michigan

My Commission Expires: _____

Acting in the County of : _____

END OF SUPPLEMENT TO BID FORM 00 4510

SECTION 00 7300 - SUPPLEMENTARY CONDITIONS AND ADDITIONAL CONDITIONS

PROJECT: Oxford Community Schools
Oxford High School
Toilet Room Renovation
Oxford, Michigan

OWNER: Oxford Community Schools
10 North. Washington
Oxford, Michigan, 48371

ARCHITECT: Integrated Design Solutions, LLC
Architecture, Engineering, Interiors & Technology

1441 W. Long Lake Road, Suite 200
Troy, MI 48098

5211 Cascade Road, SE, Suite 300
Grand Rapids, Michigan 49546

(248) 823-2100
www.ids-michigan.com

THE FOLLOWING SUPPLEMENTS MODIFY AIA DOCUMENT A104-2017, "STANDARD ABBREVIATED FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR". WHERE A PORTION OF THE GENERAL CONDITIONS IS MODIFIED OR DELETED BY THESE SUPPLEMENTARY CONDITIONS, THE UNALTERED PORTIONS OF THE GENERAL CONDITIONS SHALL REMAIN IN EFFECT.

**EXPLANATION
OF NUMBERING:** Article 22 shall constitute revisions and additions to and follow the same format of the General Conditions.

ARTICLE 22

OTHER CONDITIONS OR PROVISIONS

- 22.1 Add new subparagraph 7.1.1 as follows:
- 7.1.1 In the case of conflicts or discrepancies between Drawings and the Specifications or within or among the Contract Documents and not clarified by Addendum, the Architect will determine which takes precedence in accordance with Sections 10.7, 10.7.1 and 10.8.
- 22.2 Delete subparagraph 8.1.1 in its entirety.
- 22.3 Delete subparagraph 8.1.2 in its entirety.

22.4 Delete subparagraph 9.9.1 and add the following in its place:

9.9.1 The Contractor shall review for compliance with the Contract Documents, approve in writing and submit to the Architect all Shop Drawings, Product Data, Samples and similar submittals required by the Contract Documents in coordination with the Contractor's construction schedule and in such sequence as to allow the Architect reasonable time for review. By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Architect that the Contractor has 1) reviewed and approved them; 2) determined and verified materials, field measurements and field construction criteria related thereto, or will do so; and 3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents. At the time of submission, the Contractor shall inform the Architect in writing of any deviation in the Shop Drawings, Product Data and Samples from the requirements of the Contract Documents. Submittals which are not marked as reviewed for compliance with the Contract Documents and approved by the Contractor may be returned by the Architect without action. The Work shall be in accordance with approved submittals.

22.5 Add new paragraph 10.10 as follows:

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

22.6 Delete subparagraph 13.2 and add the following in its place:

13.2 The cost or credit to the Owner resulting from a change in the work shall be determined by mutual agreement, by an acceptable estimate and lump sum proposal by the Contractor, by actual cost of all labor and materials and a percentage or fixed fee for all other changes, such as overhead, profit, insurance, taxes and bonds or in the case of a Construction Change Directive signed only by the Owner and Architect, by the Contractor's cost of labor, material, equipment and reasonable overhead and profit. On any change which involves a net credit to the Owner, no allowance for overhead and profit shall be figured.

13.2.1 If none of the foregoing methods is agreed upon, the Contractor, upon receipt of an order as hereinbefore stated, shall proceed with the work. In such case the Contractor shall keep and present in such form as the Owner may direct, a correct account of the cost, together with vouchers. In any case, the Owner shall certify to the amount including the specified allowance for overhead and profit, due the Contractor.

13.2.2 The combined overhead and profit included in the total cost to the Owner for a change in the Work shall be based on the following schedule.

- .1 For the Contractor, for Work performed by the Contractor's own forces 15 percent of the cost.
- .2 For the contractor, for Work performed by the Contractor's Subcontractors 7-1/2 percent the amount due the Subcontractors.
- .3 For each Subcontractor involved, for Work performed by that Subcontractor's own forces, 15 percent of the cost.
- .4 For each Subcontractor involved, for work performed by the Subcontractor's, Sub-subcontractor's 7-1/2 percent of the amount due the Sub-subcontractor.
- .5 In order to facilitate checking of quotations for extras or credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by a complete itemization of costs including labor, materials, and Subcontracts. In no case will a change be approved without such itemization.

22.7 Add the following AFTER subparagraph 15.3.1

15.3.1.1 "The form of Application for Payment shall be a notarized AIA Document G702, Application and Certification for Payment, supported by AIA Document G703, Continuation Sheet."

.1 Until final completion, the Owner will pay ninety (90) percent of the amount due the Contractor on account of progress payments. Upon final completion, the Architect will certify payment in full.

22.8 Delete Article 15.2 in its entirety.

22.9 Delete subparagraphs 17.1.2 through 17.1.9 and add the following:

"17.1.2 The insurance required by Subparagraph 17.1 shall be written for not less than the following limits, or greater if required by law:

1. Worker's Compensation:
 - a. State: Statutory
 - b. Applicable Federal (e.g. Longshoremen's): Statutory
 - c. Employer's Liability: \$1,000,000.00 per Accident
\$1,000,000.00 Disease, Policy Limit
\$1,000,000.00 Disease, Each Employee
2. Comprehensive or Commercial General Liability (including Premises-Operations; Independent Contractors' Protective; Products and Completed Operations; Broad Form Property Damage);
 - a. Bodily Injury:
\$1,000,000.00 Each Occurrence
\$1,000,000.00 Aggregate
 - b. Property Damage:
\$1,000,000.00 Each Occurrence
\$1,000,000.00 Aggregate
 - c. Products and Completed Operations to be maintained for one (1) year after final payment:
\$1,000,000.00 Aggregate
 - d. Broad Form Property Damage Coverage shall include Completed Operations.
3. Contractual Liability:
 - a. Bodily Injury:
\$1,000,000.00 Each Occurrence
\$1,000,000.00 Aggregate
 - b. Property Damage:
\$1,000,000.00 Each Occurrence
\$1,000,000.00 Aggregate
4. Personal Injury, with Employment Exclusion deleted:
\$1,000,000.00 Aggregate

5. Business Auto Liability (including owned, non-owned and hired vehicles):
- a. Bodily Injury:
 - \$1,000,000.00 Each Person
 - \$1,000,000.00 Each Occurrence
 - b. Property Damage:
 - \$1,000,000.00 Each Occurrence
6. Umbrella Excess Liability \$1,000,000.00
(Bodily Injury and Property Damage
Combined)

"17.1.3" Liability Insurance shall include all major divisions of coverage and be on a comprehensive basis including:

1. Premises Operations (including X, C, and U coverages as applicable).
2. Independent Contractor's Protective.
3. Products and Completed Operations.
4. Personal Injury Liability with Employment Exclusion deleted.
5. Owned, non-owned and hired motor vehicles.
6. Broad Form Property Damage including Completed Operations.

17.1.4 If the General Liability coverages are provided by a Commercial General Liability Policy on a claims-made basis, the policy date or Retroactive Date shall predate the Contract; the termination date of the policy or applicable extended reporting period shall be no earlier than the termination date of coverages required to be maintained after final payment, certified in accordance with Subparagraph 9.10.2.

- 22.10 Delete subparagraph 17.3.1 and add the following in its place.

"17.3.1 The Owner shall have the right, prior to the signing of the Contract, to require the Contractor to furnish good and satisfactory bonds covering the faithful performance of the Contract, and the payment of all obligations arising thereunder, in such form as the Owner may prescribe and with such sureties as the Owner may approve. If such bonds are required by instructions given previous to the submission of bids, the premium shall be paid by the Contractor; if subsequent thereto, it shall be paid by the Owner.

"17.3.1 The Contractor shall furnish a Performance Bond and a Labor and Material Payment Bond covering faithful performance of the Contract and payment of obligations arising thereunder. Bonds shall be obtained from a company licensed to do business in the State of Michigan and the cost thereof shall be included in the Contract Sum. The amount of each bond shall be equal to 100 percent of the Contract Sum.

17.3.1.1 The Contractor shall deliver the required bonds to the Owner not later than three days following the date the Agreement is entered into, or if the Work is to be commenced prior thereto in response to a letter of intent, the Contractor shall, prior to the commencement of the Work, submit evidence satisfactory to the Owner that such bonds will be furnished.

- 22.11 Add the following after subparagraph 20.3.

"20.3.1 Upon receipt of written note from the Owner of such termination for the Owner's convenience, the Contractor shall:

1. Cease operations as directed by the Owner in the notice;
2. Take actions necessary, or that the Owner may direct, for the protection and preservation of the work; and
3. Except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate

- 22.12 EQUAL OPPORTUNITY

22.12.1. The Contractor shall maintain policies of employment as follows:

22.12.2. The Contractor and the Contractor's Subcontractors shall not discriminate against any employee or applicant for employment because of race, religion, color, sex or national origin. The Contractor shall take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their race, religion, color, sex or national origin. Such action shall include, but not be limited to, the following: employment, upgrading, demotion or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices setting forth the policies of non-discrimination.

22.12.3. The Contractor and the Contractor's Subcontractors shall, in all solicitations or advertisements for employees placed by them or on their behalf, state that all qualified applicants will receive consideration for employment without regard to race, religion, color, sex or national origin.

END OF SECTION 00 7300

SECTION 01 1000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Project Information.
 - 2. Work Performed by Owner.
 - 3. Owner-furnished/Contractor-installed (OFCI) products.
 - 4. Owner-furnished/Owner-installed (OFOI) products.
 - 5. Contractor's use of site and premises.
 - 6. Coordination with occupants
 - 7. Work restrictions.
 - 8. Specification and Drawing conventions.

1.3 PROJECT INFORMATION

- A. Project Identification: Oxford Community Schools, Oxford High School, Toilet Room Renovation; IDS Project Number 22154-1000
 - 1. Project Location: 745 North Oxford Road, Oxford, Michigan.
- B. Owner: Oxford Community Schools.
 - 1. 10 North Washington Street, Oxford, Michigan.
- C. Architect: Integrated Design Solutions.
 - 1. Offices:
 - a. 1441 West Long Lake Road, Suite 200, Troy, Michigan.
 - b. 5211 Cascade Road SE, Suite 300, Grand Rapids, Michigan.

1.4 WORK PERFORMED BY OWNER (If any)

- A. Cooperate fully with Owner, so work may be carried out smoothly, without interfering with or delaying Work under this Contract or work by Owner. Coordinate the Work of this Contract with work performed by Owner.

1.5 OWNER-FURNISHED/CONTRACTOR-INSTALLED (OFCI) PRODUCTS (If any)

- A. Owner's Responsibilities: Owner will furnish products indicated and perform the following, as applicable:
 - 1. Provide to Contractor Owner-reviewed Product Data, Shop Drawings, and Samples.
 - 2. Provide for delivery of Owner-furnished products to Project site.

3. Upon delivery, inspect, with Contractor present, delivered items.
 - a. If Owner-furnished products are damaged, defective, or missing, arrange for replacement.
 4. Obtain manufacturer's inspections, service, and warranties.
 5. Inform Contractor of earliest available delivery date for Owner-furnished products.
- B. Contractor's Responsibilities: The Work includes the following, as applicable:
1. Designate delivery dates of Owner-furnished products in Contractor's construction schedule, utilizing Owner-furnished earliest available delivery dates.
 2. Review Owner-reviewed Product Data, Shop Drawings, and Samples, noting discrepancies and other issues in providing for Owner-furnished products in the Work.
 3. Receive, unload, handle, store, protect, and install Owner-furnished products.
 4. Make building services connections for Owner-furnished products.
 5. Protect Owner-furnished products from damage during storage, handling, and installation and prior to Substantial Completion.
 6. Repair or replace Owner-furnished products damaged following receipt.
- C. Owner-Furnished/Contractor-Installed (OFICI) Products: (If any)
1. As indicated on Drawings and in Specification Sections.

1.6 OWNER-FURNISHED/OWNER-INSTALLED (OFOI) PRODUCTS (If any)

- A. The Owner will furnish and install products indicated.
- B. Owner-Furnished/Owner-Installed (OFOI) Products: (If any)
1. As indicated on Drawings and in Specification Sections.

1.7 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Restricted Use of Site: Contractor shall have limited use of Project site for construction operations as indicated on Drawings by the Contract limits and as indicated by requirements of this Section.
- B. Limits on Use of Site: Limit use of Project site to Work in areas indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
1. Driveways, Walkways and Entrances: Keep driveways, loading areas, and entrances serving premises clear and available to Owner, Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or for storage of materials.
 - a. Schedule deliveries to minimize use of driveways and entrances by construction operations.
 - b. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.
- C. Condition of Existing Building: Maintain portions of existing building affected by construction operations in a weathertight condition throughout construction period. Repair damage caused by construction operations.
- D. Condition of Existing Grounds: Maintain portions of existing grounds, landscaping, and hardscaping affected by construction operations throughout construction period. Repair damage caused by construction operations.

1.8 COORDINATION WITH OCCUPANTS

- A. Partial Owner Occupancy: Owner will occupy the premises during entire construction period, with the exception of areas under construction. Cooperate with Owner during construction operations to minimize conflicts and facilitate Owner usage. Perform the Work so as not to interfere with Owner's operations. Maintain existing exits unless otherwise indicated.
 - 1. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.
 - 2. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.

1.9 WORK RESTRICTIONS

- A. Comply with restrictions on construction operations.
 - 1. Comply with limitations on use of public streets, work on public streets, rights of way, and other requirements of authorities having jurisdiction.
- B. On-Site Work Hours: Limit work to between 7:00 a.m. to 7:00 p.m., Monday through Friday, unless otherwise indicated or required by Owner. Work hours may be modified to meet Project requirements if approved by Owner and authorities having jurisdiction.
 - 1. Weekend Hours: 7:00 a.m. to 7:00 p.m; subject to Owner approval.
- C. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging for temporary utility services according to requirements indicated:
 - 1. Notify Architect and Owner not less than two days in advance of proposed utility interruptions.
 - 2. Obtain Owner's written permission before proceeding with utility interruptions.
- D. Noise, Vibration, Dust, and Odors: Coordinate operations that may result in high levels of noise and vibration, dust, odors, or other disruption to Owner occupancy with Owner.
 - 1. Notify Architect, and Owner not less than two days in advance of proposed disruptive operations.
 - 2. Obtain Owner's written permission before proceeding with disruptive operations.
- E. Smoking and Controlled Substance Restrictions: Use of tobacco products, alcoholic beverages, and other controlled substances on Project site on Owner's property is not permitted.
- F. Employee Identification: Provide identification tags for Contractor personnel working on Project site. Require personnel to use identification tags at all times.

1.10 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
 - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
 - 2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.

3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
 4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.
1. Conflicting Requirements within Division 00: Division 00 Sections contained within this volume, listed in this volume's Table of Contents, and authored by the Architect, take precedence over other Division 00 Sections; regardless of any language stating otherwise.
- C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.
1. Conflicting Requirements within Division 01: Division 01 Sections contained within this volume, listed in this volume's Table of Contents, and authored by the Architect, take precedence over other Division 01 Sections; regardless of any language stating otherwise.
- D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
 2. Abbreviations: Materials and products are identified by abbreviations scheduled on Drawings.
 3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 1000

SECTION 01 2300 - 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 the 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 alternates 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. Execute accepted alternates under the same conditions as other Work of the Contract.
- C. Schedule: A Part 3 "Schedule of Alternates" Article 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: Toilet Room Renovations.
 - 1. Base Bid: No work.
 - 2. Alternate: Provide all demolition and new work associated with the renovation of toilet rooms M142 and M143 as indicated on Drawings and Specifications.
- B. Alternate No. 2: Toilet Room Renovations.
 - 1. Base Bid: No work.
 - 2. Alternate: Provide all demolition and new work associated with the renovation of toilet rooms R132 and R135 as indicated on Drawings and Specifications.

C. Alternate No. 3: Summer 2023 Construction.

1. Base Bid: Provide all demolition and new work associated with the renovation of toilet rooms D141 and D142 as indicated on Drawings and Specifications to be completed during the Summer 2024 construction schedule.
2. Alternate: Provide all demolition and new work associated with the renovation of toilet rooms D141 and D142 as indicated on Drawings and Specifications to be completed during the Summer 2023. Construction completion date to be August 18, 2023.

END OF SECTION 01 2300

SECTION 01 2500 – 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.

1.3 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents.
 - 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 to meet other Project requirements but may offer advantage to Contractor or Owner.

1.4 ACTION SUBMITTALS

- A. Substitution Requests: Submit documentation identifying 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 01 2500.01 – Substitution Request Form, provided in Project Manual.
 - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Provide the following with all Substitution Requests. Substitution Requests without the following information will be rejected.
 - 1) Product Data, including drawings and descriptions of products and fabrication and installation procedures.
 - 2) Point-by-point, Comparative Data: Provide detailed comparison of significant qualities of proposed substitutions with those of the Work specified. 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.
 - a) Provide detailed comparison on a single page. Include side-by-side, itemized, comparative data of specified product and proposed Substitution comparing essential attributes specified. Alternatively provide annotated copy of applicable Specification Section indicating differences.
 - b. Statement indicating why specified product or fabrication, or installation method cannot be provided, if applicable.
 - c. Coordination of information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
 - d. Samples, where applicable or requested.

- e. Certificates and qualification data, where applicable or requested.
 - f. List of similar installations for completed projects, with project names and addresses as well as names and addresses of architects and owners.
 - g. Material test reports from a qualified testing agency, indicating and interpreting test results for compliance with requirements indicated.
 - h. Research reports evidencing compliance with building code in effect for Project, from ICC-ES.
 - i. Detailed comparison of Contractor's construction schedule using proposed substitutions 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.
 - j. Cost information, including a proposal of change, if any, in the Contract Sum.
 - k. 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.
 - l. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
3. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
- a. Forms of Acceptance: Change Order, Construction Change Directive, or Architect's Supplemental Instructions for minor changes in the Work.
 - b. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

1.5 QUALITY ASSURANCE

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

1.6 PROCEDURES

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

1.7 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 15 days prior to time required for preparation and review of related submittals.
1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
 - b. Substitution request is fully documented and properly submitted.
 - c. Requested substitution will not adversely affect Contractor's construction schedule.
 - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
 - e. Requested substitution is compatible with other portions of the Work.
 - f. Requested substitution has been coordinated with other portions of the Work.
 - g. Requested substitution provides specified warranty.

- SUBSTITUTION PROCEDURES
-
- 01 2500-3

SUBSTITUTION REQUEST FORM

Substitution Request Number: _____ Date Submitted: _____

IDS Project Number: _____

Project Name: _____

SPECIFIED ITEM

Specification Title: _____

Specification Section No.: _____ Specification Article / Paragraph: _____

Specified Item / Description: _____

Specified Manufacturer: _____ Specified Item / Model: _____

Reason for not providing specified item (*If after Bidding*): _____

PROPOSED SUBSTITUTION

Proposed Substitution: _____

Proposed Manufacturer: _____ Proposed Item / Model: _____

Manufacturer's Website: _____

Manufacturer's Address: _____

Years manufacturer has been in business: _____ Years item / model has been manufactured: _____

Differences between proposed Substitution and specified item: _____

Will proposed Substitution affect other parts of work? ☐ No ☐ Yes

If Yes, provide explanation: _____

Benefit of proposed Substitution (*If after Bidding*): ☐ Cost savings ☐ Time savings ☐ Other

Provide explanation of Benefit: _____

5211 cascade road se, ste. 300
grand rapids, mi 49546

1441 w. long lake road, ste. 200
troy, mi 48098

248-823-2100 www.ids-michigan.com

INTEGRATED design SOLUTIONS
architecture engineering interiors & technology

IDS Project Number: _____

Provide the following information. Check box to indicate information has been attached. **Substitution Requests without the following information will be rejected.**

☐ Product data sheets.

☐ Point-by-point, comparative data.

Provide side-by-side, itemized, comparative data of specified product and proposed Substitution comparing essential attributes specified (gages, sizes, performance requirements, finishes, etc.). Alternatively provide annotated copy of applicable Specification Section indicating differences.

Indicate if any additional information is attached:

☐ Applicable certificates and test reports. ☐ List of References where proposed product is installed.

☐ Drawings. ☐ Samples. ☐ Other Items: _____

SUBMITTED BY

The Undersigned certifies, except as otherwise indicated in Substitution Request:

- Substitution is equal or superior in all respects to specified product.
- Substitution complies with requirements in the Contract Documents, is compatible with related materials, and is appropriate for applications indicated.
- Same warranty will be provided for the Substitution as for the specified product.
- Same or equivalent maintenance service and source of replacement parts, as applicable, shall be available.
- Substitution will have no adverse effect on other trades and will not affect or delay project schedule.
- Substitution will not affect dimensions and functional clearances.
- Undersigned agrees to coordinate installation of the Substitution and any changes in the Work as necessary for installation of the Substitution.
- Costs for changes to the Work and any other costs caused by the Substitution; including, but not limited to, A/E design changes, detailing, and dimensioning, shall be paid by the undersigned.
- Undersigned waives claims for additional costs and time extensions that may subsequently become apparent after Substitution is approved.

Contractor / Company: _____

Signed By: _____ Printed Name: _____

Title: _____ Date: _____

Address: _____

Email: _____ Phone: _____

ARCHITECT'S RESPONSE

- During bidding, Architect will approve Substitution by issuing an Addendum, Substitutions not approved by addendum are rejected.
- During construction, Architect will notify Contractor in writing (see below) of decision to accept or reject a Substitution. Accepted Substitutions shall be incorporated into the Work by Change Order, Construction Change Directive, Architectural Supplementary Instructions, or similar instruments as provided for in the Conditions of the Contract.

☐ Substitution Approved - Provide submittals in accordance with Specification Section 01 3000 – Submittal Procedures, as noted by Architect in Substitution Request, and in accordance with respective section for which substitution was made.

☐ Substitution Rejected - Provide specified materials.

Signed By: _____ Printed Name: _____

Architect's Comments: _____

_____ Date: _____

SECTION 01 3300 - 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:
 - 1. Submittal schedule requirements.
 - 2. Administrative and procedural requirements for submittals.
 - 3. Submittal Form.
 - 4. CAD/BIM File Release Form.

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 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit, as an action submittal, a list 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. Submit revised submittal schedule as required to reflect changes in current status and timing for submittals.
 - 3. 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.

1.5 SUBMITTAL FORMATS

- A. Submittals shall be electronic, unless otherwise indicated.
 - 1. Prepare submittals as a single PDF package, incorporating complete information into PDF file.
 - a. Name PDF file with submittal number.
- B. Submittal Information: Include the following information in each submittal:
 - 1. Project name.
 - 2. Date.
 - 3. Name of Architect.
 - 4. Name of Contractor.
 - 5. Name of firm or entity that prepared submittal.
 - 6. Names of subcontractor, manufacturer, and supplier.
 - 7. Unique submittal number, including revision identifier. Include Specification Section number with sequential alphanumeric identifier and alphanumeric suffix for resubmittals.
 - 8. Category and type of submittal.
 - 9. Submittal purpose and description.
 - 10. Number and title of Specification Section, with paragraph number and generic name for each of multiple items.
 - 11. Drawing number and detail references, as appropriate.
 - 12. Indication of full or partial submittal.
 - 13. Location(s) where product is to be installed, as appropriate.
 - 14. Other necessary identification.
 - 15. Remarks.
 - 16. Signature of transmitter.
- C. Options: Identify options requiring selection by Architect.
- D. Deviations and Additional Information: On each submittal, clearly indicate deviations from requirements in the Contract Documents, including minor variations and limitations; include relevant additional information and revisions, other than those requested by Architect on previous submittals. Indicate by highlighting on each submittal or noting on attached separate sheet.

1.6 SUBMITTAL PROCEDURES

- A. Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.
 - 1. Email: Prepare each submittal as a single PDF package and transmit to Architect by sending via email.
 - a. Send submittals to the following email address:
 - 1) shop_drawings@ids-michigan.com
 - b. Subject Line: The Subject line of email should indicate the IDS project number, the project name, and specification section number (In this order).
 - c. IDS submittal form must be completed and included at the beginning of, and in the same PDF, as the submittal.
 - d. Submit only one specification section in each e-mail.
 - e. Architect will return review comments in a PDF file.

2. Web-Based Project Management Software: When used for a Project, prepare submittals in PDF form, and upload to web-based Project management software website instead of using email.
 - a. Enter required data in web-based software site to fully identify submittal.
 - b. IDS submittal form must be completed and included at the beginning of, and in the same PDF, as the submittal.
 - c. Submit only one specification section in each e-mail.
- B. Submittal Form:
 1. Refer to copy of form at the end of this Section.
 - a. Additionally, at construction kick-off meeting the Architect will transmit the Submittal Form to the Contractor in both Word and PDF format.
 2. Complete and fill out the following information on the submittal form.
 - a. Item (1) – Project Title/Location: Refer to Title Page of specifications. Include Bid Package number, if applicable.
 - b. Item (2) – From/Return to: Contractor's/Construction Manager's name and address to whom submittal is to be returned
 - c. Item (3) - IDS Project No.: Integrated Design Solutions' project number.
 - d. Item (4) - Submittal Date:
 - e. Item (5) - Submittal Number: Use 1, 2, 3, etc. for easy reference of each separate submittal.
 - f. Item (6) - If this is a Partial Submittal of this item, check the box and use "1.1", "1.2", etc. in the submittal number space. If this is a complete submittal, do not check box.
 - g. Item (7) - If this is a resubmittal (revision to a previous submittal), check the box and use the original submittal number and number the submittal "1A", "1B", etc in the submittal number space. If this is a new submittal, do not check box.
 - h. Item (8) – Project Manual Section No.: Indicate the Project Manual Specification Section number relating to the submittal
 - i. Item (9) – Product Manufacturer: Insert name of product manufacturer.
 - j. Item (10) - Item Description (specific information, not just "drawings", i.e. Curtainwall Shop Drawings.
 - k. Item (11) – Number of copies. Indicate the number of copies, product data, samples, etc. of each item being submitted.
 - l. Item (12) – Contractor's/Construction Manager's Remarks & Deviations (if any): Indicate appropriate remarks and note any deviations from the requirements of the Contract Documents, as required, and sign the certification that all submittals have been reviewed.
 - m. Item (13) – Addendum or Bulletin (if any): Indicate if submittal information is based on an addendum or bulletin. Indicate number of issue.
 - n. Item (14) – Substitution (if any): Indicate whether the submittal was approved under a separate Substitution
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. 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 submittals for related parts of the Work specified in different Sections, so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

- D. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 15 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. Resubmittal Review: Allow 15 days for review of each resubmittal.
 - 3. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is required, allow 21 days for initial review of each submittal.
- E. Resubmittals: Make resubmittals in same format 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.
- F. 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.
- G. 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.

1.7 SUBMITTAL REQUIREMENTS

- A. 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 unsuitable 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 that show 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 Shop Drawings, and before or concurrently with Samples.

- B. 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.
- C. Samples: Submit Samples for review of type, color, pattern, and texture for a check of these characteristics with other materials.
1. Transmit Samples that contain multiple, related components, such as accessories together in one submittal package.
 2. Identification: Permanently attach label on unexposed side of Samples that includes the following:
 - a. Project name and submittal number.
 - b. Generic description of Sample.
 - c. Product name and name of manufacturer.
 - d. Sample source.
 - e. Number and title of applicable Specification Section.
 - f. Specification paragraph number and generic name of each item.
 3. Email or Web-Based Transmittal: Provide PDF transmittal. Include digital image illustrating Sample characteristics and identification information for record.
 - a. In addition to electronic submittal, submit actual physical samples.
 4. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units, showing the full range of colors, textures, and patterns available.
 - a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned. Mark up and retain one returned Sample set as a project record Sample.
 - 1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- D. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 2. Manufacturer and product name, and model number if applicable.
 3. Number and name of room or space.
 4. Location within room or space.
- E. 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.
- F. Design Data: Prepare and submit written and graphic information indicating compliance with indicated performance and design criteria in individual Specification Sections. Include list of assumptions and summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Number each page of submittal.
- G. Certificates:
 1. Certificates and Certifications Submittals: Submit 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. Provide a notarized signature where indicated.
 2. 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.
 3. 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.
 4. Material Certificates: Submit written statements on manufacturer's letterhead, certifying that material complies with requirements in the Contract Documents.
 5. Product Certificates: Submit written statements on manufacturer's letterhead, certifying that product complies with requirements in the Contract Documents.
 6. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of AWS B2.1/B2.1M on AWS forms. Include names of firms and personnel certified.

H. Test and Research Reports:

1. 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 substrate preparation and primers required.
2. 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.
3. 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.
4. 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.
5. 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.
6. 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:
 - a. Name of evaluation organization.
 - b. Date of evaluation.
 - c. Time period when report is in effect.
 - d. Product and manufacturers' names.
 - e. Description of product.
 - f. Test procedures and results.
 - g. Limitations of use.

1.8 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
1. If criteria indicated are insufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF file for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.
 2. When requested by Architect, provide three paper copies of certificate, signed and sealed by the responsible design professional

1.9 CONTRACTOR'S REVIEW

- A. Action Submittals 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. Contractor's Approval: Indicate Contractor's approval for each submittal with a uniform approval stamp. Include 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.
 - 1. Architect will not review submittals received from Contractor that do not have Contractor's review and approval.

1.10 ARCHITECT'S REVIEW

- A. Action Submittals: Architect will review each submittal, indicate corrections or revisions required, and return.
 - 1. Email or Web-Based Submittals: Architect will indicate, via markup on each submittal, the appropriate action, as follows:
 - a. No Exceptions Taken: Work covered by the submittal may proceed provided it complies with requirements of the Contract Documents. Final payment depends on that compliance.
 - b. Exceptions As Noted: Work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the Contract Documents. Final payment depends on that compliance.
 - c. Rejected: Do not proceed with Work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal according to the notations; resubmit without delay. Repeat if necessary, to obtain different action mark.
 - 1) Do not use, or allow others to use, submittals marked "Rejected" at the Project Site or elsewhere where Work is in progress.
- 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. Architect will return without review submittals received from sources other than Contractor.
- F. Submittals not required by the Contract Documents will be returned by Architect without action.

1.11 CAD/BIM FILE RELEASE FORM

- A. Contractor's use of architect's computer-aided drafting (CAD) or building information modeling (BIM) files.
 - 1. At Contractor's written request, copies of Architect's Computer-Aided Drafting (CAD) or Building Information Modeling (BIM) files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
 - a. Contractor shall submit a fully executed "Request for Integrated Design Solutions, LLC (IDS) from Contractor For Transfer of Computer-Aided Drafting (CAD) or Building Information Modeling (BIM) Files on Electronic Media" form indicating acceptance of the terms and conditions therein.
 - 1) Refer to copy of form at the end of this Section.

Oxford Community Schools
Oxford High School
Toilet Room Renovation
Oxford, Michigan

IDS Project No. 22154-1000

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 3300

SUBMITTAL FORM

Project Title ⁽¹⁾ :		From/Return To ⁽²⁾ :
IDS Project No. ⁽³⁾ :		
Submittal Date ⁽⁴⁾ :		

Submittal No. ⁽⁵⁾ :		<input type="checkbox"/> Partial ⁽⁶⁾ <input type="checkbox"/> Resubmittal ⁽⁷⁾	IDS Submittal No.:	
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Project Manual Section No. ⁽⁸⁾ :		Manufacturer(s) ⁽⁹⁾ :	
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Item Description ⁽¹⁰⁾	Print ⁽¹¹⁾	Product Data	Sample	Other	A	M	E	EN	S	C	DN	FS	IN	TE
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Contractor's/Construction Manager's Remarks and Deviations ⁽¹²⁾ :
Addendum or Bulletin: ⁽¹³⁾
Substitution: ⁽¹⁴⁾
<p>The undersigned certifies that the above submitted items have been reviewed in detail, including materials, quantities, dimensions, specified performance criteria, installation requirements, catalog numbers and field conditions and are correct and in strict compliance with the Contract Documents, except as the undersigned has noted otherwise. Approval of items does not relieve the Contractor/Construction Manager from complying with all requirements of the Contract Documents. IDS review does not relieve the contractor from responsibility for errors or omissions in this submittal.</p> <p>Contractor/Construction Manager: _____</p> <p>Signature _____</p>

IDS Remarks:
<p>IDS Construction Administration Approval:</p> <p>_____</p> <p>Date: _____</p> <div style="display: flex; justify-content: space-between;"> <div> <p>ACTION CODES:</p> <ol style="list-style-type: none"> 1. NO EXCEPTIONS TAKEN 2. EXCEPTIONS AS NOTED 3. REJECTED 4. ACTION NOT REQUIRED </div> <div> <p>IDS Received Stamp</p> </div> </div>

INSTRUCTIONS

- A. Use this form for all submittals. Integrated Design Solutions, will furnish the Contractor/Construction Manager with forms.
- B. Organize submittals by Specification Section. Use a separate form for submittals of each Specification Section. **DO NOT SUBMIT ITEMS SPECIFIED IN DIFFERENT SPECIFICATION SECTIONS ON ONE SUBMITTAL FORM.**
- C. Fill in submittal form as follows:
- (1) Project Title and Location. (Refer to Title Page of specifications. Include Bid Package number, if applicable.)
 - (2) Contractor's/Construction Manager's name and address to whom submittal is to be returned.
 - (3) Integrated Design Solutions' project number.
 - (4) Submittal Date.
 - (5) Submittal Number: Use 1, 2, 3, etc. for easy reference of each separate submittal.
 - (6) If this is a Partial Submittal of this item, check the box and use "1.1", "1.2", etc. in the submittal number space. If this is a complete submittal, do not check box.
 - (7) If this is a resubmittal (revision to a previous submittal), check the box and use the original submittal number and number the submittal "1A", "1B", etc in the submittal number space. If this is a new submittal, do not check box.
 - (8) Indicate the Project Manual Specification Section number relating to the submittal.
 - (9) Manufacturer: Insert name of product manufacturer, (e.g., Liebert).
 - (10) Item Description: Insert a brief statement describing the submitted item in generic terms (e.g. Ceramic Mosaic Tile, etc.) with a list of all drawings or identifying numbers.
 - (11) No. of Copies: Indicate the number of copies, product data, samples, etc. of each item being submitted (e.g. prints-2, reproducible-1, etc.).
 - (12) Indicate appropriate remarks and note any deviations from the requirements of the Contract Documents, as required, and sign the certification that all submittals have been reviewed.
 - (13) Indicate if submittal information is based on an addendum or bulletin. Indicate number of issue.
 - (14) Indicate whether the submittal was approved under a separate Substitution Request.
- D. The balance of this form will be filled in by Integrated Design Solutions, and returned to the Contractor along with the submittal.

**Request for Integrated Design Solutions, LLC (IDS) from Contractor For Transfer of
Computer-Aided Drafting (CAD) or Building Information Modeling (BIM) Files on Electronic Media**

Project Administrator:	_____	Contractors:	_____
IDS Project Number:	_____	Construction Manager:	_____
Project Name:	_____		_____
Location:	_____		_____
Bid Package Number	_____	Date:	_____

IDS is requested to provide the following CAD/BIM files, as listed, for the named project, for the convenience of the contractor in preparing shop fabrication drawings:

<u>Drawing No./BIM File Discipline</u>	<u>Drawing Title</u>	<u>Issue Date of Drawing/BIM File</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____

Drawings were prepared on the following:

Software: _____ Operating System: _____

Check appropriate format for requested files.

DWG _____ DXF _____ IGES _____ NWD _____ RVT _____ DGN _____

TERMS AND CONDITIONS

- IDS makes no representation as to the compatibility of the CAD/BIM files with any hardware or software.
- Since the information set forth on the CAD/BIM files can be modified unintentionally or otherwise, IDS reserves the right to remove all indicia of its ownership and/or involvement from each electronic display.
- Contractor will use figured dimensions only and will not "pull" dimensions from the CAD/BIM files.
- All information on the CAD/BIM files is considered instruments of service of IDS and shall not be used for other projects, for additions to this project, or completion of this project by others. CAD/BIM files shall remain the property of IDS, and in no case shall the transfer of these files be considered a sale.
- IDS makes no representation regarding the accuracy, completeness, or permanence of CAD/BIM files, nor for their merchantability or fitness for a particular purpose. Addenda information or revisions made after the date indicated on the CAD/BIM files may not have been incorporated. In the event of a conflict between IDS' sealed contract drawings and CAD/BIM files, the sealed contract drawings shall govern. It is the Contractor's responsibility to determine if any conflict exists. The CAD/BIM files shall not be considered to be Contract Documents as defined by the General Conditions of the Contract for Construction.
- The use of CAD/BIM files prepared by IDS shall not in any way obviate the Contractor's responsibility for the proper checking and coordination of dimensions, details, member sizes and gage, and quantities of materials as required to facilitate complete and accurate construction of the project.

5215 cascade road se, ste. 300
grand rapids, mi 49546

1441 w. long lake road, ste. 200
troy, mi 48098

248-823-2100 www.ids-michigan.com

integrated design solutions
architecture engineering interiors & technology

7. The Contractor/Construction Manager shall, to the fullest extent permitted by law, indemnify, defend and hold harmless IDS and its subconsultants from all claims, damages, losses, expenses, penalties and liabilities of any kind, including attorney's fees, arising out of or resulting from the use of CAD/BIM files by the Contractor, or by third party recipients of the CAD/BIM files from the Contractor.
8. IDS believes that no licensing or copyright fees are due to others on account of the transfer of the CAD/BIM files, but to the extent any are, the Contractor will pay the appropriate fees and hold IDS harmless from such claims.
9. Any purchase order number provided by the Contractor is for the Contractor's accounting purposes only. Purchase order terms and conditions are void and are not a part of this agreement.
10. This agreement shall be governed by the laws of the State of Michigan.

3D TERMS OF USE

1. The 3D Computer Model(s), including but not limited to related calculation modeling and material, for the Project is provided by IDS as defined above to the User/Recipient as defined above (individually, a "User", or collectively, "Users") at the User's request subject to the terms and conditions stated below (the "Terms of Use"). User hereby acknowledges and agrees to the following terms and conditions.
2. The 3D Model is made available to User solely as a convenience to the User and for informational purposes only. The User is not to rely upon the 3D Computer Model and the data and/or information contained therein in preparing any of its documents for the Project. The User acknowledges that the 3D Computer Model is not a part of the Construction or Contract Documents for the Project and that IDS makes no representations or warranties, expressed or implied, regarding the 3D Computer Model, the accuracy or completeness of the 3D Computer Model or the data and/or information contained therein. It is agreed that the 3D Computer Model is generated for the purposes of assisting in the construction of the Project, the sealed construction drawings/instruments of service ultimately govern the design and the construction of the Project. The construction drawings/instruments of service trump the 3D Computer Model as the ultimate authority for the design and construction of the Project and are the Project's governing documents.
3. The User agrees that these terms apply to the 3D Model in its entirety, together with all of its component parts and data. The User acknowledges that the requirements of these Terms of Use apply to all of User's principals, employees, agents, consultants, and trade contractors, including all subcontractors.
4. The User agrees that the use of the 3D Computer Model is solely at the User's risk and that the User assumes full responsibility and liability in connection with the User's use of the 3D Computer Model and the information and/or data contained therein. The User agrees that IDS has no responsibility for any deficiencies, inaccuracies, errors and/or omissions contained in the 3D Computer Model or the data and/or information contained therein. IDS has no responsibility for any deficiencies or defects in the User's documents, work and/or services resulting from the User's use of the 3D Computer Model in lieu of the Construction and/or Contract Documents for the Project.
5. The User acknowledges and agrees a) that the use of the 3D Computer Model is not a substitute for professional judgment, b) that the use of the 3D Computer Model does not relieve the User from applying the appropriate standard of care and skill relevant to the use of the 3D Computer Model and its contents; c) that the 3D Computer Model is only to be used as a tool to assist the User in connection with the Project; d) that the User is solely responsible for verifying the accuracy of all results created with the use of the 3D Computer Model; and e) IDS is not responsible or liable for the means and methods of construction and the User's use of the 3D Computer Model shall in no way give rise to such duty or liability by IDS or its consultants.
6. IDS AND ITS CONSULTANTS SPECIFICALLY DISCLAIM ALL WARRANTIES WHETHER EXPRESSED, IMPLIED OR STATUTORY, INCLUDING, WITHOUT LIMITATION, ALL WARRANTIES OF MERCHANTABILITY, TITLE, FITNESS FOR A PARTICULAR PURPOSE, CONSTRUCTABILITY, NON-INFRINGEMENT, COMPATIBILITY, SECURITY OR ACCURACY. USERS' USE OF THE 3D COMPUTER MODEL IS AT ITS OWN RISK. USER ASSUMES FULL RESPONSIBILITY AND RISK OF LOSS RESULTING FROM USE OR INABILITY TO USE THE 3D COMPUTER MODEL OR ITS CONTENT AND WAIVES ANY AND ALL CLAIMS AGAINST IDS IN ANY WAY RELATED TO THE 3D COMPUTER MODEL.

7. The User further agrees that the 3D Computer Model contains information that is confidential and proprietary to IDS, and that IDS retains the ownership and all other reserved rights in the work product reflected in the 3D Computer Model that was prepared by IDS or its consultants for the Project. IDS grants the User a non-exclusive, non-transferable royalty-free license to use the 3D Computer Model for information purposes only in connection with the Project [or defined other specific task] in strict accordance with these Terms of Use. The User agrees that the 3D Computer Model will be used solely and exclusively for the Project and that it will not use the 3D Computer Model and the data and/or information contained therein, in whole or in part, for any purpose or project other than the Project. The User further agrees that the 3D Computer Model will continue to be kept confidential by the User, and that it shall not be disclosed in any manner, transferred or exchanged to any third parties by the User without the expressed, written consent of IDS.
8. Upon completion of the User's involvement with the Project or at any time upon written request of IDS, the User shall upon request promptly deliver to IDS the 3D Computer Model and any other material containing or reflecting any information or data in the 3D Computer Model (whether prepared by IDS, the User or otherwise) and will not retain copies, extracts or other reproductions, tangible or intangible, in whole or in part of the 3D Computer Model. The User's non-disclosure and non-use obligations set forth herein shall survive the return, destruction or deletion of the 3D Computer Model. If the User becomes legally compelled, by subpoena or court order to disclose the 3D Model, or any information contained therein, the User shall provide IDS with prompt notice so that a protective order or other appropriate remedy may be sought by and/or compliance with the provisions of the Terms of Use may be waived.
9. User hereby agrees that IDS shall be entitled to equitable relief, including injunction, in the event of any breach of the Terms of Use, including without limitation its obligations to maintain the confidentiality of the 3D Model, that the granting of such relief will not be opposed and that such relief shall not be the exclusive remedy for such breach. IDS's failure to insist upon strict adherence to any term of these Terms of Use shall not be considered a waiver thereof or deprive IDS of the right subsequently to insist upon strict adherence to that term or any other term of this Terms of Use.
10. The User hereby agrees, to the fullest extent permitted by law, that in no event shall IDS be liable to User for any damages or losses of any kind including, but not limited to, damages by death or bodily injury to persons, injury to property, and direct, indirect, consequential, special, or incidental damages, resulting from any error, omission, inaccuracy, deficiency or defect in or problem with, the 3D Computer Model or the data and/or information contained therein. Without limiting the foregoing, the User acknowledges that the 3D Computer Model and the data and/or information contained therein may be inaccurate and/or incomplete and that IDS will have no obligation to update or modify the 3D Computer Model or any of the data and/or information contained in it because the 3D Computer Model was prepared solely for informational purposes and is not part of the Construction or Contract Documents for the Project.
11. The User its officers, directors, shareholders, partners, agents, employees, consultants, trade contractors, subcontractors or independent contractors shall, to the fullest extent permitted by law, defend, indemnify and hold IDS and its officers, directors, shareholders, partners, principals, consultants, agents and employees harmless from and against any and all actions, damages, demands, claims, suits, losses, liability, judgments, recoveries, costs and expenses including, but not limited to, reasonable attorney's fees related in any way to the 3D Computer model and/or to any use of the 3D Computer Model or the data and/or the information contained therein by the User or any third party who receives the 3D Computer Model from the User. Such claims may include, but are not limited to, any claim which may arise due to deletions, omissions or variations of data due to mechanical or technical failure in connection with the transmission of the 3D Computer Model.
12. The User acknowledges and agrees that it is not in privity of contract with IDS as of result of these Terms of Use with respect to any claims or causes of action related to or arising out of the Project. The User further agrees to obligate any contractor, consultant or other party who uses the 3D Computer Model to be bound in writing by the terms and conditions contained herein and to provide a copy of such acceptance of the Terms of Use to IDS. Any User's use of the 3D Computer Model and the information and/or data contained therein constitutes such User's acceptance of all the terms here specified.
13. The signatory of these Terms of Use on User's behalf warrants to IDS that he/she is duly authorized to sign these Terms of Use on User's behalf and that these Terms of Use are a binding obligation assumed by the User.
14. These Terms of Use shall control and supersede all prior or simultaneous negotiations, representations and agreements, either written or oral including separate agreements between the User and IDS. Signing these Terms of Use indicates the User's agreement to the terms stated above. However in the event that these Terms of Use are not fully executed, they shall nonetheless be effective and controlling to the parties so long as IDS has provided same to the User and it has utilized the 3D Computer Model subsequent to receiving this document without registering its written objections/modifications to these terms.

AUTHORIZED ACCEPTANCE

by Integrated Design Solutions, LLC

by Contractor

Signature

Signature

Print Name and Title

Print Name and Title

Date

Date

Document1

SECTION 01 4000 - 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 inspection 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 quality-control requirements for individual work results are specified in their respective Specification Sections. Requirements in individual Sections may also cover production of standard products.
 - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and quality-control procedures that facilitate compliance with the Contract Document requirements.
 - 3. Requirements for Contractor to provide quality-assurance and quality-control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

1.3 DEFINITIONS

- A. Experienced: When used with an entity or individual, "experienced," unless otherwise further described, 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.
- B. Field Quality-Control Tests and Inspections: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- C. 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, assembly, and similar operations.
 - 1. Use of trade-specific terminology in referring to a Work result does not require that certain construction activities specified apply exclusively to specific trade(s).
- D. Mockups: Physical assemblies of portions of the Work constructed to establish the standard by which the Work will be judged. Mockups are not Samples.
 - 1. Mockups are used for one or more of the following:
 - a. Verify selections made under Sample submittals.
 - b. Demonstrate aesthetic effects.
 - c. Demonstrate the qualities of products and workmanship.
 - d. Demonstrate successful installation of interfaces between components and systems.
 - e. Perform preconstruction testing to determine system performance.
 - 2. Product Mockups: Mockups that may include multiple products, materials, or systems specified in a single Section.
 - 3. In-Place Mockups: Mockups constructed on-site in their actual final location as part of permanent construction.

- E. 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. Unless otherwise indicated, copies of reports of tests or inspections performed for other than the Project do not meet this definition.
- F. Product Tests: Tests and inspections that are performed by a nationally recognized testing laboratory (NRTL) according to 29 CFR 1910.7, by a testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program (NVLAP), or by a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.
- G. Source Quality-Control Tests and Inspections: Tests and inspections that are performed at the source (e.g., plant, mill, factory, or shop).
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. The term "testing laboratory" has the same meaning as the term "testing agency."
- I. 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.
- J. 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. Contractor's quality-control services do not include contract administration activities performed by Architect.

1.4 DELEGATED DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

- A. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, inform the Architect regarding the conflict and obtain clarification prior to proceeding with the Work. Refer conflicting requirements that are different, but apparently equal, to Architect for clarification before proceeding.
- B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified is 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.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Contractor's quality-control personnel.
- B. 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.
- C. 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.
- D. Reports: Prepare and submit certified written reports and documents as specified.
- E. Permits, Licenses, and Certificates: For Owner's record, 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 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, telephone number, and email address 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 inspection.
 - 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, telephone number, and email address 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 of 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, telephone number, and email address 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 of whether conditions, products, and installation will affect warranty.
 5. Other required items indicated in individual Specification Sections.

1.8 QUALITY ASSURANCE

- A. 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. As applicable, procure products from manufacturers able to meet qualification requirements, warranty requirements, and technical or factory-authorized service representative requirements.
- 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, applying, 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 is similar in material, design, and extent to those indicated for this Project.
- F. Testing and Inspecting Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspection indicated, as documented in accordance with ASTM E329, and with additional qualifications specified in individual Sections; and, where required by authorities having jurisdiction, that is acceptable to authorities.
- G. 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.
- H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect, demonstrate, repair, and perform service on installations of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

- I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following Contractor's responsibilities, including the following:
 - 1. Provide test specimens representative of proposed products and construction.
 - 2. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
 - 3. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
 - 4. Build site-assembled test assemblies and mockups, using installers who will perform same tasks for Project.
 - 5. When testing is complete, remove test specimens and test assemblies, and mockups; do not reuse products on Project.
 - 6. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Contractor. Interpret tests and inspections, and state in each report whether tested and inspected Work complies with or deviates from the Contract Documents.

- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
 - 1. Build mockups of size indicated.
 - 2. Build mockups in location indicated or, if not indicated, as directed by Architect.
 - 3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
 - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers who will be employed to perform same tasks during the construction at Project.
 - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 6. Obtain Architect's approval of mockups before starting corresponding Work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 7. Promptly correct unsatisfactory conditions noted by Architect's preliminary review, to the satisfaction of the Architect, before completion of final mockup.
 - 8. Approval of mockups by the Architect does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 9. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
 - 10. Demolish and remove mockups when directed unless otherwise indicated.

1.9 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 inspection they are engaged to perform.
 - 2. Costs for retesting and reinspecting construction that replaces or is necessitated by Work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

- B. Contractor Responsibilities: Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Perform additional quality-control activities, whether specified or not, to verify and document that the Work complies with requirements.
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. Engage a qualified testing agency to perform quality-control services.
 - a. Contractor will 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 inspection 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 inspection 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. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.
- D. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
 2. Determine the locations 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 duties of Contractor.
- E. 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 Section 01 3300 "Submittal Procedures."
- F. 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.
- G. Contractor's Associated Requirements and Services: Cooperate with agencies and representatives 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 inspection. 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 inspection equipment at Project site.
- H. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and quality-control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspection.
1. Schedule times for tests, inspections, obtaining samples, and similar activities.

1.10 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: Owner will engage a qualified testing agency to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:
1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
 2. Notifying Architect, Commissioning Authority, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority with copy to Contractor and to authorities having jurisdiction.
 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
 5. Interpreting tests and inspections, and stating in each report whether tested and inspected Work complies with or deviates from the Contract Documents.
 6. Retesting and reinspecting corrected Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

- A. Test and Inspection Log: Prepare a record of tests and inspections. Include the following:
1. Date test or inspection was conducted.
 2. Description of the Work tested or inspected.
 3. Date test or inspection results were transmitted to Architect.
 4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's, Commissioning Authority's and authorities' having jurisdiction reference during normal working hours.
1. Submit log at Project closeout as part of Project Record Documents.

3.2 REPAIR AND PROTECTION

- A. General: On completion of testing, inspection, sample-taking, and similar services, repair damaged construction and restore substrates and finishes.
 - 1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 01 7300 - 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 01 4000

SECTION 01 4200 - 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": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- 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.
 - 1. For standards referenced by applicable building codes, comply with dates of standards as listed in building codes.

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

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

1.4 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."
- B. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list.
 - 1. EPA - Environmental Protection Agency; www.epa.gov.
 - 2. OSHA - Occupational Safety & Health Administration; www.osha.gov.
 - 3. USDA - Department of Agriculture; www.usda.gov.

1.5 CODES AND REGULATORY REQUIREMENTS

- A. Regulatory requirements applicable to this project: Refer to Drawings.
- B. Where Drawings and specification sections reference more current standards or codes, comply with the more restrictive requirements.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 4200

SECTION 01 6000 - PRODUCT 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 selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; and comparable products.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Salvaged items or items reused from other projects are not considered new products. Items that are manufactured or fabricated to include recycled content materials are considered new products, unless indicated otherwise.
 - 3. Comparable Product: Product by named manufacturer that is demonstrated and approved through the comparable product submittal process described in Part 2 "Comparable Products" Article, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. Published attributes and characteristics of basis-of-design product establish salient characteristics of products.
 - 1. Evaluation of Comparable Products: In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- C. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications; submit a comparable product request or substitution request, if applicable.
- D. Comparable Product Request Submittal: An action submittal requesting consideration of a comparable product, including the following information:
 - 1. Identification of basis-of-design product or fabrication or installation method to be replaced, including Specification Section number and title and Drawing numbers and titles.

2. Data indicating compliance with the requirements specified in Part 2 "Comparable Products" Article.
- E. Basis-of-Design Product Specification Submittal: An action submittal complying with requirements in Section 013300 "Submittal Procedures."
- F. Substitution: Refer to Section 01 2500 - Substitution Procedures, for definition and limitations on substitutions.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
- B. Identification of Products: Except for required labels and operating data, do not attach or imprint manufacturer or product names or trademarks on exposed surfaces of products or equipment that will be exposed to view in occupied spaces or on the exterior.
 1. Labels: Locate required product labels and stamps on a concealed surface, or, where required for observation following installation, on a visually accessible surface that is not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service- or power-operated equipment. Locate on a visually accessible but inconspicuous surface. Include information essential for operation, including the following:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.
 3. See individual identification Sections in Divisions 21, 22, 23, and 26 for additional equipment identification requirements.

1.5 COORDINATION

- A. Modify or adjust affected work as necessary to integrate work of approved comparable products and approved substitutions.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products, using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 4. Inspect products on delivery to determine compliance with the Contract Documents and that products are undamaged and properly protected.

C. Storage:

1. Provide a secure location and enclosure at Project site for storage of materials and equipment.
2. Store products to allow for inspection and measurement of quantity or counting of units.
3. Store materials in a manner that will not endanger Project structure.
4. Store products that are subject to damage by the elements under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation and with adequate protection from wind.
5. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Written standard warranty form furnished by individual manufacturer for a particular product and issued in the name of the Owner or endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner and issued in the name of the Owner or endorsed by manufacturer to Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included in the Project Manual, prepare a written document, using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 01 7700 - Closeout Procedures.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Architect will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.

6. Or Equal: For products specified by name and accompanied by the term "or equal," "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Architect in order to establish equivalency of proposed products. Unless otherwise indicated, evaluation of "or equal" product status is by the Architect, whose determination is final.

B. Product Selection Procedures:

1. Sole Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole product may be indicated by the phrase "Subject to compliance with requirements, provide the following."
2. Sole Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
 - a. Sole manufacturer/source may be indicated by the phrase "Subject to compliance with requirements, provide products by the following."
3. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - a. Limited list of products may be indicated by the phrase "Subject to compliance with requirements, provide one of the following."
4. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed or an unnamed product that complies with requirements.
 - a. Non-limited list of products is indicated by the phrase "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of an unnamed product is not considered a substitution, if the product complies with requirements.
5. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered unless otherwise indicated.
 - a. Limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, provide products by one of the following."
6. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed or a product by an unnamed manufacturer that complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following."
 - b. Provision of products of an unnamed manufacturer is not considered a substitution, if the product complies with requirements.

7. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications may additionally indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section 01 2500 "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require the phrase "match Architect's sample," provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or a similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with the following requirements:
 1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work.
 2. Detailed comparison of significant qualities of proposed product with those of the named basis-of-design product. Significant product qualities include attributes, such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 3. Evidence that proposed product provides specified warranty.
 4. List of similar installations for completed projects, with project names and addresses and names and addresses of architects and owners, if requested.
 5. Samples, if requested.
- B. Architect's Action on Comparable Products Submittal: If necessary, Architect will request additional information or documentation for evaluation, as specified in Section 01 3300 "Submittal Procedures."
 1. Form of Approval of Submittal: As specified in Section 01 3300 "Submittal Procedures."
 2. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.
- C. Submittal Requirements, Two-Step Process: Approval by the Architect of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 6000

SECTION 01 7300 - 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. Installation of the Work.
 - 2. RFIs.
 - 3. Cutting and patching.
 - 4. General coordination procedures.
 - 5. Coordination of Owner's portion of the Work.
 - 6. Progress cleaning.
 - 7. Starting and adjusting.
 - 8. Protection of installed construction.

1.3 DEFINITIONS

- A. RFI: Request for Information. Request from Contractor seeking information required by or clarifications of the Contract Documents.
- B. Cutting: Removal of in-place construction necessary to permit installation or performance of subsequent work.
- C. Patching: Fitting and repair work required to restore construction to original conditions after installation of subsequent work.

1.4 PREINSTALLATION MEETINGS

- A. Cutting and Patching Conference: Conduct conference at Project site.
 - 1. Prior to commencing work requiring cutting and patching, review extent of cutting and patching anticipated and examine procedures for ensuring satisfactory result from cutting and patching work. Inform Architect of scheduled meeting. Require representatives of each entity directly concerned with cutting and patching to attend, including the following:
 - a. Contractor's superintendent.
 - b. Trade supervisor responsible for cutting operations.
 - c. Trade supervisor(s) responsible for patching of each type of substrate.
 - d. Mechanical, electrical, and utilities subcontractors' supervisors, to the extent each trade is affected by cutting and patching operations.
 - 2. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.5 REQUEST FOR INFORMATION (RFI)

- A. General: Immediately on discovery of the need for additional information, clarification, or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. Architect will return without response those RFIs submitted to Architect by other entities controlled by Contractor.
 - 2. Coordinate and submit RFIs in a prompt manner to avoid delays in work.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Architect's Project number.
 - 3. Date.
 - 4. Name of Contractor.
 - 5. RFI number, numbered sequentially.
 - 6. RFI subject.
 - 7. Specification Section number and title and related paragraphs, as appropriate.
 - 8. Drawing number and detail references, as appropriate.
 - 9. Field dimensions and conditions, as appropriate.
 - 10. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 11. Contractor's signature.
 - 12. 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: AIA Document G716 or similar form.
 - 1. Attachments shall be electronic files in PDF format.
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow seven 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 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 by Architect of additional information.
 - 3. If Contractor believes the RFI response from Architect warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 5 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 unless other arrangement is agreed upon with Architect. Include 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.
 8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
- 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 three days if Contractor disagrees with response.

1.6 CLOSEOUT SUBMITTALS

- A. Certified statements from existing manufacturers stating that existing warranties have not been affected by cutting and patching work performed under this Section.

1.7 QUALITY ASSURANCE

- A. Manufacturer's Installation Instructions: Obtain and maintain on-site manufacturer's written recommendations and instructions for installation of specified products and equipment.
- 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, or when encountering the need for cutting and patching of elements whose structural function is not known, 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 but are not limited to the following:
 - a. Primary operational systems and equipment.
 - b. Fire separation assemblies.
 - c. Air or smoke barriers.
 - d. Fire-suppression systems.
 - e. Plumbing piping systems.
 - f. Mechanical systems piping and ducts.
 - g. Control systems.
 - h. Communication systems.
 - i. Fire-detection and -alarm systems.
 - j. Conveying systems.
 - k. Electrical wiring systems.
 - l. 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.

1.8 WARRANTY

- A. 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.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Comply with requirements specified in other Sections.
 1. For projects requiring compliance with sustainable design and construction practices and procedures, use products for patching that comply with sustainable design requirements.
- B. In-Place Materials: Use materials for patching identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will provide a match acceptable to Architect for the visual and functional performance of in-place materials. Use materials that are not considered hazardous.
- C. 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 EXAMINATION

- A. Cutting and Patching: 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.

- B. Existing Conditions: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities, mechanical and electrical systems, and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, gas service piping, 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.
- C. 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.
- D. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - 1. Description of the Work, including Specification Section number and paragraph, and Drawing sheet number and detail, where applicable.
 - 2. List of detrimental conditions, including substrates.
 - 3. List of unacceptable installation tolerances.
 - 4. Recommended corrections.
- E. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Cutting and Patching:
 - 1. Temporary Support: Provide temporary support of Work to be cut.
 - 2. 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.
 - 3. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
 - 4. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize or prevent interruption to occupied areas.
- B. Existing Utility Information: Furnish information to local utility and 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.
- C. 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.

- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect through Contractor.

3.3 CUTTING AND PATCHING

- 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. Temporary Support: Provide temporary support of Work to be cut.
- C. 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.
- D. Adjacent Occupied Areas: Where interference with use of adjoining areas or interruption of free passage to adjoining areas is unavoidable, coordinate cutting and patching in accordance with requirements in Section 01 1000 "Summary."
- E. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize or prevent interruption to occupied areas.
- 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 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, as judged by Architect. 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 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, 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, corner to corner of wall and edge to edge of ceiling. 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.

3.4 INSTALLATION

- A. Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces, unless otherwise indicated on Drawings.
- 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 satisfactory results as judged by Architect. 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 of type expected for Project.
- 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: Select tools or equipment that minimize production of excessive 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 portions of the 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 with manufacturer.
 - 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, as judged by Architect. Fit exposed connections together to form hairline joints.
- J. Repair or remove and replace damaged, defective, or nonconforming Work.
 1. Comply with Section 01 7700 "Closeout Procedures" for repairing or removing and replacing defective Work.

3.5 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.

3.6 COORDINATION OF OWNER'S PORTION OF THE WORK

- A. Site Access: Provide access to Project site for Owner's construction personnel and Owner's separate contractors.
 1. Provide temporary facilities required for Owner-furnished, Contractor-installed products.
 2. Refer to Section 01 1000 "Summary" for other requirements for Owner-furnished, Contractor-installed and Owner-furnished, Owner-installed products
- B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction personnel and Owner's separate contractors.
 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 and Owner's separate contractors 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. Clean Project site and work areas daily, including common areas. Enforce requirements strictly. Dispose of materials lawfully.
 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 2. Do not hold waste materials more than seven days during normal weather or three days if the temperature is expected to rise above 80 deg F (27 deg C).

3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
 - a. Use containers intended for holding waste materials of type to be stored.
- 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: 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.
- 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 ensure 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.
- B. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- C. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- D. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- E. Manufacturer's Field Service: Comply with qualification requirements in Section 01 4000 "Quality Requirements."

3.9 PROTECTION AND REPAIR 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. Repair Work previously completed and subsequently damaged during construction period. Repair to like-new condition.
- C. Protection of Existing Items: Provide protection and ensure that existing items to remain undisturbed by construction are maintained in condition that existed at commencement of the Work.
- D. Comply with manufacturer's written instructions for temperature and relative humidity.

END OF SECTION 01 7300

SECTION 01 7700 - 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.

1.3 DEFINITIONS

- A. List of Incomplete Items (Contractor's "punch list"): Contractor-prepared list of items to be completed or corrected, prepared for the Architect's use prior to Architect's inspection, to determine if the Work is substantially complete.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cleaning agent.
- B. Contractor's List of Incomplete Items (Contractor's "punch list"): Initial submittal at Substantial Completion.
- C. Certified List of Incomplete Items (Contractor's "punch list"): Final submittal at Final Completion.

1.5 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items required by other Sections.

1.7 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items (Contractor's "punch list"): Prepare and submit a list of items to be completed and corrected, 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, damage or settlement surveys, property surveys, and similar final record information.
 3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
 4. Submit maintenance material submittals specified in individual Sections, including tools, spare parts, extra materials, and similar items, and deliver to location designated by Architect. Label with manufacturer's name and model number.
 - 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 Owner's signature for receipt of submittals.
 5. Submit testing, adjusting, and balancing records.
 6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of 10 days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
1. Advise Owner of pending insurance changeover requirements.
 2. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 3. Complete startup and testing of systems and equipment.
 4. Perform preventive maintenance on equipment used prior to Substantial Completion.
 5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
 6. Advise Owner of changeover in utility services.
 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.
 10. Touch up paint 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. 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.

1.8 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 in accordance with Division 01.
 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 Final Completion photographic documentation.
- 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. Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.9 LIST OF INCOMPLETE ITEMS (CONTRACTOR'S "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 and proceeding from lowest floor to highest floor, listed by room or space number.
 2. Organize items applying to each space by major element, including categories for ceilings, individual walls, floors, equipment, and building systems.
 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Page number.
 4. Submit list of incomplete items in one of the following formats as directed by Architect:
 - a. PDF Electronic File: Architect will return annotated file.
 - b. Web-Based Project Software Upload: Utilize software feature for creating and updating list of incomplete items (punch list).

1.10 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where warranties are indicated to commence on dates other than date of Substantial Completion, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Partial Occupancy: Submit properly executed warranties within 15 days 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.
- D. Warranty Electronic File: Provide warranties and bonds in PDF format. Assemble complete warranty and bond submittal package into a single electronic PDF file with bookmarks enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
 - 1. Submit on digital media acceptable to Architect or by uploading to web-based project software site.
- E. Warranties in Paper Form: In addition to the Warranty Electronic File, provide one copy in paper form.
 - 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 (215-by-280-mm) paper.
 - 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
 - 3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
- F. 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 of rubbish, waste material, litter, and other foreign substances.
 - b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
 - c. Remove tools, construction equipment, machinery, and surplus material from Project site.
 - d. 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.
 - e. Remove debris and surface dust from limited-access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
 - f. Clean flooring, removing debris, dirt, and staining; clean according to manufacturer's recommendations.
 - g. Vacuum and mop concrete.

- h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
- i. 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.
- j. Remove labels that are not permanent.
- k. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- l. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- m. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- n. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
- o. Clean luminaires, lamps, globes, and reflectors to function with full efficiency.
- p. Clean strainers.
- q. Leave Project clean and ready for occupancy.

- C. Construction Waste Disposal: Comply with waste-disposal requirements in Division 01.

3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations required by Section 01 7300 "Execution" before requesting inspection for determination of Substantial Completion.

END OF SECTION 01 7700

SECTION 01 7823 - 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 manuals.
 - 2. Emergency manuals.
 - 3. Systems and equipment operation manuals.
 - 4. Systems and equipment maintenance manuals.
 - 5. Product maintenance manuals.

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. Submit operation and maintenance manuals indicated. Provide content for each manual as specified in individual Specification Sections, and as reviewed and approved at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect and Commissioning Authority (if any) will comment on whether content of operation and maintenance submittals is acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operation and maintenance manuals in the following format:
 - 1. Submit on digital media acceptable to Architect or by uploading to web-based project software site as directed by Architect. Enable reviewer comments on draft submittals.
 - 2. Submit two paper copies. Architect, through Construction Manager, will return one copies.
 - a. Paper copies may be omitted with written approval of Architect.
- C. Initial Manual Submittal: Submit draft copy of each manual at least 30 days before commencing demonstration and training. Architect and Commissioning Authority (if any) will comment on whether general scope and content of manual are acceptable.

- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 15 days before commencing demonstration and training. Architect and Commissioning Authority (if any) will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's and Commissioning Authority (if any) comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's (if any) comments and prior to commencing demonstration and training.
- E. Comply with Section 01 7700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

1.5 FORMAT OF OPERATION AND MAINTENANCE MANUALS

- A. 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: Bookmark 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.
- B. 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 (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. 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. 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. Enclose title pages and directories in clear plastic sleeves.
 - 4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) 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.

1.6 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Organization of Manuals: 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 (if any).
 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. 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."

1.7 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY MANUAL

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals. List items and their location to facilitate ready access to desired information. Include the following:
1. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
 2. 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.
 3. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

1.8 EMERGENCY MANUALS

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

- B. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- C. 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.
- D. 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.
- E. 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.

1.9 SYSTEMS AND EQUIPMENT OPERATION MANUALS

- A. Systems and Equipment Operation Manual: Assemble a complete set of data indicating operation of each system, subsystem, and piece of equipment not part of a system. Include information required for daily operation and management, operating standards, and routine and special operating procedures.
 - 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.

- B. 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.
- C. 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.
- D. 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.
- E. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- F. Piped Systems: Diagram piping as installed and identify color coding where required for identification.

1.10 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Systems and Equipment Maintenance Manuals: Assemble a complete set of data indicating maintenance of each system, subsystem, and piece of equipment not part of a system. Include manufacturers' maintenance documentation, preventive maintenance procedures and frequency, repair procedures, wiring and systems diagrams, lists of spare parts, and warranty information.
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.

- B. 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 warranties and bonds as described below.
- C. 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.
- D. Manufacturers' Maintenance Documentation: Include the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins; 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.
 - a. 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.
 - 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.
- E. 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.
- F. 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.
- G. 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.
- H. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.

- I. 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.
- J. 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 maintenance manuals.

1.11 PRODUCT MAINTENANCE MANUALS

- A. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- B. 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.
- C. 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.
- D. 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.
- E. 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.
- F. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- G. 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.

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Toilet Room Renovation
Oxford, Michigan

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PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 7823

SECTION 01 7839 - 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.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Submit annotated PDF electronic files and one paper copies of Record Drawings, including addenda and Contract modifications
 - 1. Paper copies may be omitted with written approval of Architect.
- B. Record Specifications: Submit annotated PDF electronic files and one paper copies of Project's Specifications, including addenda and Contract modifications.
 - 1. Paper copies may be omitted with written approval of Architect.
- C. Record Product Data: Submit annotated PDF electronic files and directories and one paper copies of each submittal.
 - 1. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual.
 - 2. Paper copies may be omitted with written approval of Architect.
- D. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories and one paper copies of each submittal.
 - 1. Paper copies may be omitted with written approval of Architect.

1.4 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 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.
 - 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 prints 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.
- B. Record Digital Data Files: Immediately before inspection for Certificate of Substantial Completion, review marked-up record prints with Architect. When authorized, prepare a full set of corrected digital data files of the Contract Drawings, as follows:
1. Formats: Provide both of the following formats unless otherwise directed by Architect.
 - a. Same digital data software program, version, and operating system as for the original Contract Drawings.
 - b. Annotated PDF electronic file with comment function enabled.
 2. Incorporate changes and additional information previously marked on record prints. Delete, redraw, and add details and notations where applicable.
 3. Refer instances of uncertainty to Architect for resolution.

4. Architect will furnish Contractor with one set of digital data files of the Contract Drawings for use in recording information.
- C. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.
1. Record Prints: Organize record prints into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 2. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
 3. Identification: As follows:
 - a. Project name.
 - b. Date.
 - c. Designation "PROJECT RECORD DRAWINGS."
 - d. Name of Architect and Contractor.
 - e. Name of Contractor.

1.5 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation, where installation varies from that indicated in Specifications, addenda, and Contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 2. Mark copy with the proprietary name and model number of products, materials, and equipment furnished, including substitutions and product options selected.
 3. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
 4. Note related Change Orders, Record Product Data, and Record Drawings where applicable.
- B. Format: Submit record specifications in the following two formats.
1. Annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Specifications
 2. Paper copy.

1.6 RECORD PRODUCT DATA

- 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. 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.

C. Format:

1. Submit record product data in the following two formats.
 - a. Annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Product Data
 - b. Paper copy.
2. Include Record Product Data directory organized by Specification Section number and title, electronically linked to each item of Record Product Data.

1.7 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:
 1. Submit miscellaneous record submittals in the following two formats.
 - a. Annotated PDF electronic file or scanned PDF electronic file(s) of marked-up miscellaneous record submittals
 - b. Paper copy.
 2. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.

1.8 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents: Store Record Documents 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 reference during normal working hours.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 7839

SECTION 01 7900 – DEMONSTRATION AND TRAINING

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 instructing Owner's personnel, including the following:
 - 1. Instruction in operation and maintenance of systems, subsystems, and equipment.

1.3 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
- B. Qualification Data: For instructor and facilitator.

1.4 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 01 4000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 01 3100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data have been reviewed and approved by Architect.

1.6 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.
 - 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Systems and equipment operation manuals.
 - c. Systems and equipment maintenance manuals.
 - d. Product maintenance manuals.
 - e. Project Record Documents.
 - f. Identification systems.
 - g. Warranties and bonds.
 - h. Maintenance service agreements and similar continuing commitments.
 - 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
 - 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - l. Required sequences for electric or electronic systems.

- m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning.
 - e. Procedures for preventive maintenance.
 - f. Procedures for routine maintenance.
 - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

1.7 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 01 7823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

1.8 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Owner, through Construction Manager, will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed-on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner, through Construction Manager, with at least seven days' advance notice.
- D. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- E. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 7900

SECTION 02 4119 – SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Demolition and removal of selected portions of building or structure.
 - 2. Demolition and removal of selected site elements.
 - 3. Abandonment and removal of existing utilities and utility structures.
 - 4. Salvage of existing items to be reused or recycled.
 - 5. Removed and reinstalled items.

1.3 DEFINITIONS

- A. Remove (Demolished): Detach items from existing construction and dispose of them off-site unless indicated to be salvaged or reinstalled.
- B. Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.
- D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Unless otherwise indicated, demolition waste becomes property of Contractor.

1.5 PREINSTALLATION MEETINGS

- A. Predemolition Conference: Conduct conference at Project site.
 - 1. Inspect and discuss condition of construction to be selectively demolished.
 - 2. Review structural load limitations of existing structure.
 - 3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
 - 5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For demolition firm.
- B. Proposed Protection Measures: Submit report, including Drawings, that indicates the measures proposed for protecting individuals and property, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

- C. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Submit before Work begins.
- D. Warranties: Documentation indicating 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.

1.8 QUALITY ASSURANCE

- A. Demolition Firm Qualifications: Company specializing in the type of work required.

- 1. Minimum of 5 years of documented experience.

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.
 - 1. Before selective demolition, Owner may remove items:
- 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. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.
- E. Storage or sale of removed items or materials on-site is not permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 - 1. Maintain fire-protection facilities in service during selective demolition operations.

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 and using approved contractors so as not to void existing warranties. Notify warrantor before proceeding.
 - 1. Coordinate with Owner for list of existing warranties still in effect.
- 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.

1.11 COORDINATION

- A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Review Project Record Documents of existing construction or other existing conditions.
- B. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.
 - 1. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.
- C. Verify that hazardous materials have been remediated before proceeding with building demolition operations.
- D. Survey of Existing Conditions: Record existing conditions by use of measured drawings and preconstruction photographs or video.
 - 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 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
- B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.
 - 1. Arrange to shut off utilities with utility companies and Owner.
 - 2. Refer to Divisions 20, 21, 22, 23, 26, 27, and 28 for additional requirements.
 - 3. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
 - 4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated on Drawings to be removed.
 - a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material and leave in place.
 - c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.

- e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
- g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material and leave in place.

3.3 PROTECTION

- A. Temporary Protection: 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.
- B. Temporary Shoring: Design, 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.
- C. Remove temporary barricades and protections where hazards no longer exist.

3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
 - 1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
 - 2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Temporarily cover openings to remain.
 - 3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
 - 4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
 - 5. Maintain fire watch during and for at least 8 hours after flame-cutting operations.
 - 6. Maintain adequate ventilation when using cutting torches.
 - 7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
 - 8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
 - 9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
 - 10. Dispose of demolished items and materials promptly. Comply with requirements of Division 01.]

- B. 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.
- C. 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.
- D. Removed and Reinstalled Items:
 - 1. Clean and repair items to functional condition adequate for intended reuse.
 - 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 - 3. Protect items from damage during transport and storage.
 - 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. 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.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

- A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.
 - 1. Where concrete cannot be cut full depth, cut concrete to a depth of at least 3/4 inch. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.
- B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.
- C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.
- D. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.
- E. Acoustic Panel Ceilings:
 - 1. Refer to Section 09 5113 – Acoustic Panel Ceilings, for removing, modifying, and reinstalling portions of existing acoustical panel ceilings.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.
 - 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.

B. Burning: Do not burn demolished materials.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 4119

SECTION 06 1000 - 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. Miscellaneous lumber.
 - 2. Plywood backing panels.
 - 3. Miscellaneous panels and sheathing.
 - 4. Wood blocking, furring, and nailers.

1.3 DEFINITIONS

- A. Dimension Lumber: Lumber of 2 inches nominal size or greater but less than 5 inches nominal size in least dimension.
- B. Timber: Lumber of 5 inches nominal size or greater in least dimension.
- C. Lumber grading agencies, and abbreviations used to reference them, include the following:
 - 1. NLGA: National Lumber Grades Authority.
 - 2. SPIB: The Southern Pine Inspection Bureau.
 - 3. WCLIB: West Coast Lumber Inspection Bureau.
 - 4. 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 data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
 - 3. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D5664.
 - 4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
 - 1. Wood-preservative-treated wood.
 - 2. Fire-retardant-treated wood.
 - 3. Post-installed 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 wood products flat with spacers beneath and between each bundle to provide air circulation. Protect wood products from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 LUMBER PRODUCTS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, comply with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Grade lumber 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. Dress lumber, S4S, unless otherwise indicated.
- B. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

2.2 SHEATHING AND PANEL PRODUCTS, GENERAL

- A. Thickness: As needed to comply with requirements specified, but not less than thickness indicated.
- B. Factory mark panels to indicate compliance with applicable standard.

2.3 WOOD-PRESERVATIVE-TREATED LUMBER

- 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. Lonza Group: www.wolmanizedwood.com.
 - 2. Hoover Treated Wood Products, Inc.: www.frtw.com.
 - 3. Koppers Performance Chemicals, Inc.: www.koppersperformancechemicals.com.
 - 4. Viance, LLC: www.treatedwood.com.
- B. Preservative Treatment by Pressure Process: AWP A U1; Use Category UC2 for interior construction not in contact with ground, Use Category UC3b for exterior construction not in contact with ground, and Use Category UC4a for items in contact with ground.
 - 1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
 - a. Inorganic boron (SBX) is prohibited.
 - 2. For exposed items indicated to receive a stained or natural finish, chemical formulations shall not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

- C. 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.
- D. Kiln-dry plywood and other wood panels after treatment to maximum moisture content of 15 percent.
- E. 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.
- F. Identify fire-retardant-treated plywood and panels with appropriate classification marking of qualified testing agency.
 - 1. For exposed plywood and other wood panels 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.
- G. Application: Treat items indicated on Drawings, and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - a. At Contractor's option, roof nailers may be non-preservative treated.
 - 2. Plywood and other wood paneling in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing
 - 3. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
 - 4. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
 - 5. Wood framing members that are less than 18 inches above the ground in crawlspaces or unexcavated areas.
 - 6. Wood floor plates that are installed over concrete slabs-on-grade.
 - 7. Other items as indicated on Drawings.

2.4 FIRE-RETARDANT-TREATED MATERIALS

- 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. Lonza Group: www.wolmanizedwood.com.
 - 2. Hoover Treated Wood Products, Inc.: www.frtw.com.
 - 3. Koppers Performance Chemicals, Inc.: www.koppersperformancechemicals.com.
 - 4. Viance, LLC: www.treatedwood.com.
- B. General: Where fire-retardant-treated materials are indicated, materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
- C. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
 - 1. Treatment shall not promote corrosion of metal fasteners.

2. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated lumber and plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.
 3. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.
- D. Kiln-dry lumber after treatment to maximum moisture content of 19 percent. Kiln-dry plywood after treatment to maximum moisture content of 15 percent.
- E. Identify fire-retardant-treated lumber with appropriate classification marking of qualified testing agency.
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 testing agency.
- F. Identify fire-retardant-treated plywood and other wood panels with appropriate classification marking of qualified testing agency.
1. For exposed plywood and other wood paneling 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 testing agency.
- G. Application: Treat items indicated on Drawings, and the following:
1. All interior rough carpentry items unless otherwise indicated.
 2. Other items as indicated on Drawings.

2.5 MISCELLANEOUS LUMBER

- A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Miscellaneous Framing, Blocking, Furring and Nailers
- B. Dimension Lumber Items:
1. Species: Provide one of the following:
 - a. Southern pine or mixed southern pine; SPIB.
 - b. Spruce-pine-fir; NLGA.
 - c. Hem-fir; WCLIB, or WWPA
 2. Grade: No. 2 or as follows:
 - a. Standard Grade, provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.
- 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.
- D. For furring strips for installing plywood or other paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

- A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

2.7 MISCELLANEOUS PANELS AND SHEATHING

- A. Plywood Concealed from View and Part of Exterior Enclosure: DOC PS 1, Exposure 1, Grade C-D
- B. Concealed Plywood at Interior Locations: DOC PS 1, Exposure 2, Grade C-D.

2.8 FASTENERS

- A. General: Fasteners shall be of size and type indicated and shall comply with requirements specified in this article for material and manufacture.
 - 1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners of Type 304 stainless steel.
- B. Nails, Brads, and Staples: ASTM F1667.
- C. Screws for Fastening Sheathing to Wood Framing: ASTM C1002.
- D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 or ICC-ES AC193 as appropriate for the substrate.
 - 1. Interior Locations: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.
 - 2. Exterior and high relative Humidity Locations: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

2.9 MISCELLANEOUS MATERIALS

- A. Construction Adhesives: Adhesives complying with ASTM C557 or ASTM D3498 and approved for use indicated by adhesive manufacturer
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Franklin International, Inc; Titebond GREENchoice Heavy Duty Construction Adhesive: www.titebond.com.
 - b. Liquid Nails, a brand of PPG Industries, Inc.; LN-903 Heavy Duty Construction Adhesive (Low VOC): www.liquidnails.com.
- B. Organic Felt: Asphalt-saturated organic felts, nonperforated and complying with the following:
 - 1. ASTM D226: Type I.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry accurately to other construction. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.
- C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels.

- D. Do not splice structural members between supports unless otherwise indicated.
- E. 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.
- F. Sort and select lumber so that natural characteristics do 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.
- G. Comply with AWP A M4 for applying field treatment to cut surfaces of preservative-treated lumber.
 - 1. Use copper naphthenate for items not continuously protected from liquid water.
- H. Where wood-preservative-treated lumber is installed adjacent to metal decking, install continuous organic felt separator between wood and metal decking.
- I. Where non-preservative treated roof nailers are installed adjacent to masonry or concrete, install continuous organic felt separator between wood and masonry or concrete.
- J. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
 - 1. Table 2304.10.1, "Fastening Schedule," in Michigan Building Code
 - 2. ICC-ES evaluation report for fastener.
- K. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.
- L. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Comply with approved fastener patterns where applicable.
 - 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 PANEL AND SHEATHING INSTALLATION, GENERAL

- A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement. Arrange joints so that pieces do not span between fewer than three support members.
- B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction unless otherwise indicated.
- C. Coordinate wall parapet and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.
- D. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

- E. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.
- F. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.
 - 1. Comply with approved fastener patterns where applicable.
 - 2. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.3 INSTALLATION OF WOOD BLOCKING AND NAILERS

- 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.

3.4 WOOD PANEL AND SHEATHING INSTALLATION

- A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Wall and Roof Sheathing:
 - a. Nail to wood framing.
 - b. Screw to cold-formed metal framing.
 - c. Space panels 1/8 inch apart at edges and ends.

END OF SECTION 06 1000

SECTION 07 8413 - FIRESTOP SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes:
 - 1. Penetrations in fire-resistance-rated walls.
 - 2. Penetrations in smoke barriers.
 - 3. Head of wall fire-resistive systems.
- B. Related Sections include the following:
 - 1. Division 20, 22 and 23 Sections specifying duct and piping penetrations.
 - 2. Division 26 Sections specifying cable and conduit penetrations.

1.3 PERFORMANCE REQUIREMENTS

- A. General: For penetrations through the following fire-rated constructions, including both empty openings and openings containing penetrating items, provide firestop systems to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-rating of construction penetrated.
 - 1. Fire-rated walls including fire walls, fire partitions, fire barriers and smoke barriers.
- B. Rated Systems: Provide firestop systems with the following ratings determined per ASTM E 814:
 - 1. F-Rated Systems: Provide firestop systems with F-ratings not less than that equaling or exceeding fire-rating of constructions penetrated.
 - 2. T-Rated Systems: Provide firestop systems with T-ratings, as well as F-ratings, where systems protect penetrating items exposed to potential contact with adjacent materials in occupiable floor areas:
 - a. Penetrations located outside wall cavities.
 - b. Penetrations located outside fire-rated shaft enclosures.
 - 3. L-Rated Systems: Where firestop systems are indicated in smoke barriers, provide firestop systems with L-ratings of not more than 3.0 cfm/sq. ft at both ambient temperatures and 400 deg F.
- C. For firestop systems exposed to view, traffic, moisture, and physical damage, provide products that, after curing, do not deteriorate when exposed to these conditions both during and after construction.
 - 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant firestop systems.
 - 2. For penetrations involving insulated piping, provide firestop systems not requiring removal of insulation.

- D. For firestop systems exposed to view, provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For each firestop system, show each type of construction penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
 - 1. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each firestop system configuration for construction and penetrating items.
 - 2. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular firestop condition, submit illustration, with modifications marked, approved by firestop system manufacturer's fire-protection engineer as an engineering judgment for equivalent fire-rated assembly.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing firestop systems similar in material, design, and extent to that indicated for this Project. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements.
- B. Fire-Test Characteristics: Provide firestop systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:
 - 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, OPL, or ITS, or another agency performing testing and follow-up inspection services for firestop systems acceptable to authorities having jurisdiction.
 - 2. Firestop systems are identical to those tested per testing standard referenced in "Part 1 Performance Requirements" Article. Provide rated systems complying with the following requirements:
 - a. Firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Firestop systems correspond to those indicated by reference to firestop system designations listed by the following:
 - 1) UL in its "Fire Resistance Directory."
 - 2) OPL in its "Directory of Listed Building Products, Materials, & Assemblies."
 - 3) ITS in its "Directory of Listed Products."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver firestop system products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, lot number, shelf life if applicable, qualified testing and inspecting agency's classification marking applicable to Project, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials for firestop systems to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

1.7 PROJECT CONDITIONS

- A. Environmental Limitations: Do not install firestop systems when ambient or substrate temperatures are outside limits permitted by firestop system manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilate firestop systems per manufacturer's written instructions by natural means or, where this is inadequate, forced-air circulation.

1.8 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that firestop systems are installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate firestop systems.
- C. Do not cover up firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide firestop systems that are produced by one of the following manufacturers:
 - 1. Hilti, Inc.
 - 2. RectorSeal Corporation (The).
 - 3. Specified Technologies Inc.
 - 4. 3M; Fire Protection Products Division.
 - 5. Tremco; Sealant/Weatherproofing Division.

2.2 FIRESTOPPING, GENERAL

- A. VOC Content: Provide firestopping that complies with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24) to meet LEED requirements:
 - 1. Architectural Sealants: 250 g/L.
 - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
 - 3. Sealant Primers for Porous Substrates: 775 g/L.
- B. Compatibility: Provide firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating firestop systems.
- C. Accessories: Provide components for each firestop system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated. Accessories include, but are not limited to, the following items:
 - 1. Permanent forming/damming/backing materials, including the following:
 - a. Slag-/rock-wool-fiber insulation.
 - b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.

- c. Fire-rated form board.
 - d. Fillers for sealants.
-
- 2. Temporary forming materials.
 - 3. Substrate primers.
 - 4. Collars.
 - 5. Steel sleeves.
 - 6. Steel retaining clips.

2.3 FILL MATERIALS

- A. General: Provide firestop systems containing the types of fill materials indicated. Fill materials are those referred to in directories of referenced testing and inspecting agencies as "fill," "void," or "cavity" materials.
- B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
 - 1. Do not use sealants that are white in color, as authorities having jurisdiction are unsure if sealants are approved firestopping or non-rated type.
- C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
- D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.
- E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
- F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
- G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
- H. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
- I. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
 - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.
 - 4. Do not use sealants that are white in color, as authorities having jurisdiction are unsure if sealants are approved firestopping or non-rated type.
- J. Spray Coatings for Head of Wall and Perimeter joints: Manufacturer's standard water based flexible spray coating that after cure do not re-emulsify during exposure to moisture.

1. Do not use spray coatings that are white in color, as authorities having jurisdiction are unsure if sealants are approved firestopping or non-rated type.

2.4 MIXING

- A. For those products requiring mixing before application, comply with firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.
 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning: Clean out openings immediately before installing firestop systems to comply with firestop system manufacturer's written instructions and with the following requirements:
 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of firestop systems.
 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestop systems. Remove loose particles remaining from cleaning operation.
 3. Remove laitance and form-release agents from concrete.
- B. Priming: Prime substrates where recommended in writing by firestop system manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestop systems from contacting adjoining surfaces that will remain exposed on completion of Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestop system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

3.3 FIRESTOP SYSTEM INSTALLATION

- A. General: Install firestop systems to comply with Part 1 "Performance Requirements" Article and with firestop system manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Install forming/damming/backing materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.

- C. Install fill materials for firestop systems by proven techniques to produce the following results:
1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 CLEANING AND PROTECTING

- A. Clean off excess fill materials adjacent to openings as Work progresses by methods and with cleaning materials that are approved in writing by firestop system manufacturers and that do not damage materials in which openings occur.
- B. Provide final protection and maintain conditions during and after installation that ensure that firestop systems are without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestop systems immediately and install new materials to produce systems complying with specified requirements.

3.5 FIRESTOP SYSTEM SCHEDULE

- A. Firestop Systems with No Penetrating Items:
1. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Mortar.
- B. Firestop Systems for Metallic Pipes, Conduit, or Tubing:
1. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Mortar.
- C. Firestop Systems for Nonmetallic Pipe, Conduit, or Tubing:
1. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Intumescent wrap strips.
 - e. Firestop device.

D. Firestop Systems for Electrical Cables:

1. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Silicone sealant.
 - c. Intumescent putty.
 - d. Silicone foam.

E. Firestop Systems for Insulated Pipes:

1. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Intumescent putty.
 - c. Silicone foam.
 - d. Intumescent wrap strips.

F. Firestop Systems for Miscellaneous Electrical Penetrants:

1. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Intumescent putty.
 - c. Mortar.

G. Firestop Systems for Miscellaneous Mechanical Penetrants:

1. Type of Fill Materials: One or both of the following:
 - a. Latex sealant.
 - b. Mortar.

H. Firestop Systems for Groupings of Penetrants:

1. Type of Fill Materials: One or more of the following:
 - a. Latex sealant.
 - b. Mortar.
 - c. Intumescent wrap strips.
 - d. Firestop device.
 - e. Intumescent composite sheet.

I. Firestop Systems for Head of Wall:

1. Type of Fill Materials: One of the following:
 - a. Latex sealant.
 - b. Spray coatings for head of wall.

END OF SECTION 07 8413

SECTION 07 9200 - 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. This Section includes:
 - 1. Silicone joint sealants.
 - 2. Latex joint sealants.
 - 3. Joint backings and accessories.
- B. Related Sections include the following:
 - 1. Section 07 8413 - Firestopping: For firestopping sealants.
 - 2. Section 09 2900 - Gypsum Board: For sealing acoustical and sound-rated walls and ceilings.

1.3 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.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency, installer, and manufacturer.
- B. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.
- C. Preconstruction Laboratory Test Schedule: Include the following information for each joint sealant and substrate material to be tested:
 - 1. Joint-sealant location and designation.
 - 2. Manufacturer and product name.
 - 3. Type of substrate material.
 - 4. Proposed test.
 - 5. Number of samples required.

- D. 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.
- E. Field-Adhesion-Test Reports: For each sealant application tested.
- F. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum 5 years documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section and with at least 5 years of documented experience.
- C. Product Testing: Test joint sealants using a qualified testing agency.
 - 1. Testing Agency Qualifications: Qualified according to ASTM C1021 to conduct the testing indicated.
- 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. In addition, provide other sealant mockups not part of an assembly specified in other Sections when requested by the Architect.
 - a. Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - b. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- E. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

1.6 PRECONSTRUCTION TESTING

- A. 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 kind of sealant and joint substrate.
 - 3. Notify Architect seven days in advance of dates and times when test joints will be erected.
 - 4. Test as follows:
 - a. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C1193 or Method A, Tail Procedure, in ASTM C1521.
 - 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.

1.7 FIELD 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: Installer agrees to repair or replace joint sealants that do not comply with installation, performance and other requirements specified in this Section within specified warranty period.
1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and manufacturing requirements specified in this Section within specified warranty period.
1. Warranty Period: Five years from date of Substantial Completion.
- C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 2. Disintegration of joint substrates from causes exceeding design specifications.
 3. Mechanical damage caused by individuals, tools, or other outside agents.
 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 JOINT SEALANTS, 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. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range, unless otherwise indicated.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide exterior joint sealants that establish and maintain watertight and airtight continuous joint seals without staining or deteriorating joint substrates.
- B. Provide joint sealants for interior applications that establish and maintain airtight and water-resistant continuous joint seals without staining or deteriorating joint substrates.

2.3 SILICONE JOINT SEALANTS

- A. Silicone, Nonstaining – JS1:
1. ASTM C920, Type S, Grade NS, Class 50; Uses NT, A, G, M and O.

2. Non-Staining: No staining of substrates when tested according to ASTM C1248.
3. Cure Type: Single-component, neutral-curing.
4. Hardness Range: Comply with one of the following:
 - a. 15 to 35, Shore A, when tested in accordance with ASTM C661.
 - b. 25 to 35, Shore A, when tested in accordance with ASTM D2240.
5. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning Corporation; Dowsil 756 SMS Building Sealant: www.dow.com.
 - b. Momentive Performance Materials, Inc./GE; SCS9000 SilPruf NB: www.siliconeforbuilding.com.
 - c. Pecora Corporation; 890NST: www.pecora.com.
 - d. Sika Corporation; Sikasil WS-295 FPS: www.usa.sika.com.
 - e. Tremco, Inc.; Spectrem 3: www.tremcosealants.com.

B. Silicone, Traffic Grade – JS2:

1. ASTM C920, Type S, Grade NS, Class 100/50; Uses T, M, and O.
2. Cure Type: Single-component, neutral-curing.
3. Hardness Range: Comply with one of the following:
 - a. 5 to 15, Shore A, when tested in accordance with ASTM C661.
 - b. 50 to 85, Shore 00, when tested in accordance with ASTM D2240.
4. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning; Dowsil NS Parking Structure Sealant: www.dow.com.
 - b. Pecora Corporation; 311NS: www.pecora.com.
 - c. Sika Corporation; Sikasil - 728 NS: www.usa.sika.com.
 - d. Tremco, Inc.; Spectrem 800: www.tremcosealants.com.

C. Silicone, Mildew-Resistant – JS4:

1. ASTM C920, Type S, Grade NS, Class 25; Uses NT, A, G, and O.
2. Mildew-Resistant: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.
3. Cure Type: Single-component, acetoxy or neutral-curing.
4. Hardness Range: Comply with one of the following:
 - a. 15 to 35, Shore A, when tested in accordance with ASTM C661.
 - b. 25 to 35, Shore A, when tested in accordance with ASTM D2240.
5. Color: Clear.
6. Products: Subject to compliance with requirements, provide one of the following:
 - a. Dow Corning; Dowsil 786 Sealant M: www.dow.com.
 - b. Momentive Performance Materials, Inc./GE; SCS1700 Sanitary: www.siliconeforbuilding.com.
 - c. Pecora Corporation; 898NST: www.pecora.com.
 - d. Sika Corporation; Sikasil - GP: www.usa.sika.com.
 - e. Tremco, Inc.; Tremsil 200 with fungicide: www.tremcosealants.com.

2.4 LATEX JOINT SEALANTS

A. Acrylic Latex – JS5:

1. Acrylic latex or siliconized acrylic latex
2. ASTM C834, Type OP, Grade NF or Minus 18 Degrees C (0 Degrees F).
3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc.; PWC; www.bostik.com.
 - b. Franklin International Inc; Titebond Painter's Plus Caulk: www.titebond.com.
 - c. Pecora Corporation; AC-20 +Silicone: www.pecora.com.
 - d. Sherwin Williams; 950A Siliconized Acrylic Latex Caulk: www.sherwin-williams.com.
 - e. Tremco, Inc.; Tremflex 834: www.tremcosealants.com.

B. Acrylic Latex, Acoustical Sealant – JS6:

1. Nonsag, paintable, nonstaining latex sealant. Reduces airborne sound transmission through perimeter joints and openings in wall assemblies.
2. ASTM C834
3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Franklin International Inc; Titebond GreenChoice Professional Acoustical Smoke & Sound Sealant: www.titebond.com.
 - b. PPG Architectural Coatings; Liquid Nails AS-825 Acoustical Sound Sealant: www.liquidnails.com.
 - c. Pecora Corporation; AC-20 FTR: www.pecora.com.
 - d. Pecora Corporation; AIS-919: www.pecora.com.
 - e. United States Gypsum Co.; USG Sheetrock Brand Firecode Smoke-Sound Sealant: www.usg.com.
 - f. United States Gypsum Co.; USG Sheetrock Brand Acoustical Sealant: www.usg.com.

2.5 JOINT-SEALANT BACKING

- A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings (Backer Rod): ASTM C1330, Type C (closed-cell material with a surface skin) or Type B (bicellular material with a surface skin) as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.6 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting performance of the Work.
- 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, but are not limited to, the following:
 - a. Concrete.
 - b. Masonry.
 - 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, but are not limited to, 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 C1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Cast-in-place Concrete:
 - 1. Defer joint filling until concrete has aged at least one month(s).

2. Do not fill joints until construction traffic has permanently ceased.
- D. 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.
- E. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- F. 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.
- G. 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 C1193 unless otherwise indicated or recommended by sealant manufacturer.
 - a. Use masking tape to protect surfaces adjacent to tooled joints.

3.4 CLEANING

- A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.5 PROTECTION

- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

- A. Horizontal Traffic Surfaces:
 1. Interior Joints:
 - a. Joint Sealant: Silicone, Traffic-Grade – JS2.

B. Vertical and Horizontal Nontraffic Surfaces:

1. Exterior Joints:

- a. Joint Sealant: Silicone, Nonstaining – JS1.

2. Interior Joints:

- a. Latex Joint Sealant: Acrylic Latex – JS5.

- 1) Joint Locations: All locations except as follows:

- a) Tile joints; refer to Section 09 3000 Tiling, for nontraffic tile sealant.
 - b) Locations where silicone, nonstaining sealants are specified.
 - c) Locations where mildew-resistant silicone sealants are specified.
 - d) Locations where acoustic sealants are specified.

- b. Silicone Joint Sealant: Silicone, Nonstaining – JS1.

- 1) Joint Locations:

- a) Other joints as indicated on Drawings.

- c. Mildew-Resistant Joint Sealant: Silicone, Mildew-Resistant – JS4

- 1) Joint Locations:

- a) Joints between plumbing fixtures and adjoining walls, floors, and counters.
 - b) Joints between countertops and walls
 - c) Other joints as indicated on Drawings.

- d. Acoustical Joint Sealant: Acrylic Latex, Acoustical Sealant – JS6

- 1) Joint Locations:

- a) Gypsum board assemblies; refer to Section 09 2900 Gypsum Board.
 - b) Acoustical panel ceilings; refer to Section 09 5113 Acoustical Panel Ceilings.
 - c) Other joints as indicated on Drawings.

END OF SECTION 07 9200

SECTION 08 1113 – 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 other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Frame filler plates for existing hollow metal frames.

1.3 DEFINITIONS

- A. Minimum Thickness: Minimum thickness of base metal without coatings according to NAAMM-HMMA 803 or ANSI/SDI A250.8.

1.4 COORDINATION

- A. Coordinate requirements for installation of door hardware, electrified door hardware, and access control and security systems.

1.5 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, temperature-rise ratings, and finishes.

1.7 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and installer.

1.8 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of door numbers and applicable room name and number to which door accesses.

1.9 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 5 years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years of documented experience.

PART 2 - PRODUCTS

2.1 FILLER PLATES FOR EXISTING FRAMES

- A. Provide steel plate with pre-drilled fastener holes for infilling hinge and strike plate mortises at existing hollow metal door frames to remain.
 - 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. Basis-of-Design Product for Hinge Plate: Rockwood DFF4 by Assa Abloy.
 - b. Basis-of-Design Product for Strike Plate: Rockwood SF160 by Assa Abloy.
- B. Contractor to verify size and condition of existing hinge and strike mortises in frame and provide product sized for correct fit.

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. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install filler plates properly aligned and securely fastened in place. Comply with manufacturer's written instructions.
 - 1. Existing hollow metal frames: Secure filler plates in place with manufacturer provided fasteners. Countersink fasteners, and fill and make smooth, flush, and invisible on exposed faces.

3.3 REPAIR

- A. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 1113

SECTION 08 3113 – 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 other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Access doors and frames.

1.3 DEFINITIONS

- A. Wet Areas: Includes the following:
 - 1. Exterior locations.
 - 2. Showers.
 - 3. Other areas as indicated.
- B. Non-Wet Areas: Areas not defined as wet areas; including, but not limited to, the following:
 - 1. Kitchens.
 - 2. Locker rooms.
 - 3. Toilet rooms.
 - 4. Janitor closets.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, fire ratings, material descriptions, dimensions of individual components and profiles, and finishes.
- B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
- C. Samples: For each type of access door and frame and for each finish specified, complete assembly minimum 6 by 6 inches in size.
- D. Product Schedule: For access doors and frames.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and installer.

1.6 CLOSEOUT SUBMITTALS

- A. Record Documents: For fire-rated doors, list of applicable room name and number in which access door is located.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 5 years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years of documented experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Acudor; www.acudor.com.
 - 2. Babcock-Davis; www.babcockdavis.com.
 - 3. JL Industries/Activar Construction Products Group, Inc; www.activarcpg.com/jl-industries.
 - 4. Karp Associates, Inc; www.karpinc.com.
 - 5. Larsen's Manufacturing Company; www.larsenmfg.com.
 - 6. Milcor / Hart & Cooley Inc; www.milcorinc.com.
 - 7. MIFAB, Inc.; www.mifab.com.
 - 8. Nystrom; www.nystrom.com.

2.2 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Access Doors and Frames: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection and temperature-rise limit ratings indicated, according to NFPA 252 or UL 10B.

2.3 MATERIALS

- A. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A879, with cold-rolled steel sheet substrate complying with ASTM A1008, Commercial Steel (CS), exposed.
- B. Metallic-Coated Steel Sheet: ASTM A653, Commercial Steel (CS), Type B; with minimum G60 or A60 metallic coating.
- C. Frame Anchors: Same material as door face.
- D. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153 or ASTM F2329.

2.4 ACCESS DOORS AND FRAMES

- A. Flush Access Doors with Exposed Flanges:
 - 1. Locations: Masonry.
 - 2. Description: Face of door flush with frame, with exposed flange and concealed hinge.
 - 3. Door Size: As indicated on Drawings; otherwise provide in size as required for proper access of items behind access door.
 - 4. Door Material:
 - a. Dry Areas:
 - 1) Uncoated Steel Sheet for Door: Nominal 0.060 inch (16 gage), factory primed.

- b. Wet Areas:
 - 1) Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch (16 gage), factory primed.
- 5. Frame Material: Same material, thickness, and finish as door.
- 6. Hardware:
 - a. Hinge: Concealed, spring type.
 - b. Latch and Lock: Cylinder lock-operated cam latch, two keys for each unit.
- B. Flush Access Doors with Concealed Flanges:
 - 1. Locations: Gypsum board.
 - 2. Description: Face of door flush with frame; with concealed flange for gypsum board installation and concealed hinge.
 - 3. Door Size: As indicated on Drawings; otherwise provide in size as required for proper access of items behind access door.
 - 4. Door Material:
 - a. Dry Areas:
 - 1) Uncoated Steel Sheet for Door: Nominal 0.060 inch (16 gage), factory primed.
 - b. Wet Areas:
 - 1) Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch (16 gage), factory primed.
 - 5. Frame Material: Same material and thickness as door.
 - 6. Hardware:
 - a. Hinge: Concealed, spring type.
 - b. Latch and Lock: Cylinder lock-operated cam latch, two keys for each unit.

2.5 FIRE-RATED ACCESS DOORS AND FRAMES

- A. Fire-Rated, Flush, Uninsulated, Access Doors with Exposed Flanges:
 - 1. Locations: Masonry.
 - 2. Description: Face of door flush with frame, uninsulated, with exposed flange and self-closing door.
 - 3. Fire-Rating: Not less than that of adjacent construction.
 - 4. Door Size: As indicated on Drawings; otherwise provide in size as required for proper access of items behind access door.
 - 5. Door Material:
 - a. Dry Areas:
 - 1) Uncoated Steel Sheet for Door: Nominal 0.060 inch (16 gage), factory primed.
 - b. Wet Areas:
 - 1) Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch (16 gage), factory primed.
 - 6. Frame Material: Same material, thickness, and finish as door.
 - 7. Hardware: Automatic closing, self-latching, with interior latch release.
 - a. Hinges: Exposed, continuous piano hinge.
 - b. Latch/Lock: Cylinder lock-operated cam latch, two keys for each unit.

B. Fire-Rated, Flush, Uninsulated, Access Doors with Concealed Flanges:

1. Locations: Gypsum board.
2. Description: Face of door flush with frame, uninsulated, with concealed flange for gypsum board installation and self-closing door.
3. Fire-Rating: Not less than that of adjacent construction.
4. Door Size: As indicated on Drawings; otherwise provide in size as required for proper access of items behind access door.
5. Door Material:
 - a. Dry Areas:
 - 1) Uncoated Steel Sheet for Door: Nominal 0.060 inch (16 gage), factory primed.
 - b. Wet Areas:
 - 1) Metallic-Coated Steel Sheet for Door: Nominal 0.064 inch (16 gage), factory primed.
6. Frame Material: Same material and thickness as door.
7. Hardware: Automatic closing, self-latching, with interior latch release.
 - a. Hinges: Exposed, continuous piano hinge.
 - b. Latch/Lock: Cylinder lock-operated cam latch, two keys for each unit.

2.6 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 mounting holes, 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 panels securely attached to perimeter of frames.
- D. Latch and Lock Hardware:
 1. Quantity: Furnish number of latches and locks required to hold doors tightly closed.
 2. Keys: Furnish two keys per lock and key all locks alike.

2.7 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.

- D. Painted Finishes: Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 - 1. Factory Primed: Apply manufacturer's standard, lead- and chromate-free, universal primer immediately after surface preparation and pretreatment.

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. Set frames accurately in position and attach securely to supports.
- C. Ensure that flush panel door faces align with adjacent finish surfaces.

3.3 ADJUSTING

- A. Adjust doors and hardware, after installation, for proper operation.

END OF SECTION 08 3113

SECTION 09 2216 - 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 other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section includes:
 - 1. Non-load-bearing steel framing systems for interior partitions, ceilings, and soffits.
 - 2. Suspension systems for interior ceilings and soffits.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Indicate component details, stud layout, framed openings, anchorage to structure, acoustic details, type and location of fasteners, accessories and items of other related work.
 - 2. Describe method for securing studs to tracks, splicing, and for blocking and reinforcement of framing connections.

1.4 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Qualification Statement.
- B. Installer's Qualification Statement.
- C. Evaluation Reports: For firestop tracks, post-installed anchors, and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
 - 1. ClarkDietrich Building Systems: www.clarkdietrich.com.
 - 2. Jaimes Industries Inc.: www.jaimesind.com.
 - 3. MarinoWARE: www.marinoware.com.
 - 4. MBA Building Supplies, Inc.: www.mbastuds.com.
 - 5. MRI Steel Framing LLC: www.mristeel framing.com.
 - 6. State Building Products; www.statebp.com.
 - 7. Telling Industries; www.buildstrong.com.

2.2 PERFORMANCE REQUIREMENTS

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Protective Coatings: Equivalent (EQ) coatings are not acceptable; products shall be hot-dip galvanized as indicated.
- C. Embossed (equivalent thickness) steel framing products are not acceptable; products shall be in steel thicknesses indicated.
- D. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E119 by an independent testing agency.
- E. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated on Drawings, according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
- F. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.
 - 1. Exception: Limit deflection of walls to receive hard tile surfaces to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft.

2.3 FRAMING SYSTEMS

- A. Framing Members, General: Comply with ASTM C754 for conditions indicated.
 - 1. Steel Sheet Components: Comply with ASTM C645 requirements for steel unless otherwise indicated.
 - 2. Protective Coating: ASTM A653, G40 (Z120), hot-dip galvanized unless otherwise indicated.
- B. Studs and Tracks: ASTM C645.
 - 1. Steel Studs and Tracks:
 - a. Minimum Base-Steel Thickness: 0.033 inch (20 gage).
 - b. Depth: As indicated on Drawings.
- C. Slotted Deflection Track: Provide galvanized sheet steel track with slotted holes in flanges for mechanical anchorage of studs that accommodate deflection; provide screws and anti-friction bushings.
 - 1. Comply with the following:
 - a. Provide at partition heads to structure connections, where indicated on Drawings, and elsewhere as required to accommodate axial deflection.
 - b. Shall prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above
 - c. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
 - d. Comply with ASTM C645 and ASTM C754.
 - e. Protective Coating: ASTM A653/A653M, G40, hot-dip galvanized.
 - f. Minimum Metal Thickness: Same material thickness as studs.
 - g. Track Depth: Matching studs.
 - h. Provide components UL-listed for use in UL-listed fire-rated head of partition joint systems indicated on drawings.

- D. At Contractor's option, the following products may be used instead of traditional framing and firestopping:
1. General: Provide components UL-listed for use in head of partitions and joint systems and as indicated on drawings.
 2. Slotted Deflection and Firestop Track: Galvanized sheet steel track with slotted holes in flanges for mechanical anchorage of studs that accommodate deflection; provide screws and anti-friction bushings. Includes intumescent strip factory-applied to track flanges or web that expands when exposed to heat or flames to provide a perimeter joint seal.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ClarkDietrich Building Systems; BlazeFrame (DSL 2): www.clarkdietrich.com.
 - 2) MarinoWARE; FAS Track 1000: www.marinoware.com.
 3. Firestop Track: Galvanized sheet steel track with intumescent strip factory-applied to track flanges or web that expands when exposed to heat or flames to provide a perimeter joint seal.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ClarkDietrich Building Systems; BlazeFrame (DL2): www.clarkdietrich.com.
 4. Preformed Top Track Firestop Seal: Pre-formed firestop device field-applied to head of top track that expands when exposed to heat or flames to provide a perimeter joint seal.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) Hilti, Inc; Top Track Seal CFS TTS: www.us.hilti.com.
- E. Cold-Rolled Channel Bridging: 0.054 inch thick (16 gage), galvanized minimum base-steel thickness, with minimum 1/2-inch-wide flanges.
1. Depth: 1-1/2 inches.
 2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.064-inch (16 gage) thick, galvanized steel.
 3. At Contractor's option, the following products may be used instead of traditional clip angles:
 - a. Rapid Clips: Friction fit clip design allowing for rapid installation of channel bridging.
 - 1) Minimum Base-Steel Thickness: 0.043 inch (18 gage).
 - 2) Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a) ClarkDietrich Building Systems; Fastbridge Clip: www.clarkdietrich.com.
- F. Hat-Shaped, Rigid Furring Channels: Galvanized steel sheet members.
1. Minimum Base-Steel Thickness: 0.033 inch (20 gage).
 2. Depth: 7/8 inch, unless otherwise indicated on Drawings.
- G. Resilient Furring Channels: ASTM C645; 1/2-inch-deep, galvanized steel sheet members designed to reduce sound transmission.
1. Minimum Base-Steel Thickness: 0.0232 inch (24 gage).
 2. Configuration: Asymmetrical.

- H. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.
1. Minimum Base-Steel Thickness: 0.054 inch thick (16 gage), galvanized.
 2. At Contractor's option, the following products may be used instead of traditional flat strap and backing plates:
 - a. Flexible Wood Backing: Fire-retardant treated wood with sheet steel connectors.
 - 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) ClarkDietrich Building Systems; Danback Flexible Wood Backing System: www.clarkdietrich.com.
 - b) The Steel Network, Inc; BackIt: www.SteelNetwork.com.

2.4 SUSPENSION SYSTEMS

- A. Tie Wire: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
- B. Hanger Attachments to Concrete:
1. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01, AC193, AC58, or AC308 as appropriate for the substrate.
 - a. Uses: Securing hangers to structure.
 - b. Material for Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
 - c. Material for Exterior or Interior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 (A1) stainless-steel bolts, ASTM F593, and nuts, ASTM F594.
- C. Wire Hangers: ASTM A641/A641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
- D. Carrying Channels (Main Runners): Cold-rolled, commercial-steel sheet with a base-steel thickness of 0.033 inch (20 gage) and minimum 1/2-inch-wide flanges.
1. Depth: 2 inches, unless otherwise indicated on Drawings.
- E. Furring Channels (Furring Members):
1. Hat-Shaped, Rigid Furring Channels: ASTM C645; galvanized steel sheet members.
 - a. Minimum Base-Steel Thickness: 0.033inch (20 gage).
 - b. Depth: 7/8 inch, unless otherwise indicated on Drawings.
 2. Resilient Furring Channels: ASTM C645; 1/2-inch-deep, galvanized steel sheet members designed to reduce sound transmission.
 - a. Minimum Base-Steel Thickness: 0.0232 inch (24 gage).
 - b. Configuration: Asymmetrical.
- F. Grid Suspension System for Gypsum Board Ceilings: ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.
1. At Contractor's option provide grid suspension system instead of traditional carrying and furring channels.
 2. Not permitted for multi-layer gypsum board systems.

3. Manufacturers: Subject to compliance with requirements, provide one of the following products:
 - a. Armstrong World Industries, Inc.; Drywall Grid System: www.armstrongceilings.com.
 - b. CertainTeed/Saint-Gobain; Quickspan Locking Drywall Grid System: www.certainteed.com.
 - c. Rockfon, Part of the Rockwool Group; Chicago Metallic Drywall Grid: www.rockfon.com.
 - d. USG Corporation: Drywall Suspension System: www.usg.com

2.5 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards.
 1. Fasteners for Steel Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.
- B. Neoprene Closure Strips: ASTM D1056, Type 2 (Closed Cell), Class C (neoprene), Grade 2 (5 to 9 psi for 25 percent compression).
 1. Color: Black.
 2. Thickness: 1/2 inch thick, unless otherwise required.
 3. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Williams Products, Inc.; 1040 Series, Type NN1; www.williamsproducts.net.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination with Sprayed Fire-Resistive Materials:
 1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling 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 are required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 INSTALLATION, GENERAL

- A. Installation Standard: ASTM C754.
 1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.
- B. Install framing, suspension systems and other related accessories and components in accordance with manufacturer's instructions.
- C. Install framing and accessories plumb, square, and true to line, with connections securely fastened.

- D. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.
- E. Install bracing at terminations in assemblies.
- F. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING FRAMED ASSEMBLIES

- A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Install studs at 16 inches o.c. unless otherwise indicated or required by horizontal deflection performance requirements.
- B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.
- C. Where stud tracks are installed directly against overhead decking, install closure strip between track and decking.
- D. Install studs so flanges within framing system point in same direction.
- E. Install tracks 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 that penetrate partitions above ceiling.
 - 1. Slotted Deflection Tracks: Where framing extends to overhead structural supports, install slotted deflection tracks to produce joints at tops of framing systems that prevent axial loading of finished assemblies.
 - 2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install 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 through suspended ceilings 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.
 - 5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.
- F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING CEILING SUSPENSION SYSTEMS

- A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
 - 1. Hangers: 48 inches o.c.

2. Carrying Channels (Main Runners): 48 inches o.c.
 3. Furring Channels (Furring Members): 16 inches o.c.
- B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
- C. Suspend hangers from building structure as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
 - a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
 2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
 - a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
 3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
 4. 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. Lateral/Seismic Bracing: Sway-brace suspension systems with hangers used for support.
- F. 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.
- G. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 09 2116

SECTION 09 2900 – 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. Gypsum board.
 - 2. Tile backing panels.
 - 3. Finishing materials.
 - 4. Trim accessories.
 - 5. Acoustic insulation.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Indicate special details associated with fireproofing and acoustic seals.
 - 1. Include locations of control joints.
- C. Samples: For the following products:
 - 1. Submit three samples of each board type, 4 inches square in size
 - 2. Trim Accessories: Submit three samples of each type of trim, full-size in 4-inch-long lengths.

1.4 INFORMATIONAL SUBMITTALS

- A. Manufacturer's Qualification Statement.
- B. Installer's Qualification Statement.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least five years of documented experience.
- B. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.
- C. Mockups: Build mockups of at least 100 sq. ft. in surface area to demonstrate aesthetic effects and to set quality standards for materials and execution.
 - 1. Build mockups for the following:
 - a. Each level of gypsum board finish indicated for use in exposed locations.
 - 2. Apply or install final decoration indicated, including painting and wallcoverings, on exposed surfaces for review of mockups.

3. Simulate finished lighting conditions for review of mockups.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 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.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written instructions, whichever are more stringent.
- B. Do not install interior gypsum panels until installation areas are enclosed and conditioned.
- C. Do not install 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.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Provide completed assemblies complying with ASTM C840 and GA-216.
- B. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.
- C. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.
- D. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 5 lbf/sq. ft.
 1. Exception: Limit deflection of walls to receive hard tile surfaces to 1/360 of the wall height based on horizontal loading of 5 lbf/sq. ft.

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 GYPSUM BOARD

- A. Gypsum Board, Type X: Paper-faced gypsum panels with fire-resistant core; ASTM C1396.
 1. Thickness: 5/8 inch.
 2. Long Edges: Tapered with paper face wrapping edge.
 3. Short Edges: Square cut.
 4. Type: Fire resistance rated Type X, UL or WH listed.

5. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; Type X Gypsum Board: www.certainteed.com.
 - b. Georgia-Pacific Gypsum; ToughRock Fireguard X: www.gp.com.
 - c. National Gypsum Company; Gold Bond Brand Fire-Shield Gypsum Board: www.nationalgypsum.com.
 - d. USG Corporation; Sheetrock Brand Firecode X Panels: www.usg.com.
- B. Mold Resistant Gypsum Board, Type X: Paper-faced, mold and moisture resistant, gypsum panels; with fire-resistant core ASTM C1396.
 1. Thickness: 5/8 inch.
 2. Long Edges: Tapered with paper face wrapping edge.
 3. Short Edges: Square cut.
 4. Type: Fire resistance rated Type X, UL or WH listed.
 5. Mold Resistance: Score of 10 when tested in accordance with ASTM D3273.
 6. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; M2Tech Type X Gypsum Board: www.certainteed.com.
 - b. Georgia-Pacific Gypsum; ToughRock Fireguard X Mold-Guard Gypsum Board: www.gp.com.
 - c. National Gypsum Company; Gold Bond Brand XP Fire-Shield Gypsum Board: www.nationalgypsum.com.
 - d. USG Corporation; Sheetrock Brand Mold Tough Panels Firecode X: www.usg.com.
- C. Lightweight Gypsum Wallboard, Type X: Paper-faced lightweight gypsum panels with fire-resistant core; ASTM C1396.
 1. May be used at Contractor's option instead of gypsum board, Type X.
 2. Thickness: 5/8 inch.
 3. Long Edges: Tapered with paper face wrapping edge.
 4. Short Edges: Square cut.
 5. Type: Fire resistance rated Type X, UL or WH listed.
 6. Maximum Weight: 2 psf.
 7. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; www.certainteed.com.
 - b. Georgia-Pacific Gypsum; ToughRock Lite-Weight Fire-Rated Gypsum Board: www.gp.com.
 - c. National Gypsum Company; Gold Bond Brand High Strength Fire-Shield Lite Gypsum Board: www.nationalgypsum.com.
 - d. USG Corporation; Sheetrock Brand UltraLight Firecode X Panels: www.usg.com.
- D. Impact Resistant Gypsum Board: Heavy paper-faced mold and moisture resistant gypsum panels with fire-resistant core; ASTM C1396.
 1. Thickness: 5/8 inch.
 2. Long Edges: Tapered with paper face wrapping edge.
 3. Short Edges: Square cut.
 4. Type: Fire resistance rated Type X, UL or WH listed.
 5. Mold Resistance: Score of 10 when tested in accordance with ASTM D3273.
 6. Surface Abrasion: Level 2, minimum, when tested in accordance with ASTM C1629.
 7. Indentation: Level 1, minimum, when tested in accordance with ASTM C1629.
 8. Soft Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629.
 9. Hard Body Impact: Level 3, minimum, when tested in accordance with ASTM C1629.
 10. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; Extreme Impact Resistant Gypsum Board: www.certainteed.com.

- b. National Gypsum Company; Gold Bond Brand Hi-Impact XP Gypsum Board: www.nationalgypsum.com.
- c. USG Corporation; Sheetrock Brand Mold Tough VHI Firecode X Panels: www.usg.com.

2.4 TILE BACKING PANELS

- A. Cementitious Backing Panel: ANSI A118.9 and ASTM C1288 or ASTM C1325, with manufacturer's standard edges.
 - 1. Thickness: 5/8 inch.
 - 2. Flame Spread/Smoke Developed: 0/0 per ASTM E84.
 - 3. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
 - 4. Locations: Wet areas and elsewhere as indicated on Drawings; including, but not limited to, the following:
 - a. Showers.
 - b. Natatorium areas.
 - 5. Products: Subject to compliance with requirements, provide one of the following:
 - a. National Gypsum Company; PermaBase Brand Cement Board: www.nationalgypsum.com.
 - b. USG Corporation; Durock Brand Cement Board: www.usg.com.

2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C1047.
 - 1. Manufacturers: Subject to compliance with requirements, available manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:
 - a. ClarkDietrich Building Systems: www.clarkdietrich.com.
 - b. Marino\WARE: www.marinoware.com.
 - c. Telling Industries; www.buildstrong.com.
 - d. Phillips Manufacturing Co: www.phillipsmfg.com.
 - e. USG Corporation: www.usg.com.
 - 2. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, or paper-faced galvanized-steel sheet.
 - a. At Contractor's option, for Cornerbeads (inside and outside corners), L-Beads, and Arches (curved edges):
 - 1) Material: Impact-resistant composite corner beads consisting of copolymer core, joint tape backing, and surface paper face.
 - 2) Products: Subject to compliance with requirements, provide the following:
 - a) CertainTeed Corp.; No-Coat Drywall Corner: www.certainteed.com.
 - 3. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. L-Bead: L-shaped; exposed long flange receives joint compound.
 - d. Expansion (control) joint.

4. For Cornerbeads (inside and outside corners), L-Beads, and Arches (curved edges):
 - a. Material: Impact-resistant composite corner beads consisting of copolymer core, joint tape backing, and surface paper face.
 - b. Products: Subject to compliance with requirements, provide the following:
 - 1) CertainTeed Corp.; No-Coat Drywall Corner: www.certainteed.com.
5. For LC-Bead (J-shaped) and Expansion (control) Joints:
 - a. Material: Paper-faced galvanized-steel sheet.
 - b. Manufacturers: Subject to compliance with requirements, available manufacturers with products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) ClarkDietrich Building Systems: www.clarkdietrich.com.
 - 2) Marino\WARE: www.marinoware.com.
 - 3) Telling Industries; www.buildstrong.com.
 - 4) Phillips Manufacturing Co: www.phillipsmfg.com.
 - 5) USG Corporation: www.usg.com.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

1. Manufacturers: Subject to compliance with requirements, provide products from one of the following
 - a. Fry Reglet Corp.; www.fryreglet.com.
 - b. Gordon, Inc.; www.gordon-inc.com.
 - c. Pittcon Industries; www.pittconindustries.com.
2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B221, Alloy 6063-T5.
3. Shapes and Profiles: As indicated on Drawings, including, but not limited to, the following:
 - a. Reveals: Equal to Fry Reglet Model DRM-625-625.
 - 1) Reveal Size: 5/8 inch wide by 5/8 inch deep
 - b. F-Reveals: Equal to Fry Reglet Model DRMF-625-625.
 - 1) Reveal Size: 5/8 inch wide by 5/8 inch deep
 - c. Wall End Caps: Equal to Fry Reglet DMEC Series.
 - 1) Size to match wall construction.
4. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.

2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C475/C475M.
- B. Joint Tape: Paper, 2 inches wide, creased for joints and corners.
 1. Exception: At tile backing panels use fiberglass tape; coated 10-by-10 glass mesh.
 2. Manufacturers: Subject to compliance with requirements, provide products from one of the specified gypsum wall board manufacturers.

- C. Joint Compound for Interior Applications: For each coat, use formulation that is compatible with other compounds applied on previous or for successive coats.
1. Prefilling: At open joints 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 setting-type taping compound or drying-type, all-purpose compound.
 - a. Use setting-type compound for installing paper-faced metal trim accessories.
 3. Fill Coat: For second coat, use setting-type, sandable topping compound or drying-type, all-purpose compound.
 4. Finish Coat: For third coat, use setting-type, sandable topping compound or drying-type, all-purpose compound.
 5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound or drying-type, all-purpose compound.
 - a. Contractor's option high-build drywall surfacer may be used instead of traditional trowel-applied Level 5 skim-coating process.
 - 1) High Build Drywall Surfer: Vinyl acrylic latex-based coating for spray application, designed to take the place of skim coating and separate paint primer in achieving Level 5 finish.
 - 2) Products: Subject to compliance with requirements, provide one of the following:
 - a) CertainTeed Corp.; Level V Wall and Ceiling Primer/Surfer with M2Tech: www.certainteed.com
 - b) USG Corporation; Tuff-Hide Primer-Surfer: www.usg.com.
- D. Joint Compound for Tile Backing Panels:
1. Cementitious Backing Panel: As recommended by backer unit manufacturer.

2.7 AUXILIARY MATERIALS

- A. Provide auxiliary materials that comply with referenced installation standards and manufacturer's written instructions.
- B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
1. Adhesives: Subject to compliance with requirements, provide one of the following
 - a. Franklin International, Inc; Titebond GREENchoice Professional Drywall Adhesive; www.titebond.com.
 - b. PPG Architectural Coatings; Liquid Nails DWP-24 Drywall Construction Adhesive: www.liquidnails.com.
- C. Steel Drill Screws: ASTM C1002 unless otherwise indicated.
1. Use screws complying with ASTM C954 for fastening panels to steel members (cold-formed metal framing) from 0.033 to 0.112 inch thick.
 2. For fastening cementitious backing panels, use screws of type and size recommended by panel manufacturer.
- D. Sound-Attenuation Blankets: Produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
2. Acoustic Insulation: Provide one of the following types:
 - a. Mineral Fiber/Rock Wool Batts: ASTM C665; preformed mineral fiber, friction fit type, unfaced.
 - 1) Thickness: 3 inches, unless otherwise indicated.
 - 2) Density: 2.5 pcf.
 - 3) Flame Spread/Smoke Developed: 0/0 per ASTM E84.
 - 4) Products: Subject to compliance with requirements, provide one of the following:
 - a) Johns Manville; Mineral Wool Sound Attenuation Fire Batts (SAFB): www.jm.com.
 - b) Owens Corning; Thermafiber SAFB (Sound Attenuation Fire Batts): www.owenscorning.com.
 - c) Rockwool; Safe'n'Sound: www.rockwool.com.
 - b. Fiberglass Batts: ASTM C665; preformed glass fiber, friction fit type, unfaced.
 - 1) Thickness: 3-1/2 inches, unless otherwise indicated.
 - 2) Products: Subject to compliance with requirements, provide one of the following:
 - a) CertainTeed Corporation/Saint-Gobain; NoiseReducer Sound Attenuation Batts: www.certainteed.com.
 - b) Johns Manville; Formaldehyde-Free Fiberglass Insulation: www.jm.com.
 - c) Knauf Insulation; EcoBatt Insulation with ECOSE Technology: www.knaufinsulation.com.
 - d) Owens Corning Corporation; EcoTouch Sound Attenuation Batts: www.owenscorning.com.
- E. Acoustical Sealant: As specified in Section 07 9200 – Joint Sealants.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and substrates including welded hollow-metal frames and support framing, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.
- 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 INSTALLATION AND FINISHING OF PANELS, GENERAL

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions.
- 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. 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. STC-Rated Assemblies: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written instructions for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.
- J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 INSTALLATION OF 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) unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
 - a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
 - b. At stairwells and other high walls, install panels horizontally unless otherwise indicated or required by fire-resistance-rated assembly.
 - 3. On Z-shaped 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 (400 mm) 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-shaped 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.
- C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written instructions and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 INSTALLATION OF TILE BACKING PANELS

- A. Cementitious Backer Units: Comply with ANSI A108.11.
- B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLATION OF 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 C840 and in specific locations approved by Architect for visual effect. Place control joints consistent with lines of building spaces and as follows:
 1. Not more than 30 feet apart on walls and ceilings, unless otherwise indicated.
 2. Submit control joint locations to Architect for approval prior to installation.
- C. Interior Trim: Install in the following locations:
 1. Cornerbead: Use at outside corners.
 2. L-Bead: Use at exposed panel edges except where Drawings indicate LC-Beads.
 3. Arches: Use at curved openings.
- D. Aluminum Trim: Install in locations indicated on Drawings and as follows:
 1. Wall End Caps: Provide at all exposed ends of wall assemblies not covered in wallboard and at locations of partition closures.
 2. Use longest practical lengths.

3.6 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 C840:
 1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.

- a. Exception: Fire-Rated Construction shall comply with requirements of assembly listing
- 2. Level 2: In utility areas, behind cabinetry, and in similar locations that shall not be painted or finished, and at tile backing board to receive tile finish.
- 3. Level 4: At areas that will be exposed to view; unless otherwise indicated.
- 4. Level 5: Where indicated on Drawings including, but not limited to, the following:
 - a. Dry erase coatings; refer to Section 09 9100 – Painting.
- E. Cementitious Backing Panels: Finish according to manufacturer's written instructions.

3.7 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.

3.8 FIELD QUALITY CONTROL

- A. Above-Ceiling Observation: Before Contractor installs gypsum board ceilings, Architect will conduct an above-ceiling observation and report deficiencies in the Work observed. Do not proceed with installation of gypsum board until deficiencies have been corrected.
 - 1. Notify Architect seven days in advance of date and time when Project, or part of Project, will be ready for above-ceiling observation.
 - 2. Before notifying Architect, complete the following in areas to receive gypsum board ceilings:
 - a. Installation of 80 percent of lighting fixtures, powered for operation.
 - b. Installation, insulation, and leak and pressure testing of water piping systems.
 - c. Installation of air-duct systems.
 - d. Installation of air devices.
 - e. Installation of mechanical system control wiring.
 - f. Installation of ceiling support framing.

END OF SECTION 09 2900

SECTION 09 3000 – TILING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. Hard tile.
 - 2. Stone thresholds.
 - 3. Setting materials.
 - 4. Waterproofing and crack isolation membranes.
 - 5. Metal trim.

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 its "Specifications for Installation of Ceramic Tile."
- C. Large Format Tile: Tiles that have at least one side greater than 15 inches long but are not as large as tile panels/slabs.
- D. LHT: Large and heavy tile.

1.4 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at Project site.
 - 1. Review requirements in ANSI A108.01 for substrates and for preparation by other trades.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- 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. Include:
 - a. TCNA installation methods.
 - b. Locations of waterproofing and crack isolation membranes.
 - c. Locations and profiles of metal trim.
- C. Samples for Initial Selection: For tile, grout, and accessories involving color selection.
- D. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
 - a. For sheet-mounted tile, provide full size sheet.
2. Full-size units of each type of trim and accessory for each color and finish required.
3. Thresholds in 6-inch lengths for each profile, color and finish required.
4. Metal trim in 6-inch lengths for each profile, color and finish required.

E. Product Schedule: For tile. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and installer.
- B. Product Certificates: For each type of product.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Tile and Trim Units: Furnish quantity of full-size units equal to 2 percent of amount installed for each type, composition, color, pattern, and size indicated but not less than 1 box.
 2. Grout: Furnish quantity of grout equal to 2 percent of amount installed for each type, composition, and color indicated.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 5 years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years of documented experience, and as follows:
 1. Installer employs only Ceramic Tile Education Foundation Certified Installers.
 2. Installer employs at least one installer for Project that has completed the Advanced Certification for Tile Installers (ACT) certification for installation of mud floors, membranes, shower receptors, and large format tile.
- C. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Build mockup of each type of floor tile installation.
 2. Build mockup of each type of wall tile installation.
 3. Mockup sizes shall be sized as appropriate to demonstrate complete tile pattern layout; 16 square feet, minimum
 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.9 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.

1.10 FIELD 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 MANUFACTURERS

- A. Source Limitations for Tile: Obtain tile of each type and color or finish from single source or producer.
 - 1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.
- B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from single manufacturer and each aggregate from single source or producer.
 - 1. Obtain setting and grouting materials from single manufacturer.
 - 2. Obtain waterproofing and crack isolation membrane from manufacturer of setting and grouting materials.
- C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer:
 - 1. Thresholds.
 - 2. Metal edge strips.

2.2 PERFORMANCE REQUIREMENTS

- A. Floor tile and other traffic surfaces:
 - 1. Dynamic Coefficient of Friction: Not less than 0.42 when tested in accordance with DCOF AcuTest per ANSI A137.1.

2.3 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.
- 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 TCNA installation methods specified in tile installation methods, and other requirements specified.
- C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

- D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.
 - 1. Where tile is indicated for installation in swimming pools on exteriors or in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for installation indicated and has a record of successful in-service performance.

2.4 TILE PRODUCTS

- A. Tile: Refer to Color Codes on Drawings. Substitutions not permitted.
 - 1. Drawing Designations: FT and WT Series.
 - 2. Grout Colors: As indicated by Room Finish Schedules and Color Codes on Drawings or, if not indicated, standard colors as selected by Architect.
 - 3. Joint Sizes: As recommended by tile manufacturer unless otherwise indicated on Drawings..

2.5 TILE TRIM UNITS

- A. Tile Trim Units: Except as otherwise specified or indicated in Color Codes on Drawings (B Series Drawing Designation), provide trim units from same manufacturer, product line, color and finish, as each specified tile; and as follows:
 - 1. Shapes: As selected by Architect from manufacturer's standard shapes; coordinate with adjacent tile sizes and jointing
 - a. Shapes include, but are not limited to, the following:
 - 1) Bullnose units.
 - 2) Cove base units.
 - 2. Sizes: As selected by Architect from manufacturer's standard sizes; coordinate with adjacent tile sizes and jointing

2.6 THRESHOLDS

- A. General: Fabricate to sizes and profiles indicated or required to provide transition between adjacent floor finishes.
 - 1. Bevel edges at 1:2 slope, with lower edge of bevel aligned with or up to 1/16 inch above adjacent floor surface.
 - a. Finish bevel to match top surface of threshold.
 - 2. Limit height of threshold to 1/2 inch or less above adjacent floor surface.
- B. Marble Threshold:
 - 1. Comply with ASTM C503.
 - 2. Abrasion Resistance: 12 minimum according to ASTM C1353 or ASTM C241 and with honed finish.
 - 3. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.7 SETTING MATERIALS

- A. Modified Dry-Set Mortar (Thinset): ANSI A118.4.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc; Bostik PM: www.bostik.com.
 - b. Custom Building Products; VersaBond Flex Professional Thin-Set Mortar or Porcelain Tile Professional Thin-Set Mortar: www.custombuildingproducts.com.
 - c. LATICRETE International, Inc; 253 Gold or 254 Platinum: www.laticrete.com.
 - d. MAPEI Corp.; Ultraflex 2 or Ultraflex 3: www.mapei.com.
 - e. TEC, H.B. Fuller Construction Products Inc.; Full Flex Premium Thin Set Mortar or Super Flex Ultra-Premium Thin Set Mortar: www.tecspecialty.com.
 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- B. Large Format Tile, Modified Dry-Set Mortar (LHT Mortar/Medium-Bed): Comply with requirements in ANSI A118.4. Provide product that is approved by manufacturer for application thickness of up to 3/4 inch.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc; Big Tile & Stone: www.bostik.com.
 - b. Custom Building Products; Natural Stone & Large Tile Premium Mortar or Versabond LFT: www.custombuildingproducts.com.
 - c. LATICRETE International, Inc; 220 Marble & Granite Mortar or LHT Plus: www.laticrete.com.
 - d. MAPEI Corp.; Large Tile & Stone Mortar or Ultraflex LFT: www.mapei.com.
 - e. TEC, H.B. Fuller Construction Products Inc; Ultimate Large Tile Mortar: www.tecspecialty.com.
 2. Provide prepackaged, dry-mortar mix containing dry, redispersible, vinyl acetate or acrylic additive to which only water must be added at Project site.
 3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.
- C. Mortar Bed Materials (Thick-Bed): ANSI A108.02
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Bostik, Inc; Mud-In-A-Bag with 425 Multi-Purpose Acrylic Latex Admixture: www.bostik.com.
 - b. Custom Building Products; Thick Bed Bedding Mortar with Thin-Set & Mortar Admix: www.custombuildingproducts.com.
 - c. LATICRETE International, Inc; 3701 Fortified Mortar: www.laticrete.com.
 - d. MAPEI Corp.; Modified Mortar Bed: www.mapei.com.
 - e. TEC, H.B. Fuller Construction Products Inc.; Floor Mud with Acrylond AMA Acrylic Mortar Additive: www.tecspecialty.com.
 2. Provide prepackaged, dry-mortar mix that either contains a dry, redispersible, vinyl acetate or acrylic additive or has a separately packaged liquid-latex additive. only water must be added at Project site after mixing prepackaged ingredients.
 3. At Contractor's option a field mixed mortar bed may be used instead of the specified prepackaged materials. Comply with ANSI A108.1a and the following:
 - a. Mortar mix to include Portland cement, sand, hydrated lime, liquid-latex additive, and water in ratios complying with ANSI A108.1a, Article 2.2
 - b. Latex Additive: Acrylic resin or styrene-butadiene-rubber water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement and aggregate mortar beds.

4. Reinforcing Wire Fabric: Galvanized, welded-wire fabric, 2 by 2 inches by 0.062-inch diameter; comply with ASTM A185 and ASTM A82, except for minimum wire size.

2.8 GROUT MATERIALS

A. High-Performance Grout: ANSI A118.7.

1. Grout Colors: As indicated in Color Codes on Drawings or, if not indicated, standard colors as selected by Architect.
2. Products:
 - a. Pre-mixed Single-component Grout: High performance formulation; stain resistant, no sealer required. Subject to compliance with requirements, provide one of the following:
 - 1) Bostik, Inc; TruColor RapidCure: www.bostik.com.
 - 2) Custom Building Products; Fusion Pro Single Grout: www.custombuildingproducts.com.
 - 3) LATICRETE International, Inc; Ready-To_use Grout: www.laticrete.com.
 - 4) MAPEI Corp.; Flexcolor CQ: www.mapei.com.
 - 5) TEC, H.B. Fuller Construction Products Inc; InColor Advanced Performance Grout: www.tecspecialty.com.

2.9 WATERPROOFING AND CRACK ISOLATION MEMBRANE

A. Waterproofing and Crack Isolation Membrane: ANSI A118.10 and ANSI A118.12.

1. System consisting of liquid-latex rubber or elastomeric polymer; with or without fabric reinforcement
2. Thickness: As recommended by membrane manufacturer.
3. Crack Resistance: No failure at 1/8 inch gap, minimum.

B. Products: Subject to compliance with requirements, provide one of the following:

1. Without Fabric Reinforcing:
 - a. Custom Building Products; RedGard: www.custombuildingproducts.com.
 - b. LATICRETE International, Inc; Hydro Ban: www.laticrete.com.
 - c. MAPEI Corp.; Mapelastic AquaDefense: www.mapei.com.
2. With Fabric Reinforcing:
 - a. Bostik, Inc; GoldPlus: www.bostik.com.
 - b. Custom Building Products; 9240 Waterproofing and Anti-Fracture Membrane: www.custombuildingproducts.com.
 - c. LATICRETE International, Inc; Hydro Barrier: www.laticrete.com.
 - d. MAPEI Corp.; Mapelastic AquaDefense: www.mapei.com.
 - e. TEC, H.B. Fuller Construction Products Inc; HydraFlex: www.tecspecialty.com.

2.10 METAL TRIM

A. Metal Trim: Except as otherwise indicated provide the following:

1. Metallic edge trim, height to match tile and setting-bed thickness, designed specifically for tiling applications; stainless steel, ASTM A276 or ASTM A666, 300 Series exposed-edge material.
 - a. Profiles:
 - 1) Angle or L-shaped.

- 2) Other shapes as indicated on Drawings.
 - b. Finish: Satin anodized aluminum.
 - c. Provide associated corner pieces, if any.
 - d. Applications and Locations: Unless otherwise indicated or finished with tile trim units, provide metal trim at the following locations:
 - 1) Open edges of wall tile.
 - 2) Open edges of floor tile.
 - 3) Outside wall corners.
 - 4) Transitions between hard tile and other floor finishes.
 - 5) Tile perimeters not against a wall or other solid vertical surface.
 - 6) Other areas as indicated on Drawings.
 - e. Manufacturers: Subject to compliance with requirements, provide products from one of the following:
 - 1) Schluter-Systems: www.schluter.com.
2. B-02: Cove-shaped profile.
 - a. Finish: Satin anodized aluminum.
 - b. Basis of Design Product: Subject to compliance with requirements, provide Schluter; DILEX- AHKA.
 3. MT-01: Angle or L-shaped profile.
 - a. Finish: Satin anodized aluminum.
 - b. Basis of Design Product: Subject to compliance with requirements, provide Schluter; QUADEC.
 4. MT-02: Square shaped profile.
 - a. Finish: Satin anodized aluminum.
 - b. Basis of Design Product: Subject to compliance with requirements, provide Schluter; QUADEC-K.
 5. MT-03: Angle or L-shaped profile.
 - a. Finish: Satin anodized aluminum.
 - b. Basis of Design Product: Subject to compliance with requirements, provide Schluter; RENO-TK.

2.11 MISCELLANEOUS MATERIALS

- A. Lippage Control Systems: As standard with manufacturer.
- B. Grout Spacers: As standard with manufacturer, sized for tile joints indicated.
- C. Joint Sealants
 1. Tile Sealants - Traffic Grade:
 - a. Refer to Section 07 9200 - Joint Sealants.
 - 1) Provide Nonsag traffic grade silicone sealant or self-leveling silicone sealant.

2. Tile Sealant - Non-traffic Grade: Gunnable siliconized acrylic; moisture and mildew resistant type.

- a. Colors: To match adjacent grout colors.
- b. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Bostik, Inc; Bosti-Flex Plus: www.bostik.com.
 - 2) Custom Building Products; Polyblend Ceramic Tile Caulk: www.custombuildingproducts.com.
 - 3) LATICRETE International, Inc; Premium Acrylic Caulk: www.laticrete.com.
 - 4) MAPEI Corp.; Keracaulk S (sanded) and Keracaulk U (unsanded): www.mapei.com.
 - 5) TEC, H.B. Fuller Construction Products Inc; AccuColor Sanded/Unsanded Siliconized Acrylic Caulk: www.tecspecialty.com.

- D. 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.
- E. Trowelable Patching Compounds: Latex-modified, portland cement-based formulation provided or approved by manufacturer of tile-setting materials for installations indicated.

2.12 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 the Work.
 - 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.
 - a. Flatness tolerances shall also comply with requirements of specified TCNA installation methods.
 - 2. Verify that concrete substrates for tile floors installed with bonded mortar bed or thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.
 - a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
 - b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.
 - 3. 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.
 - 4. 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 thinset mortar with trowelable 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.
- C. For Tile Panel/Slabs: Verify that substrates comply with flatness requirements of ANSI A108.19 as follows:
 - 1. Substrate maximum allowable variation in flatness shall not exceed 1/8 inch in 10 feet and 1/16 inch in 2 feet from the required plane when measured from the high points in the surface per ANSI A108.19 and its accompanying Appendix A.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 INSTALLATION OF TILE

- A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation methods.
- B. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in specified TCNA installation methods and as follows:
 - 1. For Tile Panel/Slabs: Comply with ANSI A108.19.
 - a. Grout spacers are required during installation.
 - b. Provide lippage control systems when required by ANSI A108.19.
- C. Tile shall have 80 percent mortar coverage except as follows:
 - 1. For the following installations, follow procedures in the ANSI A108 series of tile installation standards for providing 95 percent mortar coverage:
 - a. Exterior tile floors.
 - b. Tile floors in wet areas.
 - c. Tile swimming pool decks.
 - d. Tile floors in laundries.
 - e. Tile floors consisting of tiles 8 by 8 inches or larger.
 - f. Tile floors consisting of rib-backed tiles.
- D. Bond Coats:
 - 1. Use latex-portland cement thin-set mortar, unless otherwise indicated.
 - a. Exceptions:
 - 1) For tiles that have at least one side greater than 15 inches long, use LHT mortar/medium-bed mortar.
 - 2) For tile panels/slabs, use LHT mortar/medium-bed mortar.
 - b. Bond Coat Color: White or gray.

- E. Grout:
 - 1. Use high performance grout.
- F. 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.
- G. 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.
- H. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges except where metal trim is indicated.
- I. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
- J. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
 - 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.
- K. Joint Widths: Install tiles with joint widths indicated, if not indicated install in widths as directed by Architect in writing.
- L. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- M. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.
 - 1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
- N. Thresholds: Install thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
- O. Metal Edge Strips: Install in same type of setting bed as adjacent tile unless otherwise indicated.

3.4 INSTALLATION OF WATERPROOF MEMBRANE

- A. Install waterproofing and crack isolation membrane to comply with ANSI A108.13, ANSI A108.17 and manufacturer's written instructions to produce waterproof membrane of uniform thickness that is bonded securely to substrate.
- B. Allow waterproofing and crack isolation membrane to cure and verify by testing that it is watertight before installing tile or setting materials over it.
- C. Locations: Install waterproofing and crack isolation membrane at the following locations:
 - 1. All floor and traffic areas.

2. Shower walls and floors.
3. Other areas as indicated on Drawings.

3.5 ADJUSTING AND CLEANING

- A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.
- B. 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.

3.6 PROTECTION

- A. 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.
- B. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
- C. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR FLOOR TILE - INSTALLATION METHODS

- A. Interior Floor Tile Installations:
 1. Concrete Substrates - Thinset Installation: Install in accordance with TCNA F122 or F122A as appropriate for substrate conditions.
 - a. Provide waterproofing and crack isolation membrane.
 - b. Bond Coat: Modified dry-set mortar or medium-bed, modified dry-set mortar as appropriate to tile.
 - c. Grout: High-performance grout.
 2. Concrete Substrates - Bonded Mortar Bed Installation: Install in accordance with TCNA F112.
 - a. Provide waterproofing and crack isolation membrane.
 - b. Bond Coat: Modified dry-set mortar or medium-bed modified dry-set mortar as appropriate to tile.
- B. Grout: High-performance grout.

3.8 INTERIOR WALL TILE - INSTALLATION METHODS

- A. Interior Wall Tile Installations:
 1. Concrete and Masonry Substrates – Thinset Installation: Install in accordance with TCNA W202I.
 - a. Provide waterproofing and crack isolation membrane at specified locations and as indicated on Drawings.

- b. Bond Coat: Modified dry-set mortar or medium-bed modified dry-set mortar as appropriate to tile.
 - c. Grout: High-performance grout.
- 2. Cementitious Backing Panel Substrates - Thinset Installation: Install in accordance with TCNA W244C.
 - a. Provide waterproofing and crack isolation membrane at specified locations and as indicated on Drawings.
 - b. Bond Coat: Thinset mortar or LHT mortar/medium-bed mortar as appropriate to tile.
 - c. Grout: High-performance grout
- 3. Over Existing Tile, Structural Glazed Facing Tile (SGFT), Stone and Other Hard Smooth Surfaces - Thinset Installation: Install in accordance with TCNA TR713 using W202I.
 - a. Mechanical abrade substrates as recommended by TCNA.
 - b. Provide waterproofing and crack isolation membrane at specified locations and as indicated on Drawings.
 - c. Bond Coat: LHT mortar/medium-bed mortar as appropriate to tile.
 - d. Grout: High-performance grout.

END OF SECTION 09 3000

SECTION 09 9100 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Interior painting.
- B. Related Requirements:
 - 1. Section 09 9600 "High-Performance Coatings" for epoxy paint.

1.3 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section
- B. DFT: Dry film thickness, measured in mils.
- C. WFT: Wet film thickness, measured in mils.
- D. Mils: One one-thousandth of an inch. Used to measure thickness of coating films.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions. Include the following:
 - 1. Indicate VOC content.
 - 2. Manufacturer's name, product name and/or catalog number, and general product category.
 - a. Example of general product categories:
 - 1) Interior finish coat - latex, eggshell.
 - 3. For each paint system and substrate, indicate which paint products are to be used.
 - a. Examples:
 - 1) Interior latex eggshell system for gypsum board:
 - a) Primer: Name of specific product provided.
 - b) Finish Coats: Name of specific product provided.
 - 4. Use same designations indicated on Drawings and Schedules.
- B. Samples: Submit 3 paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating each color and sheen specified.

1. Paint color submittals will not be considered until color submittals for major materials not to be painted, such as masonry and storefront finishes, have been approved.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer and manufacturer.
- B. Paint Compatibility Certificates:
 1. For Steel: From manufacturers of field-applied primers and finish (top) coats, certifying material compatibility with one another and shop-applied primers.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Paint Maintenance Manual: Submit coating maintenance manual including:
 1. Finish schedule showing where each product, color, and sheen was used.
 2. Product technical data sheets.
 3. Material safety data sheets (MSDS).
 4. Care and cleaning instructions.
 5. Touch-up procedures.
 6. Repair of painted and finished surfaces.
- B. Color Chips: After final approval of all colors, submit color chips of all coatings used with manufacturer's name, product, and mix formulation of each color, sheen, and coating for the purpose of future re-ordering of coatings.
 1. Color chips shall be at least six (6) inches square.
 2. Include in Paint Maintenance Manual.
- C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Paint Products: 2 percent of that installed, but not less than 1 gal. of each material, color, and sheen applied.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 5 years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years documented experience.
 1. Only qualified journeypersons, as defined by local jurisdiction, shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyperson in accordance with trade regulations.
- C. Mockups: Apply mockups of each paint system indicated for each substrate, color, sheen, and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..

- b. Doors and Frames: Provide mock-up samples of one complete door and frame.
 - c. Railings and Other Lineal Materials: Provide mock-up samples of at least 8 lineal feet.
 - d. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 1. Maintain containers in clean condition, free of foreign materials and residue.
 2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.
 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.
- C. Apply paint only to dry, clean, and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations:
 1. Provide paint and coating products from same manufacturer, unless otherwise specified.
 2. Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats, unless otherwise specified.
 3. Exceptions shall be permitted, provided approval of Architect is obtained using specified procedures for substitutions.
- B. Paint Manufacturers - General: For each paint type specified in Part 2, provide one of the products listed, subject to compliance with requirements. Products shall be from one of the following:
 1. Benjamin Moore: Benjamin Moore & Co.: [www: benjaminmoore.com](http://www.benjaminmoore.com).
 2. PPG: PPG Industries, Inc., Architectural Coatings: www.ppgpaints.com.
 3. Sherwin-Williams: The Sherwin-Williams Company: [www: sherwin-williams.com](http://www.sherwin-williams.com).

2.2 PAINT MATERIALS, GENERAL

A. Material Compatibility:

1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
3. Shop-applied Primer Compatibility for Steel: Field-applied primers and finish (top) coats shall be compatible with one another and shop-applied primers. Refer to Division 05 sections for shop-applied primers for steel.

B. VOC Content:

1. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction
2. For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits unless stricter limits are required by authorities having jurisdiction:
 - a. Flat Paints and Coatings: 50 g/L.
 - b. Nonflat Paints and Coatings: 50 g/L.
 - c. Dry-Fog (Dryfall) Coatings: 150 g/L.
 - d. Primers, Sealers, and Undercoaters: 100 g/L.
 - e. Rust-Preventive Coatings: 100 g/L.
 - f. Zinc-Rich Industrial Maintenance Primers: 100 g/L.

C. Supply each paint material in quantity required to complete entire project's work from a single production run.

D. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.

E. Sheen/Gloss Criteria.

1. Product names are not acceptable as gloss level identification.
2. Determine gloss value of paint finish by testing paint samples according to ASTM D523, using 60 degree geometry. Sheen/Gloss levels shall be defined as follows:
 - a. Gloss Level 1: Flat/Matte, value between 0 and 5 units.
 - b. Gloss Level 2: Velvet, value between 5 and 10 units.
 - c. Gloss Level 3: Eggshell, value between 10 and 20 units.
 - d. Gloss Level 4: Satin, value between 20 and 35 units.
 - e. Gloss Level 5: Semigloss, value between 35 and 70 units.
 - f. Gloss Level 6: Gloss, value between 70 and 85 units.
 - g. Gloss Level 7: High Gloss, value more than 85 units.
3. Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.

F. Colors: As indicated in Room Finish Schedule on Drawings or, if not indicated, to match Architect's samples.

1. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as indicated color.
2. Provide tinted deep tone primers at deep tone colors, and as recommended by paint manufacturer.

2.3 INTERIOR PAINTS

A. General:

1. Unless otherwise indicated, each interior paint system consists of the following:
 - a. Primer: One coat based on substrate material.
 - b. Finish (Top) Coats: Two coats based on required sheen and substrate material.
2. Required Sheens: For each paint system, provide paint sheens as follows unless otherwise indicated:
 - a. Ceilings, Soffits and Ceiling Drops: Flat sheen.
 - b. Gypsum Board (except at ceilings):
 - 1) Semigloss Sheen: Storage rooms, janitor closets, electrical rooms, mechanical rooms, closets, and similar non-public areas.
 - 2) Eggshell Sheen: Public areas.
 - c. Concrete (except at ceilings): Semigloss sheen.
 - d. Masonry: Semigloss sheen.
 - e. Metals: Semigloss sheen.
 - f. Insulated Piping and Insulated Ductwork: Sheen to match surface it is mounted on unless otherwise indicated.

B. Interior Paint Systems - Latex.

1. Primers:
 - a. Primer for concrete: Alkali-resistant acrylic/latex primer, water-based.
 - 1) Benjamin Moore; Super Spec Masonry Interior/Exterior Hi-Build Masonry Primer, N068; DFT 1.0 mils
 - 2) PPG; Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603; DFT 1.5 mils.
 - 3) Sherwin Williams; Loxon Concrete & Masonry Primer-Sealer, LX02; DFT 2.5 mils.
 - b. Block Filler/primer for concrete masonry units: Acrylic/latex block filler, water-based.
 - 1) Benjamin Moore; Super Spec Masonry Interior/Exterior Hi-Build Block Filler, 206; DFT 9.0 mils.
 - 2) PPG; Speedhide Interior/Exterior Masonry Hi Fill Latex Block Filler, 6-15; DFT 7.0 mils.
 - 3) Sherwin Williams; Pro Industrial Heavy Duty Block Filler - B42 Series; DFT 9.0 mils.
 - c. Primer for aluminum, ferrous metal, and galvanized steel: Rust-inhibitive acrylic/latex primer, water-based.
 - 1) Benjamin Moore; Super Spec HP Acrylic Metal Primer, P04; DFT 2.0 mils.
 - 2) PPG; Pitt-Tech Plus Int./Ext. DTM Industrial Primer, 90-912 Series; DFT 3.0 mils.
 - 3) Sherwin Williams; Pro Industrial Pro-Cryl Universal Primer, B66 Series; DFT 3.0 mils.
 - d. Primer for gypsum board: Acrylic/latex primer, water-based.
 - 1) Benjamin Moore; Ultra Spec 500 Interior Latex Primer, N534; DFT 1.4 mils.
 - 2) PPG; Pure Performance Interior Latex Primer - 9-900; DFT 1.4 mils.
 - 3) Sherwin Williams; ProMar 200 Zero VOC Interior Latex Primer, B28W02600; DFT 1.0 mils.

- e. Primer for previously painted surfaces; including concrete and masonry: Acrylic/latex stain-blocking primer/sealer with high adhesion, water-based.
 - 1) Benjamin Moore; Sure Seal Latex Primer Sealer, 027; DFT 1.3 mils.
 - 2) PPG; Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921 Series; DFT 1.6 mils.
 - 3) Sherwin Williams; PrepRite ProBlock Interior-Exterior Latex Primer-Sealer, B51-600 Series; DFT 1.4 mils.
 - f. Primer for insulated piping and insulated ductwork: Acrylic/latex stain-blocking primer/sealer with high adhesion, water-based.
 - 1) Benjamin Moore; Sure Seal Latex Primer Sealer, 027; DFT 1.3 mils.
 - 2) PPG; Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921 Series; DFT 1.6 mils.
 - 3) Sherwin Williams; PrepRite ProBlock Interior-Exterior Latex Primer-Sealer, B51-600 Series; DFT 1.4 mils.
2. Finish (Top) Coats:
- a. Gloss Sheen: Acrylic/latex paint, water-based.
 - 1) Finish coats for all surfaces except metals:
 - a) Benjamin Moore; Ultra Spec 500 Interior Gloss Finish, N540; DFT 1.8 mils.
 - b) PPG; Speedhide Interior/Exterior 100% Acrylic Gloss, 6-8534 Series; DFT 1.2 mils.
 - c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Gloss, B21-12650 Series; DFT 1.4 mils.
 - 2) Finish coats for aluminum, ferrous metal, and galvanized steel:
 - a) Benjamin Moore; Ultra Spec HP DTM Acrylic Gloss Enamel, WP28; DFT 2.3 mils.
 - b) PPG; Pitt-Tech Plus Int./Ext. High Gloss DTM Industrial Enamel, 90-1310 Series; DFT 2.0 mils
 - c) Sherwin-Williams; Pro Industrial DTM Acrylic Gloss, B66 Series; DFT 3.0 mils.
 - b. Semigloss Sheen: Acrylic/latex paint, water-based.
 - 1) Finish coats for all surfaces except metals:
 - a) Benjamin Moore; Ultra Spec 500 Interior Semi-gloss Finish, N539; DFT 1.8 mils.
 - b) PPG; Speedhide Zero Interior Zero-VOC Latex Semi-Gloss, 6-4500 Series; DFT 1.3 mils.
 - c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Semi-Gloss, B31-2600 Series; DFT 1.5 mils.
 - 2) Finish coats for aluminum, ferrous metal, and galvanized steel:
 - a) Benjamin Moore; Ultra Spec HP DTM Acrylic Semi-Gloss, WH29; DFT 2.3 mils.
 - b) PPG; Pitt-Tech Plus Int./Ext. Semi-Gloss DTM Industrial Enamel, 90-1210 Series; DFT 2.0 mils.
 - c) Sherwin-Williams; Pro Industrial DTM Acrylic Semi-Gloss, B66 Series; DFT 3.0 mils.

- c. Satin Sheen: Acrylic/latex paint, water-based.
 - 1) Finish coats for all surfaces except metals:
 - a) Benjamin Moore; Aura Waterborne Interior Paint Satin Finish 526; DFT 1.8 mils.
 - b) PPG; Speedhide Zero Interior Zero-VOC Latex Satin, 6-441ZI Series; DFT 1.5 mils.
 - c) Sherwin-Williams; ProMar 200 Zero VOC Interior Latex Low Sheen Eg-Shel - B24-2600 Series; DFT 1.8 mils.
 - 2) Finish coats for aluminum, ferrous metal, and galvanized steel:
 - a) Benjamin Moore; Ultra Spec HP DTM Acrylic Low Lustre Enamel, WH25; DFT 2.3 mils.
 - b) PPG; Pitt-Tech Plus Int./Ext. Satin DTM Industrial Enamel, 90-1110 Series; DFT 2.0 mils.
 - c) Sherwin-Williams; Pro Industrial DTM Acrylic Eg-Shel, B66 Series; DFT 3.0 mils.
- d. Eggshell Sheen: Acrylic/latex paint, water-based.
 - 1) Finish coats for all surfaces:
 - a) Benjamin Moore; Ultra Spec 500 Interior Eggshell Finish, N538; DFT 1.8 mils.
 - b) PPG; Speedhide Zero Interior Zero-VOC Latex Eggshell, 6-4300 Series; DFT 1.5 mils.
 - c) Sherwin Williams; ProMar 200 Zero VOC Interior Latex Eg-Shel, B20-2600 Series; DFT 1.7 mils.
 - 2) Finish coats for aluminum, ferrous metal, and galvanized steel:
 - a) Benjamin Moore; Ultra Spec HP DTM Acrylic Low Lustre Enamel, WH25; DFT 2.3 mils.
 - b) PPG; Pitt-Tech Plus Int./Ext. Satin DTM Industrial Enamel, 90-1110 Series; DFT 2.0 mils.
 - c) Sherwin-Williams; Pro Industrial DTM Acrylic Eg-Shel, B66 Series; DFT 3.0 mils.
- e. Flat Sheen: Acrylic/latex paint, water-based.
 - 1) Finish coats for all surfaces:
 - a) Benjamin Moore; Benjamin Moore; Ultra Spec 500 Interior Flat Finish, N536; DFT 1.8 mils.
 - b) PPG; Speedhide Zero Interior Zero-VOC Latex Flat, 6-4100 Series; DFT 1.4 mils.
 - c) Sherwin Williams; ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series; DFT 1.4 mils.
 - 2) Finish coats for aluminum, ferrous metal, and galvanized steel:
 - a) Benjamin Moore; Benjamin Moore; Ultra Spec 500 Interior Flat Finish, N536; DFT 1.8 mils.
 - b) PPG; Speedhide Zero Interior Zero-VOC Latex Flat, 6-4100 Series; DFT 1.4 mils.
 - c) Sherwin Williams; ProMar 200 Zero VOC Interior Latex Flat, B30-2600 Series; DFT 1.6 mils.

2.4 ACCESSORY MATERIALS

- A. Accessory Materials: Provide cleaning materials, preparation materials, and miscellaneous materials required to properly prepare and apply paints and coatings.
 - 1. Includes materials required for marking fire and smoke assemblies

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMUs): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Protect adjacent surfaces not to be painted.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. For coatings applied over previously painted surfaces, test application to check for lifting and other adhesion problems. Perform test in an isolated area where practicable.
 - 2. Remove incompatible coatings and primers or apply barrier tie coat as recommended by paint manufacturer and as required to produce paint systems indicated.
- D. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
- E. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
 - 1. Clean concrete according to ASTM D4258. Allow to dry.

- F. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- G. Steel Substrates - Unpainted or Unprimed: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 6 - Commercial Blast Cleaning.
- H. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Sand and scrape to remove loose primer and rust. Feather edges of remaining primer to make inconspicuous.
 - 1. Before painting, applicator/installer shall re-prime entire shop-primed item with primer specified in this section.
- I. Galvanized-Metal Substrates: Remove passivation coating/rinse, grease and oil residue from galvanized metal to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Clean using methods recommended in writing by paint manufacturer but not less than ASTM D6386, ASTM D7396, and the following:
 - 1. Remove surface contamination and oils in accordance with SSPC-SP 1 - Solvent Cleaning.
 - 2. Remove loose paint, rust, and other debris according to SSPC-SP 2 - Hand Tool Cleaning.
 - 3. Lightly profile galvanized surfaces and remove zinc oxide and zinc hydroxide layers in accordance with SSPC-SP16 – Brush-Off/Sweep Blast Cleaning.
 - 4. Apply paint within 1 hour of cleaning and preparation.
- J. Aluminum Substrates: Remove loose surface oxidation. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 1 - Solvent Cleaning.
- K. Previously Painted Surfaces - General:
 - 1. Remove all surface contamination such as, oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, and any other surface contamination.
 - 2. Remove masking tape, labels, adhesives, and other materials that would either be deleterious to adhesion of, or show through, new paint.
 - 3. Scrape all loose, blistered, peeling, scratched or otherwise imperfect paint down to bare substrate and sand adjacent tightly adhering paint to feather edge.
 - 4. Spot prime all bare areas with appropriate primer before priming entire surface.
- L. Repair of Existing Gypsum Board:
 - 1. Fill hairline cracks, small holes, and imperfections with filler compound and sand smooth.

3.3 APPLICATION - GENERAL

- A. Apply paints and coatings according to manufacturer's written instructions.
 - 1. Use applicators and techniques suited for paint and substrate indicated.
- B. Provide smooth, opaque coatings of uniform finish, color, appearance, and coverage without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.
- C. Terminate paint in neatlines; cut in sharp lines and color breaks.
- D. Apply paint products to properly prepared surfaces.

1. Do not apply coatings over dirt, rust, scale, grease, moisture, or other conditions detrimental to application of coatings.

E. Primers:

1. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
2. Apply first coat of primer to surfaces as soon as practical after preparation and before subsequent surface deterioration.
3. Re-prime shop-primed surfaces.

F. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.

1. Sand between coats as recommended by manufacturer; before applying next coat clean surfaces of loose particles and use tack cloth to remove any remaining dust and particles just prior to applying next coat.

G. Provide completed work matching approved samples for color, sheen, texture, coverage and quality of work.

1. Remove, refinish, or repaint work not complying with requirements.

H. Number of Coats: Each paint system in Part 2 specifies a number of coats. This is the minimum number required.

1. If undercoats, stains, or other imperfections are visible after final coat of paint, apply additional coats until paint is of uniform finish, color, and appearance without defects or imperfections.

I. Minimum Coating Thickness: Provide dry film thickness for each coating as indicated, but not less than that recommended by the coating manufacturer.

1. Number of coats and film thicknesses required are same regardless of application method.
2. Ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.

3.4 **SURFACES TO BE PAINTED**

A. General: Paint all exposed surfaces except where indicated not to be painted or where listed in "Surfaces Not to Be Painted" Article in this section.

1. The term "exposed" includes areas visible through permanent and built-in fixtures when they are in place.
2. If surface, material, or item is not specifically mentioned, paint in same manner, color, and sheen as similar surfaces, materials, or items, regardless of whether indicated or not.
3. Paint surfaces that are cut and patched including, but not limited to, cutting and patching to permit installation of electrical services, piping, and ductwork.

B. Exposed Ceilings:

1. Paint entire exposed ceiling area including, but not limited to, deck, miscellaneous steel, hangers, fasteners, and miscellaneous items and hardware, unless otherwise indicated.
2. Paint the following mechanical and electrical items unless otherwise indicated:
 - a. Insulated piping, pipe hangers, and supports
 - b. Ductwork, insulated ducts, and supports.
 - c. Conduit, fittings and junction boxes:
3. Do not paint sprinkler heads and other factory finished fire protection components.

C. Equipment and Furniture:

1. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces.
2. Paint surfaces to be concealed behind permanently installed fixtures, equipment, and furnishings, using primer only, prior to installation of permanent item.

D. Registers and Grilles: Paint interior surfaces of ducts, for a minimum of 18 inches or beyond sight line, whichever is greater, with a flat black (non-reflecting) paint.

E. Access Panels: Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

F. Doors:

1. Interior Doors: Finish doors on tops, bottoms, and all four edges the same as face of non-secured side.

G. Panelboards for Service Panels, Telephone, and Other Electrical Equipment:

1. Paint both sides and all edges of plywood before installation.
 - a. Color and Sheen: Gray, semigloss, unless otherwise indicated.

H. Mechanical and Electrical:

1. This Section includes painting of all mechanical, fire protection, and electrical items.
 - a. Do not paint sprinkler heads and polished fire protection components.
 - b. Do not paint insulated pipe, duct work or equipment before insulation is applied.
2. Piping, Insulated Piping, Pipe Hangers, and Supports:
 - a. In finished/public areas, paint exposed piping the same color and sheen as surface it is mounted on unless otherwise indicated.
 - b. In utility areas, paint exposed piping according to piping color coding scheme; otherwise paint the same color and sheen as surface it is mounted on unless otherwise indicated.
 - c. Paint all exposed pipe hangers and supports the same color and sheen as surface it is mounted on unless otherwise indicated.
 - 1) Any portion of hangers and supports encompassing the actual pipe shall be painted to match the pipe color and sheen.
3. Ductwork, Insulated Ducts, and Supports:
 - a. In finished/public areas, paint exposed ductwork and supports the same color and sheen as surface it is mounted on unless otherwise indicated.
 - b. In utility areas, paint exposed ductwork according to color coding scheme; otherwise paint the same color and sheen as surface it is mounted on unless otherwise indicated.
 - c. Paint all exposed hangers and supports the same color and sheen as surface it is mounted on unless otherwise indicated.
 - 1) Any portion of hangers and supports encompassing the actual ductwork shall be painted to match the ductwork color and sheen.
4. Electrical Conduit, Fittings and Junction Boxes:

- a. In finished/public areas, paint exposed conduit, fittings and junction boxes same color and sheen as surface it is mounted on unless otherwise indicated.
 - b. In utility areas, paint exposed conduit, fittings and junction boxes according to color coding scheme; otherwise paint the same color and sheen as surface it is mounted on unless otherwise indicated.
5. Mechanical and Electrical Equipment:
 - a. Exterior Equipment: Paint all equipment exposed to the weather.
 - 1) Do not paint factory-finished equipment unless otherwise indicated.
 - b. Paint shop-primed mechanical and electrical equipment same color and sheen as surface it is mounted on unless otherwise indicated.
 - c. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
 - d. Paint interior surfaces of convactor and baseboard heating cabinets to match face panels.

3.5 SURFACES NOT TO BE PAINTED

- A. Do not paint or finish the following unless otherwise indicated:
 1. Factory-finished items; factory-primed items are not considered factory-finished.
 2. Items indicated to receive other finish.
 3. Items indicated to remain naturally finished.
 4. Fire rating labels.
 5. Equipment serial number and capacity labels.
 6. Operating parts of equipment.
 7. Aluminum components.
 8. Polished and brushed stainless steel items.
 9. Metal flashings.
 10. Brick.
 11. Decorative concrete masonry units.
 12. Cast-in-place concrete.
 13. Floors.
 14. Surfaces concealed by suspended ceilings.
 15. Concealed piping, ductwork, and conduit.
 16. Surfaces within pipe and duct spaces.
 17. Acoustical materials.

3.6 IDENTIFICATION AND COLOR CODING

- A. Marking Fire and Smoke Assemblies.
 1. Permanently identify both sides of each fire and smoke assembly indicated on Drawings.
 - a. Labeling:
 - 1) Labeling may be either painted stencils or preprinted self-adhesive stickers.
 - 2) Lettering not less than 3 inches in height, minimum 3/8 inch stroke width, in contrasting color to wall. Example of wording as follows:
 - a) "2 HOUR FIRE BARRIER - PROTECT ALL OPENINGS" or similar.
 - 3) Colors and exact wording of labels shall comply with local code(s).

b. Locations:

- 1) Locate labels within 15 feet of the ends of each wall and intervals not to exceed 30 feet measured horizontally along the wall. Minimum of one label per run of wall.
 - a) Locate approximately 12 to 24 inches below ceiling/roof deck unless otherwise required by local code(s).
 - b) In occupied areas without ceilings do not apply labels.

c. Where multiple ratings occur in single run of wall:

- 1) Apply vertical stripe 2 inches wide and approximately 12 inches high where rating change occurs; use contrasting color to wall.
- 2) In occupied areas without ceilings do not apply.
- 3) Comply with local code(s).

B. Mechanical and Electrical Identification and Color Coding:

1. Refer to Divisions 21, 22, 23, and 26 for color coding scheme and identification of mechanical and electrical services; if no identification is provided, paint as follows:

a. Color Coding Scheme and Identification:

- 1) Piping: None; paint to match surface on which it is mounted.
- 2) Ductwork: None; paint to match surface on which it is mounted.
- 3) Conduit: None; paint to match surface on which it is mounted.

3.7 **FIELD QUALITY CONTROL**

A. Subject to the opinion of the Architect, paint shall be rejected and considered unacceptable for any of the following reasons:

1. Lacking minimum dry film thicknesses.
2. Poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, and corners.
3. Damage from touching, or disturbing paint in any other manner, before sufficiently dry.
4. Damage from application to moist surfaces or damage caused by inadequate protection from the weather.
5. Damage or contamination of paint from blown contaminants including but not limited to dust.
6. Paint shall be rejected if any of the following are evident under natural lighting for exterior surfaces and final lighting source, including daylighting, for interior surfaces:
 - a. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
 - b. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
 - c. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.

B. Visible defects are defined as follows:

1. Brush and roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
2. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.

C. Rejected paint shall be repaired or replaced at the expense of the Contractor.

1. Small affected areas shall be touched up.
2. Large affected areas shall be repainted.
3. Small and large areas shall be as defined by the Architect.
4. Areas without sufficient dry film thickness shall be repainted.
5. Paint runs and sags shall be removed by scraper or sanding and repainted.

3.8 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 1. Do not clean equipment with free-draining water. Prevent solvents, thinners, cleaners, and other contaminants from entering waterways, sanitary and storm drain systems, and ground.
 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
 3. Allow empty paint cans to dry before disposal.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 09 9100

SECTION 09 9600 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. High performance coatings - non-traffic surfaces.

1.3 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this section
- B. DFT: Dry film thickness, measured in mils.
- C. WFT: Wet film thickness, measured in mils.
- D. Mils: One one-thousandth of an inch. Used to measure thickness of coating films.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions. Include the following:
 - 1. Indicate VOC content.
 - 2. Manufacturer's name, product name and/or catalog number, and general product category.
 - a. Example of general product categories:
 - 1) Interior finish coat - latex, eggshell.
 - 3. For each high-performance coating system and substrate, indicate which products are to be used.
 - a. Examples:
 - 1) Interior Waterborne Acrylic Epoxy Paint for Concrete Masonry Units:
 - a) Primer: Name of specific product provided.
 - b) Finish Coats: Name of specific product provided.
 - 2) Interior High Performance Coating for Structural Steel.
 - a) Primer: Name of specific product provided.
 - b) Intermediate Coat: Name of specific product provided.
 - c) Top Coat: Name of specific product provided.
 - 4. Use same designations indicated on Drawings and Schedules.
- B. Samples: Submit 3 paper "draw down" samples, 8-1/2 by 11 inches in size, illustrating each color and sheen specified.

1. High-performance coating color submittals will not be considered until color submittals for major materials not to be painted, such as masonry and storefront finishes, have been approved.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For installer and manufacturer.
- B. High Performance Coating Compatibility Certificates:
 1. For Steel: From manufacturers of field-applied primers and finish (top) coats, certifying material compatibility with one another and shop-applied primers.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Paint Maintenance Manual: Submit coating maintenance manual including:
 1. Finish schedule showing where each product, color, and sheen was used.
 2. Product technical data sheets.
 3. Material safety data sheets (MSDS).
 4. Care and cleaning instructions.
 5. Touch-up procedures.
 6. Repair of painted and finished surfaces.
- B. Color Chips: After final approval of all colors, submit color chips of all coatings used with manufacturer's name, product, and mix formulation of each color, sheen, and coating for the purpose of future re-ordering of coatings.
 1. Color chips shall be at least six (6) inches square.
 2. Include in Paint Maintenance Manual.
- C. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Coating Products: 2 percent of that installed, but not less than 1 gal. of each material, color, and sheen applied.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum 5 years documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified with minimum 5 years documented experience.
 1. Only qualified journeypersons, as defined by local jurisdiction, shall be engaged in high-performance coating work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyperson in accordance with trade regulations.
- C. Mockups: Apply mockups of each coating system indicated for each substrate, color, sheen, and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft.
 - b. Doors and Frames: Provide mock-up samples of one complete door and frame.

- c. Railings and Other Lineal Materials: Provide mock-up samples of at least 8 lineal feet.
 - d. Other Items: Architect will designate items or areas required.
- 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
- 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
- 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.9 FIELD CONDITIONS

- A. Apply coatings only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
- B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures of less than 5 deg F above the dew point; or to damp or wet surfaces.
 - 1. Work may continue during inclement weather if surfaces and areas to be coated are enclosed and heated within temperature limits specified by manufacturer during application and drying periods.
- C. Apply coatings only to dry, clean, and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Source Limitations:
 - 1. Provide coating products from same manufacturer, unless otherwise specified.
 - 2. Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats, unless otherwise specified.
 - 3. Exceptions shall be permitted, provided approval of Architect is obtained using specified procedures for substitutions.
- B. High Performance Coating Manufacturers: For each coating specified in Part 2, provide one of the products listed, subject to compliance with requirements. Products shall be from one of the following:
 - 1. Benjamin Moore: Benjamin Moore & Co.: [www: benjaminmoore.com](http://www.benjaminmoore.com).
 - 2. Carboline Company www.carboline.com.
 - 3. PPG: PPG Industries, Inc., Architectural Coatings: www.ppgpaints.com.
 - 4. Sherwin-Williams: The Sherwin-Williams Company: [www: sherwin-williams.com](http://www.sherwin-williams.com).
 - 5. Tnemec: Tnemec Company Inc.: www.tnemec.com.

2.2 HIGH-PERFORMANCE COATINGS, GENERAL

- A. Provide high performance coatings where indicated on Drawings; otherwise provide paints as specified in Section 09 9100 - Painting.
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be 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, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
 - 3. Shop-applied Primer Compatibility for Steel: Field-applied primers and finish (top) coats shall be compatible with one another and shop-applied primers. Refer to Division 05 sections for shop-applied primers for steel.
- C. VOC Content:
 - 1. Determination of VOC Content: Testing and calculation in accordance with 40 CFR 59, Subpart D (EPA Method 24), exclusive of colorants added to a tint base and water added at project site; or other method acceptable to authorities having jurisdiction
 - 2. For field applications that are inside the weatherproofing system, paints and coatings shall comply with the following VOC content limits unless stricter limits are required by authorities having jurisdiction:
 - a. Flat Paints and Coatings: 50 g/L.
 - b. Nonflat Paints and Coatings: 50 g/L.
 - c. Primers, Sealers, and Undercoaters: 100 g/L.
 - d. Rust-Preventive Coatings: 100 g/L.
 - e. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
- D. Supply each coating material in quantity required to complete entire project's work from a single production run.
- E. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- F. Sheen/Gloss Criteria.
 - 1. Product names are not acceptable as gloss level identification.
 - 2. Determine gloss value of paint finish by testing paint samples according to ASTM D523, using 60 degree geometry. Sheen/Gloss levels shall be defined as follows:
 - a. Gloss Level 1: Flat/Matte, value between 0 and 5 units.
 - b. Gloss Level 2: Velvet, value between 5 and 10 units.
 - c. Gloss Level 3: Eggshell, value between 10 and 20 units.
 - d. Gloss Level 4: Satin, value between 20 and 35 units.
 - e. Gloss Level 5: Semigloss, value between 35 and 70 units.
 - f. Gloss Level 6: Gloss, value between 70 and 85 units.
 - g. Gloss Level 7: High Gloss, value more than 85 units.
 - 3. Provide the sheens specified; where sheen is not specified, sheen will be selected later by Architect from the manufacturer's full line.
- G. Colors: As indicated in Room Finish Schedule on Drawings or, if not indicated, to match Architect's samples.
 - 1. For opaque finishes, tint each coat including primer coat and intermediate coats, one-half shade lighter than succeeding coat, with final finish coat as indicated color.

2.3 INTERIOR HIGH PERFORMANCE COATINGS - NON-TRAFFIC SURFACES

A. General:

1. Unless otherwise indicated, each high performance coating system consists of the following:
 - a. Primer: One coat based on substrate material.
 - b. Finish (Top) Coats: Two coats based on required sheen and substrate material.
2. Required Sheens: For each high performance coating, provide paint sheens as follows unless otherwise indicated:
 - a. All High performance coatings: Semigloss.
3. Excludes the following:
 - a. High performance coatings for metals at locations indicated in "Critical High Performance Coatings for Metals" Article below.

B. Interior High Performance Systems – Non-Traffic Surfaces.

1. Primers:

- a. Primer for concrete: Two-component epoxy or acrylic primer.
 - 1) Benjamin Moore:
 - a) Gloss Sheen: Corotech 100 pct Solids Epoxy Pre-Primer V155; DFT 2.0 mils
 - b) Semigloss and Eggshell Sheens: INSL-X Aqua Lock Plus 100 pct Acrylic Primer Sealer, AQ-0XXX; DFT 1.6 mils.
 - 2) Carboline; Sanitile 120; DFT 2.0 mils.
 - 3) PPG; Perma-Crete Interior/Exterior Alkali Resistant Primer, 4-603; DFT 1.5 mils.
 - 4) Sherwin Williams; Loxon Concrete & Masonry Primer-Sealer, LX02; DFT 2.5 mils.
- b. Block Filler/primer for concrete masonry units: Acrylic/latex block filler, water-based.
 - 1) Benjamin Moore; Super Spec Masonry Interior/Exterior Hi-Build Block Filler, 206; DFT 9.0 mils.
 - 2) Carboline; Sanitile 100; DFT 9.0 mils.
 - 3) PPG; Speedhide Interior/Exterior Masonry Hi Fill Latex Block Filler, 6-15; DFT 7.0 mils.
 - 4) Sherwin Williams:
 - a) Gloss Sheen: Pro Industrial Heavy Duty Block Filler - B42 Series; DFT 9.0 mils
 - b) Semigloss and Eggshell Sheens: Loxon Acrylic Block Surfacer LX01 Series; DFT 8.8 mils.
- c. Primer for aluminum, ferrous metal, and galvanized steel: Rust-inhibitive acrylic/latex primer, water-based.
 - 1) Benjamin Moore; Corotech Acrylic Metal Primer, V110; DFT 2.0 mils.
 - 2) Carboline; Carbocrylic 3358; DFT 2.5 mils.
 - 3) PPG; Pitt-Tech Int./Ext. DTM Industrial Primer, 90-712 Series; DFT 3.0 mils.
 - 4) Sherwin Williams; Pro Industrial Pro-Cryl Universal Primer, B66 Series; DFT 3.0 mils.

- d. Primer for gypsum board: Acrylic/latex primer, water-based.
 - 1) Benjamin Moore; Fresh Start Natura Zero VOC Primer, 511; DFT 1.2 mils.
 - 2) Carboline; Sanitile 120; DFT 2.0 mils.
 - 3) PPG; Pure Performance Interior Latex Primer - 9-900; DFT 1.4 mils.
 - 4) Sherwin Williams; ProMar 200 Zero VOC Interior Latex Primer, B28W02600; DFT 1.0 mils.
 - e. Primer for previously painted surfaces; including concrete and masonry: Acrylic/latex stain-blocking primer/sealer with high adhesion, water-based.
 - 1) Benjamin Moore; Fresh Start High-Hiding All Purpose Primer, 046; DFT 1.4 mils.
 - 2) Carboline; Sanitile 120; DFT 2.0 mils.
 - 3) PPG; Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921XI Series; DFT 1.6 mils.
 - 4) Sherwin Williams; PrepRite ProBlock Interior-Exterior Latex Primer-Sealer, B51-600 Series; DFT 1.4 mils.
 - f. Primer for insulated piping and insulated ductwork: Acrylic/latex stain-blocking primer/sealer with high adhesion, water-based.
 - 1) Benjamin Moore; Fresh Start High-Hiding All Purpose Primer, 046; DFT 1.4 mils.
 - 2) Carboline; Sanitile 120; DFT 2.0 mils.
 - 3) PPG; Seal Grip Interior/Exterior Acrylic Universal Primer/Sealer, 17-921XI Series; DFT 1.6 mils.
 - 4) Sherwin Williams; PrepRite ProBlock Interior-Exterior Latex Primer-Sealer, B51-600 Series; DFT 1.4 mils.
2. Finish (Top) Coats:
- a. Gloss Sheen: Two component, waterbased, acrylic epoxy.
 - 1) Finish coats for all surfaces:
 - a) Benjamin Moore; Corotech Acrylic Epoxy V450, Gloss; DFT 1.3 mils
 - b) Carboline; Sanitile 555 VOC; DFT 3.5 mils.
 - c) PPG; Aquapon WB EP-1, Gloss; DFT 3.0 mils.
 - d) Sherwin Williams; Pro Industrial Water Based Catalyzed Epoxy, Gloss, B73 Series, Gloss; DFT 3.5 mils.
 - b. Semigloss Sheen: One component, pre-catalyzed, waterbased, acrylic epoxy.
 - 1) Finish coats for all surfaces:
 - a) Benjamin Moore; Corotech Pre-Catalyzed Waterborne Epoxy Semi-Gloss, V341; DFT 1.5 mils
 - b) Carboline; Sanitile 255 VOC; DFT 2.5 mils.
 - c) PPG; Aquapon WB EP-1, Semi-Gloss; DFT 3.0 mils.
 - d) Sherwin Williams; Pro Industrial Pre-Catalyzed Waterbased Epoxy, Semi-Gloss, K46 Series; DFT 1.5 mils.
 - c. Eggshell Sheen: One component, pre-catalyzed, waterbased, acrylic epoxy.
 - 1) Finish coats for all surfaces:
 - a) Benjamin Moore; Corotech Pre-Catalyzed Waterborne Epoxy Eggshell, V342; DFT 1.5 mils
 - b) Carboline; Sanitile 255 VOC; DFT 2.5 mils.

- c) PPG; Pitt-Glaze WB1 Interior Eggshell Pre-Catalyzed Water-Borne Acrylic Epoxy, 16-310 Series; DFT 2.0 mils.
- d) Sherwin Williams; Pro Industrial Pre-Catalyzed Waterbased Epoxy, Eg-Shel, K45 Series; DFT 1.5 mils.

2.4 ACCESSORY MATERIALS

- A. Accessory Materials: Provide cleaning materials, preparation materials, and miscellaneous materials required to properly prepare and apply coatings.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
 - 1. Concrete: 12 percent.
 - 2. Masonry (Clay and CMUs): 12 percent.
 - 3. Wood: 15 percent.
 - 4. Gypsum Board: 12 percent.
- C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.
- D. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- E. Proceed with coating application only after unsatisfactory conditions have been corrected.
 - 1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations applicable to substrates and paint systems indicated.
- B. Protect adjacent surfaces not to be painted.
- C. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
 - 1. For coatings applied over previously painted surfaces, test application to check for lifting and other adhesion problems. Perform test in an isolated area where practicable.
 - 2. Remove incompatible coatings and primers or apply barrier tie coat as recommended by paint manufacturer and as required to produce paint systems indicated.
- D. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
 - 1. After completing coating operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

- E. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not apply coatings to surfaces if moisture content or alkalinity of surfaces to be coated exceeds that permitted in manufacturer's written instructions.
 - 1. Clean concrete according to ASTM D4258. Allow to dry.
 - 2. Where required or recommended by coating manufacturer, abrasive blast clean surfaces to comply with SSPC-SP 13/NACE No. 6 to produce a uniform surface profile acceptable to manufacturer but not less than ICRI CSP 3.
- F. Masonry Substrates: Remove efflorescence and chalk. Do not coat surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- G. Steel Substrates - Unpainted or Unprimed: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 6 - Commercial Blast Cleaning.
- H. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Sand and scrape to remove loose primer and rust. Feather edges of remaining primer to make inconspicuous.
 - 1. Before painting, applicator/installer shall re-prime entire shop-primed item with primer specified in this section.
- I. Galvanized-Metal Substrates: Remove passivation coating/rinse, grease and oil residue from galvanized metal to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints. Clean using methods recommended in writing by paint manufacturer but not less than ASTM D6386, ASTM D7396, and the following:
 - 1. Remove surface contamination and oils in accordance with SSPC-SP 1 - Solvent Cleaning.
 - 2. Remove loose paint, rust, and other debris according to SSPC-SP 2 - Hand Tool Cleaning.
 - 3. Lightly profile galvanized surfaces and remove zinc oxide and zinc hydroxide layers in accordance with SSPC-SP16 – Brush-Off/Sweep Blast Cleaning.
 - 4. Apply paint within 1 hour of cleaning and preparation.
- J. Previously Painted Surfaces - General:
 - 1. Remove all surface contamination such as, oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, and any other surface contamination.
 - 2. Remove masking tape, labels, adhesives, and other materials that would either be deleterious to adhesion of, or show through, new paint.
 - 3. Scrape all loose, blistered, peeling, scratched or otherwise imperfect paint down to bare substrate and sand adjacent tightly adhering paint to feather edge.
 - 4. Spot prime all bare areas with appropriate primer before priming entire surface.
- K. Previously Fluoropolymer Coated (PVDF) Metals:
 - 1. Remove all surface contamination such as, oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, mortar, and any other surface contamination.
 - a. Comply with SSPC-SP 1 - Solvent Cleaning.
 - 2. Scrape all loose, blistered, peeling, scratched or otherwise imperfect paint down to bare substrate and sand adjacent tightly adhering paint to feather edge.
 - 3. Abrade substrate to remove gloss and obtain a surface profile of 1 mil. Remove dust and debris.
 - 4. Spot prime all bare areas with appropriate primer before priming entire surface.

L. Repair of Existing Gypsum Board:

1. Fill hairline cracks, small holes, and imperfections with filler compound and sand smooth.

3.3 APPLICATION - GENERAL

A. Apply coatings according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.

B. Provide smooth, opaque coatings of uniform finish, color, appearance, and coverage without brush marks, runs, sags, laps, ropiness, holidays, spotting, cloudiness, or other surface imperfections.

C. Terminate coatings in neatlines; cut in sharp lines and color breaks.

D. Apply coating products to properly prepared surfaces.

1. Do not apply coatings over dirt, rust, scale, grease, moisture, or other conditions detrimental to application of coatings.

E. Primers:

1. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
2. Apply first coat of primer to surfaces as soon as practical after preparation and before subsequent surface deterioration.
3. Re-prime shop-primed surfaces.

F. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.

1. Sand between coats as recommended by manufacturer; before applying next coat clean surfaces of loose particles and use tack cloth to remove any remaining dust and particles just prior to applying next coat.

G. Provide completed work matching approved samples for color, sheen, texture, coverage and quality of work.

1. Remove, refinish, or repaint work not complying with requirements.

H. Number of Coats: Each coating system in Part 2 specifies a number of coats. This is the minimum number required.

1. If undercoats, stains, or other imperfections are visible after final coating is applied, apply additional coats until paint is of uniform finish, color, and appearance without defects or imperfections.

I. Minimum Coating Thickness: Provide dry film thickness for each coating as indicated, but not less than that recommended by the coating manufacturer.

1. Number of coats and film thicknesses required are same regardless of application method.
2. Ensure edges, corners, crevices, welds, and exposed fasteners receive dry film thickness equivalent to that of flat surfaces.

3.4 SURFACES TO BE COATED

A. Refer to Section 09 9100 - Painting

3.5 SURFACES NOT TO BE COATED

- A. Refer to Section 09 9100 - Painting

3.6 IDENTIFICATION AND COLOR CODING

- A. Refer to Section 09 9100 - Painting.

3.7 FIELD QUALITY CONTROL

- A. Subject to the opinion of the Architect, coatings shall be rejected and considered unacceptable for any of the following reasons:
 - 1. Lacking minimum dry film thicknesses.
 - 2. Poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, and corners.
 - 3. Damage from touching, or disturbing coatings in any other manner, before sufficiently dry.
 - 4. Damage from application to moist surfaces or damage caused by inadequate protection from the weather.
 - 5. Damage or contamination of coatings from blown contaminants including but not limited to dust.
 - 6. Coatings shall be rejected if any of the following are evident under natural lighting for exterior surfaces and final lighting source, including daylighting, for interior surfaces:
 - a. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
 - b. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
 - c. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles from a distance of not less than 48 inches.
- B. Visible defects are defined as follows:
 - 1. Brush and roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
 - 2. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.
- C. Rejected coatings shall be repaired or replaced at the expense of the Contractor.
 - 1. Small affected areas shall be touched up.
 - 2. Large affected areas shall be repainted.
 - 3. Small and large areas shall be as defined by the Architect.
 - 4. Areas without sufficient dry film thickness shall be repainted.
 - 5. Paint runs and sags shall be removed by scraper or sanding and repainted.

3.8 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
 - 1. Do not clean equipment with free-draining water. Prevent solvents, thinners, cleaners, and other contaminants from entering waterways, sanitary and storm drain systems, and ground.
 - 2. Dispose of contaminants in accordance with requirements of authorities having jurisdiction.
 - 3. Allow empty paint cans to dry before disposal.
- B. After completing coating application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

- C. Protect work of other trades against damage from coating application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced coatings surfaces.

END OF SECTION 09 9600

SECTION 10 2113 – FRP-CLAD TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes:
 - 1. FRP-clad toilet partitions and compartments.
 - 2. Urinal screens.

1.3 DEFINITIONS

- A. FRP: Fiberglass reinforced plastic

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for toilet compartments.
- B. Shop Drawings: For toilet compartments.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Show locations of cutouts for compartment-mounted toilet accessories.
 - 3. Show locations of centerlines of toilet fixtures.
 - 4. Show locations of floor drains.
 - 5. Show overhead support or bracing locations.
- C. Samples for Initial Selection: For each type of toilet compartment material indicated.
 - 1. Include Samples of hardware and accessories involving material and color selection.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes unless otherwise indicated:
 - 1. Each type of material, color, and finish required for toilet compartments, prepared on 6-inch-square Samples of same thickness and material indicated for Work.
 - 2. Each type of hardware and accessory.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer and installer.
- B. Product Certificates: For each type of toilet compartment.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For toilet compartments to include in maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Door Hinges: Equal to two percent of total installed but not less than 4; include hinge(s) with associated fasteners.
 - 2. Latch and Keeper: Quantity equal to 2 percent of total installed, but not less than 4; include latch(es) and keeper(s) with associated fasteners.
 - 3. Door Bumper: Quantity equal to 2 percent of total installed, but not less than 4; include door bumper(s) with associated fasteners.
 - 4. Door Pull: Quantity equal to 2 percent of total installed, but not less than 4; include door pull(s) with associated fasteners.
 - 5. Fasteners: Quantity equal to 2 percent of total installed, but not less than 10 fasteners of each size and type.

1.8 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than 5 years documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least 5 years of documented experience.

1.9 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 PERFORMANCE REQUIREMENTS

- A. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Flame-Spread Index: 25 or less.
 - 2. Smoke-Developed Index: 450 or less.
- B. Regulatory Requirements: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines for Buildings and Facilities and ICC A117.1 for toilet compartments designated as accessible.

2.2 FRP-CLAD TOILET COMPARTMENTS

- A. Manufacturer: Subject to compliance with requirements, provide products by the following:
 - 1. Special-Lite, Inc.: www.special-lite.com.
 - 2. Substitutions not permitted.
- B. Toilet-Enclosure Style: Half-height, floor-mounted.
- C. Urinal-Screen Style: Wall hung.

- D. Panel Construction: Extruded aluminum perimeter framing with poured-in-place foam core and FRP face sheets.
1. Framing: Extruded aluminum, ASTM B221, alloy 6063, temper T5.
 - a. Channel profile with integral reglets to accept FRP face sheet on both sides of panel.
 - 1) Channel shall secure face sheets in place with flush appearance.
 - 2) Provide mitered corners, mechanically fastened with stainless steel fasteners.
 2. Foam Core: Poured-in-place foam.
 - a. Manufacturer's standard polyurethane foam.
 - 1) Density: 5 pcf; ASTM D1622.
 - 2) Compressive Strength: 60 psi; ASTM D1621.
 - 3) Tensile and Tensile Adhesion Properties: ASTM D1623.
 - a) FRP Facer, 3 inches square: 53 psi, minimum.
 - b) FRP Facer, 5 inches square: 104 psi, minimum.
 - 4) Thermal and Humid Aging: ASTM D2126; volume change at 158 degrees F and 100 percent humidity; 13 percent, maximum at 14 days.
 3. Face Sheets: Fiberglass reinforced plastic (FRP).
 - a. Thickness: 0.090 inch.
 - b. Texture: Pebble grain.
 - c. Colors – TP-01: As indicated in Color Codes on Drawings.
 - d. Performance:
 - 1) Flexural Strength: 8,500 psi, ASTM D790.
 - 2) Flexural Strength: 5,000 psi, ASTM D638.
 - 3) Barcol Hardness: 35, ASTM D2583.
 - 4) Izod Impact: 6 ft-lb per in, ASTM D256
 - 5) Gardner Impact Strength: 30 in-lb, ASTM D5420.
 - 6) Water Absorption: 0.16 percent, maximum after 24 hours at 77 degrees F, ASTM D570.
 - 7) Taber Abrasion Resistance: Taber test, CS-17 wheels, 1,000g weight, 25 cycles; 0.01 percent maximum weight loss.
- E. Doors:
1. Thickness: 1-1/4 inch.
 2. Width: 24 inch, unless otherwise indicated.
 3. Width for Handicapped Use: 36 inch, out-swinging, unless otherwise indicated.
 4. Height: As indicated on Drawings.
- F. Panels:
1. Thickness: 1-1/4 inch.
 2. Height: As indicated on Drawings.
 3. Widths: As indicated.

G. Pilasters:

1. Thickness: 1-1/4 inch.
2. Width: As required to fit space; minimum 3 inch.

H. Urinal Screens: Wall mounted with continuous panel brackets.

1. Thickness: 1-1/4 inch.
2. Width: 24 inches, unless otherwise indicated.
3. Height: 42 inches, unless otherwise indicated.

2.3 HARDWARE AND ACCESSORIES

A. Hardware: Manufacturer's heavy-duty operating hardware and accessories.

1. Continuous Hinges: Full mortise continuous aluminum hinge, gravity self-positioning.
2. Door Latch: Aluminum strike and slide-type latch; surface-applied and through bolted.
 - a. Latches shall have exterior emergency access feature.
3. Doorstop: Manufacturer's standard hollow bulb type.
 - a. Install full length door stop to pilasters; for outswinging doors, apply stop to door.
4. Door Pull: Manufacturer's standard pull; install on outswinging doors and all ADA/barrier free doors.
5. Coat hook with rubber bumper; one per compartment, mounted on door.

B. Pilaster Shoes: Formed aluminum ASTM B209, 4 inch high, concealing floor fastenings.

1. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.

C. Wall, Pilaster and Urinal Screen Brackets: Aluminum; continuous type.

1. Provide full height T-shaped brackets at walls.
2. Provide full height T-shaped brackets at urinal screens.
3. Provide U and H-shaped brackets at all other locations.

D. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.

1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.

2.4 ALUMINUM FINISHES

A. Class I Natural Anodized Finish: Clear anodic coating; AAMA 611, minimum dry film thickness 0.7 mils.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas and conditions, with Installer present, for compliance with requirements for fastening, support, alignment, operating clearances, and other conditions affecting performance of the Work.

1. Confirm location and adequacy of blocking and supports required for installation.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Coordinate layout and installation of supports, inserts, and anchors built into other units of work for toilet compartment anchorage.

3.2 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position indicated with manufacturer's recommended anchoring devices.
- B. Install partitions secure, rigid, plumb, and level in accordance with manufacturer's instructions.
 - 1. Urinal Screens: Attach with anchoring devices to suit supporting structure. Set units level and plumb, rigid, and secured to resist lateral impact.
- C. Maintain 3/8 inch to 1/2 inch space between wall and panels and between wall and end pilasters.
- D. Align tops of doors and panels.
- E. Attach panel brackets securely to walls using anchor devices.
- F. Wall fasteners shall be located at masonry and tile joints; do not penetrate masonry or tile faces.
- G. Align wall brackets and pilaster brackets.
- H. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- I. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.3 TOLERANCES

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation From Plumb: 1/8 inch.

3.4 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 10 2113

SECTION 10 2800 - TOILET AND BATH 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. This Section includes the following toilet and bath accessory items:

- 1. Grab bars.
- 2. Framed mirrors.
- 3. Sanitary napkin disposal unit.
- 4. Sanitary napkin dispenser unit.

- B. Owner-Furnished/Contractor Installed (OF/CI) Material:

- 1. Toilet tissue dispensers.
- 2. Paper towel dispensers.
- 3. Soap dispensers.

- C. Related Sections include the following:

- 1. Section 10 2113 "Toilet Compartments" for toilet compartments.

1.3 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. Samples: Full size, for each accessory item to verify design, operation, and finish requirements.

- 1. Approved full-size Samples will be returned and may be used in the Work.

- C. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

- 1. Identify locations using room designations indicated on Drawings.
- 2. Identify products using designations indicated on Drawings.

- D. Maintenance Data: For toilet and bath accessories to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. Source Limitations: For products listed together in the same articles in Part 2, provide products of same manufacturer unless otherwise approved by Architect.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

1.5 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.

1.6 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, 0.0312-inch minimum nominal thickness, unless otherwise indicated.
- B. Brass: ASTM B 19 flat products; ASTM B 16, rods, shapes, forgings, and flat products with finished edges; or ASTM B 30, castings.
- C. Steel Sheet: ASTM A 1008, Designation CS (cold rolled, commercial steel), 0.0359-inch minimum nominal thickness.
- D. Galvanized Steel Sheet: ASTM A 653, with G60 hot-dip zinc coating.
- E. Galvanized Steel Mounting Devices: ASTM A 153, hot-dip galvanized after fabrication.
- F. 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.
- G. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).
- H. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

2.2 WASHROOM ACCESSORIES

- A. Toilet Tissue Dispenser: Owner furnished/Contractor installed.
- B. Paper Towel Dispenser: Owner furnished/Contractor installed.

- C. Waste Receptacle: Owner furnished and installed.
- D. Liquid Soap Dispenser, Wall or Mirror-Mounted: Owner furnished/Contractor installed.
- E. Sanitary Napkin Disposal Unit: Owner furnished/Contractor installed.
- F. Sanitary-Napkin Disposal Unit:
 - 1. Description: Top-opening unit with recessed finger pull.
 - 2. Mounting: Surface mounted.
 - 3. Operation: Self-closing, disposal door.
 - 4. Capacity: 1/2 gallon.
 - 5. Material: Stainless steel with reusable vinyl waste receptacle liner.
 - 6. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-254.
- G. Sanitary-Napkin Dispenser Unit:
 - 1. Mounting: Semi-recessed.
 - 2. Operation: Push-button, ADA compliant. Factory pre-set for "free" operation, not requiring coin.
 - 3. Capacity: 30 tampons, 20 napkins.
 - 4. Material: Stainless steel with all-welded construction.
 - 5. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-47064.
- H. Mirrors:
 - 1. Frame: Stainless steel angle, 0.05 inch thick; with corners welded and ground smooth.
 - 2. Hangers: Manufacturer's standard rigid, tamper and theft resistant.
 - 3. Size: As indicated on Drawings but not less than 24 inches wide by 30 inches high.
 - 4. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-290.
- I. Grab Bars:
 - 1. Mounting: Flanges with concealed fasteners.
 - 2. Material: Stainless steel with smooth, satin, slip-resistant finish.
 - 3. Outside Diameter: 1-1/2 inches.
 - 4. Configuration and Length: As indicated on Drawings.
 - 5. Basis-of-Design Product: Bobrick Washroom Equipment, Inc.; B-6806 Series.

2.3 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.

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 method in 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 10 2800

SECTION 22 0500 – COMMON WORK RESULTS FOR MECHANICAL

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 work of this Section.

1.2 SUMMARY

- A. This Section includes general administrative and procedural requirements for mechanical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 01 Sections.
 - 1. Substitutions
 - 2. Permits and fees
 - 3. Submittals
 - 4. Coordination drawings
 - 5. Record drawings
 - 6. Maintenance manuals
 - 7. Rough-ins
 - 8. Mechanical installations
 - 9. Cutting and patching
- B. This Section includes basic requirements for materials and installations for mechanical work, including but not limited to:
 - 1. Mechanical demolition work
 - 2. Excavating and backfill
 - 3. Concrete
 - 4. Sleeves
 - 5. Sealing of openings
 - 6. Access doors
 - 7. Touch-up painting
 - 8. Basic electrical requirements and methods

1.3 REFERENCES

- A. The mechanical and physical properties of all materials, and the design, performance characteristics, and methods of construction of all items of equipment, shall be in accordance with the latest issue of the various, applicable Standard Specifications:

1.4 SYSTEM DESCRIPTION

- A. Design Requirements: Furnish all labor, materials, equipment, technical supervision, and incidental services required to complete, test and leave ready for operation the mechanical systems as specified in the Division 22 and 23 Sections and as indicated on Drawings.
 - 1. The Mechanical Drawings indicate the general design and extent of all equipment, piping and ductwork. Comply with the Drawings as closely as actual construction of the building and the work of other trades permit.

- B. Substitutions: Base Bid must be in accordance with materials or products specified. Any exceptions to this must be approved in writing by the Architect/Engineer ten (10) days or more prior to bidding.
 - 1. Voluntary alternates may be submitted for consideration, with listed addition or deduction to the Bid, but will not affect the awarding of the Contract.
- C. Permits and Fees: Obtain all permits, licenses, inspections and test required. Upon completion of the Work, obtain and send certificates of inspections and approvals to the Architect/Engineer.
 - 1. Pay all fees and expenses for permits, licenses, tests and inspections.
- D. Examination of Drawings and Premises: Before submitting Bids, examine the architectural, electrical and other trades' drawings and specifications.
 - 1. Notify Architect/Engineer should any discrepancies occur between them and the mechanical work.
 - 2. No additional charges will be allowed because of failure to make this examination, or to include all materials and labor required for the Work.
 - 3. Before submitting Bids, examine the premises to determine existing conditions for performing the Work. No additional charges will be allowed because of failure to make this examination or to include all materials and labor to complete the Work.
 - 4. The Architectural Drawings take precedence in all matters pertaining to the building structure, Mechanical drawings in all matters pertaining to Mechanical trades and Electrical drawings in all matters pertaining to Electrical trades installation. However, where there are conflicts or differences between the Drawings for the various trades, report such conflicts or differences to the Architect/Engineer who shall determine the course of action to be taken.
- E. Changes Involving Electrical Work: The design of the mechanical systems is based on the equipment specified and scheduled on the Drawings.
 - 1. Where equipment changes are made that involve additional electrical work (larger size motors, additional wiring of equipment, etc.) the Mechanical trades involved shall compensate the electrical trades for the cost of the additional Work required.
- F. Performance Requirements: Perform all work in a first class and workmanlike manner, in accordance with the latest accepted standards and practices for the Trades involved.
- G. All equipment of the same or similar systems shall be by the same manufacturer.

1.5 SUBMITTALS

- A. The following is in addition to the requirements for submittals in Division 01.
- B. Material List: Submit a complete list of all materials and equipment, and their manufacturers, for approval by the Architect/Engineer within 15 days after award of contract and prior to submittal of shop drawings.
- C. Shop Drawings: Prepare shop drawings drawn to scale and submit one (1) transparency copy and two (2) prints of each to the Architect/Engineer for review, together with required number of additional copies as required by the General Conditions. After the shop drawings are reviewed, the transparency copy will be stamped and returned for printing and distribution. Refer to Division 01 for submittals and quantities.
 - 1. Submit shop drawings of all sheet metal ductwork with necessary sections, details, dimensions, etc.
 - a. All sheet metal shop drawings shall bear balance agency approval stamp prior to submittal to Architect/Engineer.
 - b. Submit shop drawings and product data for all equipment, materials, valves, plumbing and heating specialties, pipe hangers, wiring diagrams and control diagrams including but not limited to items indicated below.

- D. No apparatus or equipment shall be shipped from stock or fabricated until shop drawings for them have been reviewed by the Architect/Engineer. By the review of shop drawings, the Architect/Engineer does not assume responsibility for actual dimensions or for the fit of completed work in position, nor does such review relieve Mechanical Trades of full responsibility for the proper and correct execution of the work required.
- E. Coordination Drawings: Detail major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Show space requirements for installation and access. Indicate if sequence and coordination of installations are important to efficient flow of the Work. Include the following:
 - 1. Planned piping layout, including valve and specialty locations and valve-stem movement.
 - 2. Clearances for installing and maintaining insulation.
 - 3. Clearances for servicing and maintaining equipment, accessories, and specialties, including space for disassembly required for periodic maintenance.
 - 4. Equipment and accessory service connections and support details.
 - 5. Exterior wall and foundation penetrations.
 - 6. Fire-rated wall and floor penetrations.
 - 7. Sizes and location of required concrete pads and bases.
 - 8. Scheduling, sequencing, movement, and positioning of large equipment into building during construction.
 - 9. Floor plans, elevations, and details to indicate penetrations in floors, walls, and ceilings and their relationship to other penetrations and installations.
 - 10. Reflected ceiling plans to coordinate and integrate installation of air outlets and inlets, light fixtures, communication system components, sprinklers, and other ceiling-mounted items.
- F. Submit shop drawing with all pertinent data and with identification mark number or symbol numbers as specified or scheduled on the Mechanical Drawings.
- G. Shop drawings shall be reviewed by the Mechanical Contractor for completeness and accuracy prior to submitting to the Architect/Engineer for review. The shop drawings shall be dated and signed by the Mechanical Contractor prior to submission.
- H. Where the shop drawings consist of manufacturer's standard detail drawing or schedules and contain data for a variety of similar equipment, indicate the data pertinent to the equipment furnished for this project only. Standard detail drawings and schedules not clearly indicating which data is associated with this Project shall be returned "Rejected".
- I. Where accessories and/or options are specified and do not appear as part of manufacturer's standard detail drawings, state each accessory that is to be provided with the equipment on the standard detail drawings.
- J. Partial submittals for equipment will not be permitted. Where partial submittals are transmitted to the Architect/Engineer, they will be returned "Rejected".
- K. Plumbing fixture submittals shall be submitted as one (1) package including all fixtures intended to be used for this Project.
- L. Submittal Preparation: Shop drawing shall be submitted using the IDS "Submittal Form". Provide one (1) form for each project manual section number. The mechanical contractor shall fill out each submittal following the instructions printed on the back of the submittal form.
- M. Submit manufacturer's submittals on all major mechanical systems and/or equipment, including:
 - 1. Motors
 - 2. Hangers and Supports
 - 3. Mechanical Vibration Controls
 - 4. Mechanical Identification
 - 5. Duct Insulation
 - 6. Pipe Insulation

7. Valves
8. Meters and Gages
9. Domestic Water Piping
10. Sanitary Waste and Vent Piping
11. Storm Drainage Piping
12. Fuel Gas Piping
13. Hydronic Piping
14. Rooftop Units
15. Heating Hot Water Piping
16. Metal Ducts
17. Duct Accessories
18. Diffusers, Registers, and Grilles
19. HVAC Instrumentation and Controls
20. Vibration Isolators
21. Terminal Units

N. Project Record Documents: Revise shop drawings as required during construction to indicate the as-built condition.

1. At the completion of the Project, resubmit to the Owner's Representative the revised sepias and one set of prints for Owner's record.
2. Furnish and deliver to the Owner's Representative a manual of all shop drawings and product data upon substantial completion. The manual shall consist of a standard hard cardboard, vinyl covered, 3-ring binder, letterhead size, 8-1/2" x 11". Shop drawings shall be folded and punched. All items and pages shall be numbered with typewritten index inserted at front of manual.
3. Submit final project record documents as described in Division 01.

O. Operation and Maintenance Data: Retain operating instructions, service instructions, parts lists, etc., which are shipped with mechanical equipment. On completion of the work, give these items to the Architect/Engineer, for the Owner's use. If this information is not shipped with the equipment, obtain from the manufacturer.

1. Furnish three (3) sets of bound operating instructions to the Architect/Engineer. Each set shall include:
 - a. One (1) copy of all shop drawings
 - b. Operating and maintenance instructions
 - c. As-built drawings

1.6 BASIC ELECTRICAL REQUIREMENTS AND METHODS

- A. For Electrical Work provided in Division 22 and 23 Sections, furnish UL Listed components, in accordance with Division 26 and applicable NEMA and NEC (ANSI C 1) requirements. Provide wiring, external to electrical enclosures, in conduit. All electrical work provided by this Contractor shall conform to Division 26 requirements.
- B. Heat-producing or spark-generating electrical devices located within Class I< Division I, Group D areas and Class I, Division II, Group D areas shall bear UL Label rated for the exposure.
- C. For equipment specified in Divisions 22 and 23 and provided with electrical characteristics requirements other than that specified or indicated, include necessary electrical wiring, components and transformer equipment selected to assure maximum efficiency operation.
- D. Provide specialty instrument wiring necessary to operation of a component, assembly or system as part of the work in Divisions 22 and 23.
- E. Coordinate the number of auxiliary N.O. and N.C. contacts to be provided as part of the Work to accommodate equipment and functions specified or indicated as part of the work under these Sections.

- F. Provide electrical work required for the operation of components and assemblies provided as part of the Work in Division 22 and 23 Sections but not specified or indicated as part of the Work in Division 26.
- G. Where “packaged-self-contained” equipment is specified, only one power supply shall be provided to that equipment as a part of the Work under Division 26 Sections, except as otherwise modified or supplemented by the Contract Documents for that item. All other electrical equipment including starters and wiring is part of the Work in Division 26 Sections.
- H. Where “packaged” equipment is specified, one or more power supplies and interconnecting control wiring may be required to provide a complete, operating unit. Any required intercomponent and interassembly power or control wiring shall be provided as part of the Work of Divisions 22 and 23 per the applicable requirements of Division 26.
- I. Mount line voltage (120 VAC) control components specified as part of the Work under Division 22 and 23 Sections for connection as part of the work under Division 26.
- J. Refer to Electrical Drawings and Division 26 for specific information regarding provisions for and arrangement of electrical circuits and components and for interface with Work specified under Divisions 22 and 23.
- K. Electrical testing of motors is specified as part of the Work under Division 26.
- L. Shop Drawings: Submit for review drawings indicating power, control and instrument wiring, including ladder diagrams, for field work as well as factory assembled work. Manufacturer’s drawings are acceptable only when modified and supplemented to reflect project conditions. The drawings shall include:
 - 1. Wiring diagrams showing the wiring layout of component assemblies or systems.
 - 2. Interconnection wiring diagrams showing terminations of interconnecting conductors between component assemblies, systems, control devices, and control panels complete with conductor identifications, number of conductors, conductor and conduit size.
 - 3. Sequence of operation for components, assemblies or systems.
- M. Shop drawings for motor-driven equipment shall be accompanied by complete information concerning the respective motors including the following:
 - 1. Principal dimensions
 - 2. Weights
 - 3. Horsepower
 - 4. Voltage, phase, frequency
 - 5. Speed
 - 6. Class of insulation
 - 7. Enclosure type
 - 8. Frame
 - 9. Bearings including AFBMA Rating Life (L-10 basis)
 - 10. Design letter
 - 11. Manufacturer
- N. Product Data: Submit catalogues, guaranteed performance data with efficiency and power factory indicated at 75% and 100% of rated load and verification of conformance with other requirements of the Contract Documents. The information enumerated under NEMA MG1 Paragraph MG1-10.38, shall be arranged on one sheet for each motor.
- O. Submit rotating equipment actual noise levels by sound pressure level in preferred octave bands for approval.

1.7 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Ordinances and Codes: Perform all work in accordance with applicable Federal, State and local ordinances and regulations, the Rules and Regulations of ASHRAE, NFPA, SMACNA and UL, unless otherwise indicated.
 - a. Notify the Architect/Engineer before submitting his proposal should any changes in Drawings or Specifications be required to conform to the above codes, rules or regulations. After entering into Contract, make all changes required to conform to above ordinances, rules and regulations without additional expense to the Owner.
 - b. Barrier-Free Regulations: Comply with the requirements of the State of Michigan Handicapped Barrier-Free Regulations and with the Americans with Disabilities Act (ADA).

1.8 DELIVERY, STORAGE AND HANDLING

A. Storage and Protection: Provide adequate storage space for all mechanical equipment and materials delivered to the job site under a weather protected enclosure. Location of the space will be designated by the Owner's Representative. Equipment set in place in unprotected areas must be provided with temporary protection.

1. Be responsible for the care and protection of mechanical equipment until it has been fully tested and accepted.
 - a. Protect equipment and materials from damage or theft.
2. Protect materials with permanent factory finish from damage by covering.
3. Protect materials with enamel or glaze surfaces by covering or coating as recommended in "Handling and Care of Enameled Cast Iron Plumbing Fixtures" bulletin, issued by the Plumbing Fixtures Manufacturers Association and as approved.
4. Coat polished or plated metal parts with white petroleum jelly immediately after installation.
5. Protect equipment outlets, pipe and duct openings with temporary plugs or caps.
6. Care and protection of electrical equipment furnished by Mechanical Trades and installed by Electrical Trades shall be the responsibility of the Electrical Trades after receiving equipment from Mechanical.

1.9 PROJECT/SITE CONDITIONS

A. Field Measurements:

1. Drawings are not intended to be scaled for roughing-in or to serve as shop drawings. Take all field measurements required for fitting the installation to the building.

1.10 SEQUENCING AND SCHEDULING

- A. Sequence and schedule work so as to avoid interference with the work of other Trades. Be responsible for removing and relocating any work which in the opinion of the Owner's Representatives causes interference.
- B. Coordinate mechanical equipment installation with other building components.
- C. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
- D. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components, as they are constructed.

- E. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning before closing in building.
- F. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
- G. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Section 08311 "Access Doors."
- H. Coordinate installation of identifying devices after completing covering and painting, if devices are applied to surfaces. Install identifying devices before installing acoustical ceilings and similar concealment.

1.11 WARRANTY

- A. Warranty: Warranty the mechanical installation to be free from defects and replace or repair, to the satisfaction of the Owner, any part of the mechanical installation which may fail within a period of one year after substantial completion, provided that such failure is due to defects in materials or workmanship or to failure to follow the Contract Documents.
 - 1. File with the Owner any and all warranties from equipment manufacturers and what operating conditions and performance capacities they are based on. Refer to Division 01 Sections.

1.12 MAINTENANCE

- A. Maintenance Materials: Retain all portable and detachable portions of the installation such as keys, tools, manuals, etc., until the completion of the work and then turn them over to the Owner and obtain itemized receipt. This receipt shall be attached to the "Final Application" for payment.

PART 2 - PRODUCTS

2.1 MECHANICAL EQUIPMENT – GENERAL

- A. All major items of equipment shall be furnished complete with all accessories normally supplied with the catalog items listed and all other accessories necessary for a complete and satisfactory operating system. All equipment and materials shall be new and shall be standard products of manufacturers regularly engaged in the production of plumbing, heating, ventilating and air conditioning equipment and shall be the manufacturer's latest design.

2.2 ACCESS DOORS

- A. Furnish access doors as required to make accessible all valves, controls, coils, motors, air vents, filters, motorized dampers, electrical boxes and other equipment installed by Mechanical trades or as required by Code. Refer to Section 08 3113 for the type of access doors required. Refer to drawings and specifications for the type of access door to be provided at the outside air intake duct.

2.3 SEALING OF OPENINGS

- A. Seal openings around pipes in sleeves and around duct openings through walls, floors and ceilings, and where floors, fire rated walls and smoke barriers are penetrated. (Fiberglass is not acceptable.) Fire and/or smoke barriers shall be UL Listed fire and smoke stop fittings and shall have fire rating equal to or greater than the penetrated barrier. Refer to Section 07 8413 "Firestopping".

2.4 SLEEVES

- A. Provide sleeves where pipes pass through floors, walls, and ceilings.

- B. Sleeves shall be steel pipe. Where specific sizes are not indicated on the Drawings, sleeves shall be sized to provide one-half (1/2) inch clearance around the outside surface of the item for which they were installed. They shall be cut flush with wall and ceiling surfaces in finished areas and shall extend one-half inch above floor. Sleeves shall be packed with approved non-combustible packing material and sealed with sealant to prevent passage of air, liquid or fumes from one area to another. The filler and sealant materials used shall be rated at least equal in fire resistance to the construction material being penetrated. Floor sleeves shall be sealed between floor and sleeve with concrete grout. Refer to Section 07 8413 "Firestopping".

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION WORK

- A. General: Perform mechanical demolition work in a systematic manner. Use such methods as outlined below to complete Work indicated on Drawings.
- B. Obtain approval from the Owner prior to interrupting existing services. All service interruptions shall be at a time suitable to the Owner. Where the Owner approves service interruptions at times resulting in premium time to this Contractor, this Contractor shall include the premium time in his Base Bid.
- C. Remove existing mechanical equipment, components and materials, including but not limited to piping, air handling units, heating units, plumbing fixtures, pumps, supports and other mechanical items made obsolete by the new work.
 - 1. Where existing equipment is removed, piping shall be capped under floor or behind face of wall.
- D. Work that has been cut or partially removed shall be protected against damage.
- E. Materials salvaged from this work shall not be reused except where reuse is specifically indicated.
- F. Existing fixtures and mechanical equipment removed, not reused and not specifically indicated to be turned over to the Owner shall be legally and properly disposed of off Owner's property.
- G. Existing fixtures and mechanical equipment specifically indicated to be turned over to the Owner shall be carefully disconnected, removed and turned over to the Owner in a storage area as directed by the Owner.

3.2 TEMPORARY SERVICES

- A. Provide temporary water and heat service as described in Division 01.
- B. New equipment installed shall not be used for temporary construction use without prior written approval from Owner's representative.

3.3 CUTTING AND PATCHING

- A. Refer to Division 01 for requirements for cutting, patching and refinishing work necessary for the installation of Mechanical Work.
- B. The drilling or punching of structural members, such as holes through beams or columns, shall not be done without the specific permission of the Architect/Engineer.
- C. Cutting of holes through floors and walls shall be done only at such locations as may be directed by the Architect/Engineer.
- D. Cooperate with the other Contractors so that all cutting and repairing in any given area will be done simultaneously.

3.4 DAMAGE TO OTHER WORK

- A. The Mechanical Trades will be responsible for all damage to other Work caused by their Work or through the neglect of their workers.
 - 1. All patching and repairing of any such damaged Work shall be performed by the trades that installed the Work, but the cost shall be paid by the Mechanical Trades.

3.5 CHASES AND RECESSES

- A. Provide sizes and locations of chases and recesses affecting the mechanical work for provision by general trades.

3.6 EQUIPMENT FOUNDATIONS AND SUPPORTS

- A. Furnish foundations and supports for mechanical equipment and materials as required by codes, as listed hereinafter and shown or noted on the Drawings.
- B. Provide necessary inserts, rod, structural steel frames, brackets, platforms, etc., for equipment suspended from ceilings or walls.
- C. Inserts for equipment support shall be lead shield anchors for small work and expansion shields for large work. Wooden plugs will not be allowed. Do not use metal roof decking and cellular floors for supporting equipment.
- D. Concrete bases shall be provided by Architectural Trades, the correct size and location shall be by Mechanical Trades. Mechanical Trades shall furnish and locate anchor bolts and sleeves, for installation by Architectural Trades.

3.7 STRUCTURAL AND ELECTRICAL INTERFERENCES

- A. Should construction conditions prevent the installation of mechanical equipment at locations shown on the drawings, minor deviations may be permitted and shall be as directed by the Architect/Engineer, and shall be made without additional cost to Owner.

3.8 COORDINATION WITH OTHER TRADES

- A. Install Work so as to avoid interferences with the Work of other trades. Be responsible for removing and relocating any work that, in the opinion of the Owner's Representative, causes interferences.

3.9 ASSEMBLY OF EQUIPMENT

- A. The Contract Drawings and Specifications indicate items to be purchased and installed which are noted by a manufacturer's name, catalog number and/or brief description.
- B. The catalog number may not designate all the accessory parts and appurtenances required for the particular use or function.
- C. Arrange with the manufacturer for the purchase of all items required for the complete installation and efficient operation.

3.10 LUBRICATION

- A. Provide all oil for the operation of the equipment until substantial completion. Contractor shall be held responsible for all damage to bearings while the equipment is being operated by him up to the date of acceptance of the equipment. Protect all bearings and shafts during installation and thoroughly grease the

steel shafts to prevent corrosion. All motors and other equipment shall be provided with covers as required for proper protection during construction.

3.11 EQUIPMENT CONNECTIONS

- A. Connections to equipment, fixtures, etc., shall be made in accordance with the shop drawings and rough-in measurements furnished by the manufacturers of the particular equipment furnished. Any and all additional connections not shown on the Drawings but called for by the equipment manufacturer's shop drawings or required for the successful operation of the particular equipment furnished shall be installed as part of this Contract at no additional charge to the Owner.
- B. All fittings connecting to equipment on piping 2-1/2 inches and above in size, shall be flanged, standard weight pattern with flat machine face provided with ring gaskets.
- C. All fittings connecting to equipment on piping 2 inches and below in size, shall be made with unions.
- D. All piping connections to pumps and other equipment shall be installed without strain at the pipe connection of the equipment.
 - 1. When directed, remove the bolts in flanged connections or disconnect piping to demonstrate that piping has been so connected.
- E. Brass couplings shall be used to connect dissimilar metals (such as steel and copper) to prevent electrolytic action.

3.12 CLEANING PIPES FOR OBSTRUCTIONS

- A. Pipes which are installed underground or concealed in concrete floor slab, foundations, etc., shall be cleared of foreign material and obstructions after installation.

3.13 PAINTING

- A. In general, no painting is required by Mechanical Trades other than touch-up of factory-finished mechanical equipment.
- B. All factory finished mechanical equipment shall be cleaned at completion of the job. Equipment showing rust or mars shall be thoroughly cleaned and sanded, prime coated and touched up with enamel of color to match original finish.

3.14 FIELD QUALITY CONTROL

- A. Tests and Inspection: When the systems are completed, operate equipment as directed by Architect/Engineer. Replace all faulty equipment. Make necessary adjustments before final acceptance.
 - 1. Perform all tests required by State, City, County and/or other agencies having jurisdiction.
 - 2. Provide all materials, equipment, etc., and labor required for tests.

3.15 CLEANING

- A. Keep premises free from accumulation of waste materials and rubbish. At completion of work remove all rubbish from and about the building and leave the mechanical systems clean and ready for use.

END OF SECTION 22 0500

SECTION 22 0510 - BASIC MECHANICAL MATERIALS AND METHODS

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 the following basic mechanical materials and methods to complement other Division 22 and 23 Sections.
 - 1. Piping materials and installation instructions common to most piping systems
 - 2. Escutcheons
 - 3. Dielectric fittings
 - 4. Equipment nameplate data requirements
 - 5. Labeling and identifying mechanical systems and equipment is specified in Section 22 0553 "Mechanical Identification"
 - 6. Nonshrink grout for equipment installations
 - 7. Field-fabricated metal and wood equipment supports
 - 8. Installation requirements common to equipment specification sections
- B. Pipe and pipe fitting materials are specified in Division 22 piping system Sections.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct shafts, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawl spaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors, or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in duct shafts.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants, but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. ABS: Acrylonitrile-butadiene-styrene plastic.
 - 2. CPVC: Chlorinated polyvinyl chloride plastic.
 - 3. NP: Nylon plastic.
 - 4. PE: Polyethylene plastic.
 - 5. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
 - 1. CR: Chlorosulfonated polyethylene synthetic rubber.
 - 2. EPDM: Ethylene propylene diene terpolymer rubber.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Dielectric Unions:
 - a. Epco Sales Inc.
 - b. Watts Industries, Inc.; Water Products Division
 - c. Zurn Industries, Inc.; Wilkins Division
2. Dielectric Flanges:
 - a. Epco Sales Inc.
 - b. Watts Industries, Inc.; Water Products Division
3. Dielectric-Flange Insulating Kits:
 - a. Calpico, Inc.
 - b. Central Plastics Company
4. Dielectric Couplings:
 - a. Calpico, Inc.
 - b. Lochinvar Corporation
5. Dielectric Nipples:
 - a. Grinnell Corporation; Grinnell Supply Sales Company
 - b. Perfection Corporation
 - c. Victaulic Company of America

2.2 PIPE AND PIPE FITTINGS

- A. Refer to individual Division 22 piping Sections for pipe and fitting materials and joining methods.
- B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.3 JOINING MATERIALS

- A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8 inch maximum thickness, unless thickness or specific material is indicated.
 - a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
 - b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.
 2. AWWA C110, rubber, flat face, 1/8 inch thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
- C. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

- D. Solder Filler Metals: ASTM B 32.
 - 1. Alloy Sn95 or Alloy Sn94: Approximately 95 percent tin and 5 percent silver, with 0.10 percent lead content.
- E. Brazing Filler Metals: AWS A5.8.
 - 1. BAg1: Silver alloy.
- F. Welding Filler Metals: Comply with AWS D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- G. Flanged, Ductile-Iron Pipe Gasket, Bolts, and Nuts: AWWA C110, rubber gasket, carbon-steel bolts and nuts.
- H. Couplings: Iron-body sleeve assembly, fabricated to match OD of plain-end, pressure pipes.
 - 1. Sleeve: ASTM A 126, Class B, gray iron.
 - 2. Followers: ASTM A 47 malleable iron or ASTM A 536 ductile iron.
 - 3. Gaskets: Rubber.
 - 4. Bolts and Nuts: AWWA C111.
 - 5. Finish: Enamel paint.

2.4 DIELECTRIC FITTINGS

- A. General: Assembly or fitting with insulating material isolating joined dissimilar metals, to prevent galvanic action and stop corrosion.
- B. Description: Combination of copper alloy and ferrous; threaded, solder, plain, and weld-neck end types and matching piping system materials.
- C. Insulating Material: Suitable for system fluid, pressure, and temperature.
- D. Dielectric Unions: Factory-fabricated, union assembly, for 250 psig minimum working pressure at 180 deg F.
- E. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150 or 300 psig minimum working pressure as required to suit system pressures.
- F. Dielectric-Flange Insulation Kits: Field-assembled, companion-flange assembly, full-face or ring type. Components include neoprene or phenolic gasket, phenolic or polyethylene bolt sleeves, phenolic washers, and steel backing washers.
 - 1. Provide separate companion flanges and steel bolts and nuts for 150 or 300 psig minimum working pressure as required to suit system pressures.
- G. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300 psig minimum working pressure at 225 deg F.
- H. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300 psig minimum working pressure at 225 deg F.

2.5 PIPING SPECIALTIES

- A. Sleeves: The following materials are for wall, floor, slab, and roof penetrations:
1. Steel Sheet Metal: 0.0239 inch minimum thickness, galvanized, round tube closed with welded longitudinal joint.
 2. Steel Pipe: ASTM A 53, Type E, Grade A, Schedule 40, galvanized, plain ends.
 3. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
 4. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
 - a. Underdeck Clamp: Clamping ring with set screws.
- B. Escutcheons: Manufactured wall, ceiling, and floor plates; deep-pattern type if required to conceal protruding fittings and sleeves.
1. ID: Closely fit around pipe, tube, and insulation of insulated piping.
 2. OD: Completely cover opening.
 3. Cast Brass: One piece, with set screw.
 - a. Finish: Rough brass.
 - b. Finish: Polished chrome-plate.
 4. Cast Brass: Split casting, with concealed hinge and set screw.
 - a. Finish: Polished chrome-plate.
 5. Stamped Steel: One piece, with set screw and chrome-plated finish.
 6. Stamped Steel: Split plate, with concealed hinge, set screw, and chrome-plated finish.
 7. Stamped Steel: Split plate, with concealed hinge, spring clips, and chrome-plated finish.
 8. Cast-Iron Floor Plate: One-piece casting.

2.6 GROUT

- A. Nonshrink, Nonmetallic Grout: ASTM C 1107, Grade B.
1. Characteristics: Post-hardening, volume-adjusting, dry, hydraulic-cement grout, nonstaining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
 2. Design Mix: 5,000 psig, 28-day compressive strength.
 3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 MECHANICAL DEMOLITION

- A. Refer to Section 01 7329 "Cutting and Patching" and Section 02 4119 "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove mechanical systems, equipment, and components indicated to be removed.
1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.

3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
 5. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS – COMMON REQUIREMENTS

- A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 22 piping Sections specify unique piping installation requirements.
- B. General Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated, unless deviations to layout are approved on Coordination Drawings.
- C. Install drainage piping at indicated slope.
- D. Install components with pressure rating equal to or greater than system operating pressure.
- E. Install piping in concealed interior and exterior locations, except in equipment rooms and service areas.
- F. Install piping free of sags and bends.
- G. Install exposed interior and exterior piping at right angles or parallel to building walls. Diagonal runs are prohibited, unless otherwise indicated.
- H. Install piping tight to slabs, beams, joists, columns, walls, and other building elements. Allow sufficient space above removable ceiling panels to allow for ceiling panel removal.
- I. Install piping to allow application of insulation plus 1 inch clearance around insulation.
- J. Locate groups of pipes parallel to each other, spaced to permit valve servicing.
- K. Install fittings for changes in direction and branch connections.
- L. Install couplings according to manufacturer's written instructions.
- M. Install pipe escutcheons for pipe penetrations of concrete and masonry walls, wall board partitions, and suspended ceilings according to the following:
1. Chrome-Plated Piping: Cast brass, one piece, with set screw, and polished chrome-plated finish.
 2. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
 3. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
 4. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
 5. Piping in Utility Areas: Cast brass or stamped steel, with set-screw or spring clips.
- N. Sleeves are not required for core drilled holes.

- O. Permanent sleeves are not required for holes formed by PE removable sleeves.
- P. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor.
 - 1. Cut sleeves to length for mounting flush with both surfaces.
 - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level. Extend cast-iron sleeve fittings below floor slab as required to secure clamping ring if ring is specified.
 - 2. Build sleeves into new walls and slabs as work progresses.
 - 3. Install sleeves large enough to provide 1/4 inch annular clear space between sleeve and pipe or pipe insulation. Use the following sleeve materials:
 - a. Steel Pipe Sleeves: For pipes smaller than 6 inch NPS.
 - b. Stack Sleeve Fittings: For pipes penetrating floors with membrane waterproofing. Secure flashing between clamping flanges. Install section of cast-iron soil pipe to extend sleeve to 2 inches above finished floor level. Refer to Section 07 6200 "Sheet Metal Flashing and Trim" for flashing.
 - 1) Seal space outside of sleeve fittings with nonshrink, nonmetallic grout.
 - 4. Except for underground wall penetrations, seal annular space between sleeve and pipe or pipe insulation, using elastomeric joint sealants. Refer to Section 07 9200 "Joint Sealants" for materials.
 - 5. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.
- Q. Aboveground, Exterior-Wall, Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeve for 1 inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.
 - 1. Install steel pipe for sleeves smaller than 6 inches in diameter.
 - 2. Install cast-iron "wall pipes" for sleeves 6 inches in diameter and larger.
 - 3. Assemble and install mechanical sleeve seals according to manufacturer's written instructions. Tighten bolts that cause rubber sealing elements to expand and make watertight seal.
- R. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping materials. Refer to Section 07 8413 "Firestopping" for materials.
- S. Verify final equipment locations for roughing-in.
- T. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.
- U. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping specification Sections:
 - 1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - 2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - 3. Soldered Joints: Construct joints according to AWS's "Soldering Manual," Chapter "The Soldering of Pipe and Tube"; or CDA's "Copper Tube Handbook."
 - 4. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," Chapter "Pipe and Tube."
 - 5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
 - a. Note internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.

- b. Apply appropriate tape or thread compound to external pipe threads, unless dry seal threading is specified.
 - c. Align threads at point of assembly.
 - d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
 - e. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
 - 6. Welded Joints: Construct joints according to AWS D10.12, "Recommended Practices and Procedures for Welding Low Carbon Steel Pipe," using qualified processes and welding operators according to "Quality Assurance" Article.
 - 7. Flanged Joints: Align flange surfaces parallel. Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Assemble joints by sequencing bolt tightening to make initial contact of flanges and gaskets as flat and parallel as possible. Use suitable lubricants on bolt threads. Tighten bolts gradually and uniformly using torque wrench.
- V. Piping Connections: Make connections according to the following, unless otherwise indicated:
- 1. Install unions, in piping 2 inch NPS and smaller, at final connection to each piece of equipment with 2 inch NPS or smaller threaded pipe connection.
 - 2. Install flanges, in piping 2-1/2 inch NPS and larger, adjacent to flanged valves and at final connection to each piece of equipment with flanged pipe connection.
 - 3. Dry Piping Systems: Install dielectric unions and flanges to connect piping materials of dissimilar metals.
 - 4. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.3 EQUIPMENT INSTALLATION – COMMON REQUIREMENTS

- A. Install equipment to provide maximum possible headroom, if mounting heights are not indicated.
- B. Install equipment according to approved submittal data. Portions of the Work are shown only in diagrammatic form. Refer conflicts to Architect.
- C. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- D. Install mechanical equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- E. Install equipment giving right of way to piping installed at required slope.
- F. Install flexible connectors on equipment side of shutoff valves, horizontally and parallel to equipment shafts if possible.

3.4 PAINTING AND FINISHING

- A. Refer to Sections 09 9100 "Painting" for paint materials, surface preparation, and application of paint.
- B. Apply paint to exposed piping according to the following, unless otherwise indicated:
 - 1. Exterior, Ferrous Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.
 - 2. Exterior, Galvanized-Steel Piping: Use semigloss, acrylic-enamel finish. Include two finish coats over galvanized metal primer.

3. Exterior, Ferrous Supports: Use semigloss, acrylic-enamel finish. Include two finish coats over rust-inhibitive metal primer.

C. Do not paint piping specialties with factory-applied finish.

D. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.5 ERECTION OF METAL SUPPORTS AND ANCHORAGE

A. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor mechanical materials and equipment.

B. Field Welding: Comply with AWS D1.1, "Structural Welding Code--Steel."

3.6 CUTTING AND PATCHING

A. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations. Perform cutting by skilled mechanics of trades involved.

B. Repair cut surfaces to match adjacent surfaces.

3.7 GROUTING

A. Install nonmetallic, nonshrink, grout for mechanical equipment base bearing surfaces, pump and other equipment base plates, and anchors. Mix grout according to manufacturer's written instructions.

B. Clean surfaces that will come into contact with grout.

C. Provide forms as required for placement of grout.

D. Avoid air entrapment during placing of grout.

E. Place grout, completely filling equipment bases.

F. Place grout on concrete bases to provide smooth bearing surface for equipment.

G. Place grout around anchors.

H. Cure placed grout according to manufacturer's written instructions.

END OF SECTION 22 0510

SECTION 22 0523 – GENERAL-DUTY VALVES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following general-duty valves:

- 1. Copper-alloy ball valves
- 2. Bronze check valves

1.3 DEFINITIONS

- A. The following are standard abbreviations for valves:

- 1. CWP: Cold working pressure.
- 2. EPDM: Ethylene-propylene-diene terpolymer rubber.
- 3. NBR: Acrylonitrile-butadiene rubber.
- 4. PTFE: Polytetrafluoroethylene plastic.
- 5. SWP: Steam working pressure.
- 6. TFE: Tetrafluoroethylene plastic.

1.4 SUBMITTALS

- A. Product Data: For each type of valve indicated. Include body, seating, and trim materials; valve design; pressure and temperature classifications; end connections; arrangement; dimensions; and required clearances. Include list indicating valve and its application. Include rated capacities; shipping, installed, and operating weights; furnished specialties; and accessories.

1.5 QUALITY ASSURANCE

- A. ASME Compliance: ASME B31.1 for power piping valves and ASME B31.9 for building services piping valves.
 - 1. Exceptions: Domestic hot- and cold-water, piping valves unless referenced.
- B. ASME Compliance for Ferrous Valves: ASME B16.10 and ASME B16.34 for dimension and design criteria.
- C. NSF Compliance: NSF 61 for valve materials for potable-water service.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
 - 1. Protect internal parts against rust and corrosion.
 - 2. Protect threads, flange faces, grooves, and weld ends.
 - 3. Set angle, gate, and globe valves closed to prevent rattling.
 - 4. Set ball and plug valves open to minimize exposure of functional surfaces.
 - 5. Set butterfly valves closed or slightly open.
 - 6. Block check valves in either closed or open position.

- B. Use the following precautions during storage:
 - 1. Maintain valve end protection.
 - 2. Store valves indoors and maintain at higher than ambient dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use handwheels or stems as lifting or rigging points.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

2.2 VALVES – GENERAL

- A. Refer to Part 3 "Valve Applications" Article for applications of valves.
- B. Bronze Valves: NPS 2 and smaller with threaded ends, unless otherwise indicated.
- C. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- D. Valve Sizes: Same as upstream pipe, unless otherwise indicated.
- E. Valve Actuators:
 - 1. Lever Handle: For quarter-turn valves NPS 6 and smaller, except plug valves.
- F. Valve Bypass and Drain Connections: MSS SP-45.

2.3 COPPER-ALLOY BALL VALVES

- A. Manufacturers:
 - 1. Two-Piece, Copper-Alloy Ball Valves:
 - a. Conbraco Industries, Inc.; Apollo Division
 - b. Crane Company; Crane Valve Group; Crane Valves
 - c. Crane Company; Crane Valve Group; Stockham Division
 - d. Grinnell Corporation
 - e. Milwaukee Valve Company
 - f. NIBCO INC.
- B. Copper-Alloy Ball Valves, General: MSS SP-110.
- C. Two-Piece, Copper-Alloy Ball Valves: Brass or bronze body with full-port, chrome-plated bronze ball; PTFE or TFE seats; and 600 psig minimum CWP rating and blowout-proof stem.

2.4 GATE VALVES

- A. Not allowed.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine piping system for compliance with requirements for installation tolerances and other conditions affecting performance.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
- B. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- C. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- D. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE APPLICATIONS

- A. Refer to piping Sections for specific valve applications. If valve applications are not indicated, use the following:
 - 1. Shutoff Service: Ball.
- B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.
- C. Domestic Water Piping: Use the following types of valves:
 - 1. Ball Valves, NPS 2 and Smaller: Two-piece, 600 psig CWP rating, copper alloy.
 - 2. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.
- D. Heating Water Piping: Use the following types of valves:
 - 1. Ball Valves, NPS 2 and Smaller: Two-piece, 600 psig CWP rating, copper alloy.
 - 2. Ball Valves, NPS 2-1/2 and Larger: Class 150, ferrous alloy.
- E. Select valves, except wafer and flangeless types, with the following end connections:
 - 1. For Copper Tubing, NPS 2 and Smaller: Threaded ends.
 - 2. For Steel Piping, NPS 2 and Smaller: Threaded ends.

3.3 VALVE INSTALLATION

- A. Piping installation requirements are specified in other Division 22 and 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- C. Locate valves for easy access and provide separate support where necessary.

- D. Install valves in horizontal piping with stem at or above center of pipe.
- E. Install valves in position to allow full stem movement.
- F. Install chainwheel operators on valves NPS 4 and larger and more than 96 inches above floor. Extend chains to 60 inches above finished floor elevation.

3.4 JOINT CONSTRUCTION

- A. Refer to Section 22 0510 "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Grooved Joints: Assemble joints with keyed coupling housing, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 ADJUSTING

- A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

END OF SECTION 22 0523

SECTION 22 0529 - HANGERS AND SUPPORTS FOR MECHANICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes hangers and supports for mechanical system piping and equipment.

1.3 DEFINITIONS

- A. MSS: Manufacturers Standardization Society for the Valve and Fittings Industry.
- B. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.4 PERFORMANCE REQUIREMENTS

- A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

1.5 SUBMITTALS

- A. Product Data: For each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer for multiple piping supports and trapeze hangers. Include design calculations and indicate size and characteristics of components and fabrication details.
- C. Welding Certificates: Copies of certificates for welding procedures and operators.

1.6 QUALITY ASSURANCE

- A. Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
- B. Engineering Responsibility: Design and preparation of Shop Drawings and calculations for each multiple pipe support and trapeze by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Pipe Hangers:
 - a. B-Line Systems, Inc.
 - b. Carpenter & Patterson, Inc.
 - c. Grinnell Corporation
 - d. Michigan Hanger Company, Inc.

2. Channel Support Systems:
 - a. B-Line Systems, Inc.
 - b. Grinnell Corporation; Power-Strut Unit
 - c. Michigan Hanger Company, Inc.; O-Strut Division
 - d. Unistrut Corporation
3. Thermal-Hanger Shield Inserts:
 - a. Carpenter & Patterson, Inc.
 - b. Michigan Hanger Company, Inc.
 - c. Pipe Shields, Inc.
4. Powder-Actuated Fastener Systems:
 - a. Gunnebo Fastening Corporation
 - b. Hilti, Inc.
 - c. ITW Ramset/Red Head
 - d. Masterset Fastening Systems, Inc.
5. Non-Penetrating Rooftop Hangers and Supports:
 - a. Erico; Caddy Pyramid
 - b. Miro Industries, Inc.

2.2 MANUFACTURED UNITS

- A. Pipe Hangers, Supports, and Components: MSS SP-58, factory-fabricated components. Refer to "Hanger and Support Applications" Article in Part 3 for where to use specific hanger and support types.
 1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
 1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- C. Thermal-Hanger Shield Inserts: 100 psi minimum compressive-strength insulation, encased in sheet metal shield.
 1. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
 2. Material for Hot Piping: Water-repellent-treated, ASTM C 533, Type I calcium silicate.
 3. For Trapeze or Clamped System: Insert and shield cover entire circumference of pipe.
 4. For Clevis or Band Hanger: Insert and shield cover lower 180 degrees of pipe.
 5. Insert Length: Extend 2 inches beyond sheet metal shield for piping operating below ambient air temperature.
- D. Non-Penetrating Rooftop Hangers and Supports:
 1. Dynamic Support Piping up to 3": Roller bearing pipe support for roof-mounted gas pipes with the following properties:
 - a. Base Material: Polycarbonate.

- b. Deck Base: 9 by 15-1/4 inch.
 - c. Pipe Clearance: Adjustable from 4-1/2 inch to 13 inch.
 - d. Maximum Load Weight: 186 pounds per pipestand.
 - e. Pipe Rests: Self-lubricating polycarbonate resin roller, axle, and collar.
 - f. Support All-Thread and Metal Parts: Stainless Steel.
 - g. Nominal Inside Diameter: 3 inch.
 - h. Maximum Outside Diameter: 4-1/2 inch.
 - i. Spacing: Horizontal support spacing per pipe specification. Manufacturer's suggested spacing shall not exceed 10 foot centers as loading permits.
 - 2. Dynamic Support Piping up to 4": Roller bearing pipe support for roof-mounted gas pipes with the following properties:
 - a. Base Material: Polycarbonate.
 - b. Deck Base: 9 by 15-1/4 inch.
 - c. Pipe Clearance: Adjustable from 4-1/2 inch to 12 inch.
 - d. Maximum Load Weight: 186 pounds per pipestand.
 - e. Pipe Rest: Self-lubricating polycarbonate resin roller, axle, and collar.
 - f. Support All-Thread and Metal Parts: Stainless Steel.
 - g. Nominal Inside Diameter: 4 inch.
 - h. Maximum Outside Diameter: 4-1/2 inch.
 - i. Spacing: Horizontal support spacing per pipe specification. Manufacturer's suggested spacing shall not exceed 10 foot centers as loading permits.
 - 3. Dynamic Support Piping up to 6": Roller bearing pipe support for roof-mounted gas pipes, with the following properties:
 - a. Base Material: Polycarbonate.
 - 1) Deck Base: 16 by 18 inch.
 - 2) Pipe Clearance: Adjustable from 4-1/2 to 7 Inch.
 - 3) Maximum Load Weight: 385 pounds per pipestand.
 - b. Pipe Rest: Self-lubricating polycarbonate resin roller.
 - c. Support All-Thread, Axle, and Metal Brackets: Stainless Steel.
 - d. Nominal Inside Diameter: 6 inch.
 - e. Maximum Outside Diameter: 8-1/2 inch.
 - f. Spacing: Spacing: Horizontal support spacing per pipe specification. Manufacturer's suggested spacing shall not exceed 10 foot centers as loading permits.
- E. If supporting insulated pipe a shield or saddle shall be used.

2.3 TRAPEZE PIPE HANGERS

- A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 THERMAL-HANGER SHIELD INSERTS

- A. Description: 100-psig minimum, compressive-strength insulation insert encased in sheet metal shield.

2.5 MISCELLANEOUS MATERIALS

- A. Powder-Actuated Drive-Pin Fasteners: Powder-actuated-type, drive-pin attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.

- B. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- C. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- D. Grout: ASTM C 1107, Grade B, factory-mixed and -packaged, nonshrink and nonmetallic, dry, hydraulic-cement grout.
 - 1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
 - 2. Properties: Nonstaining, noncorrosive, and nongaseous.
 - 3. Design Mix: 5,000 psi, 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.
- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.
- C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - 1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated stationary pipes, NPS 1/2 to NPS 6.
 - 2. Adjustable Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated stationary pipes, NPS 1/2 to NPS 2.
 - 3. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 6, with steel pipe base stanchion support and cast-iron floor flange.
 - 4. Pipe Stanchion Saddles (MSS Type 37): For support of pipes, NPS 4 to NPS 6, with steel pipe base stanchion support and cast-iron floor flange and with U-bolt to retain pipe.
 - 5. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes, NPS 2-1/2 to NPS 6, if vertical adjustment is required, with steel pipe base stanchion support and cast-iron floor flange.
 - 6. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 6, from two rods if longitudinal movement caused by expansion and contraction might occur.
 - 7. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes, NPS 2-1/2 to NPS 6, from single rod if horizontal movement caused by expansion and contraction might occur.
 - 8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 6, if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
 - 9. Pipe Roll and Plate Units (MSS Type 45): For support of pipes, NPS 2 to NPS 6, if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
 - 10. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes, NPS 2 to NPS 6, if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- D. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
 - 1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 6.
 - 2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 6, if longer ends are required for riser clamps.

- E. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches for heavy loads.
 2. Steel Clevises (MSS Type 14): For 120 to 450 deg F piping installations.
- F. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
 2. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
 3. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
 4. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
 5. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
 6. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
 - a. Light (MSS Type 31): 750 lbs.
 - b. Medium (MSS Type 32): 1,500 lbs.
 - c. Heavy (MSS Type 33): 3,000 lbs.
 7. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
 8. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
 9. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where head room is limited.
- G. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
 2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
 3. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100 psi minimum compressive-strength, water-repellent-treated calcium silicate pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.
- H. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Restraint-Control Devices (MSS Type 47): Where indicated to control piping movement.
 2. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches.
 3. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
 4. Spring Sway Braces (MSS Type 50): To retard sway, shock, vibration, or thermal expansion in piping systems.
 5. Variable-Spring Hangers (MSS Type 51): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from hanger.
 6. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.
 7. Variable-Spring Trapeze Hangers (MSS Type 53): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from trapeze support.

8. Constant Supports: For critical piping stress and if necessary to avoid transfer of stress from one support to another support, critical terminal, or connected equipment. Include auxiliary stops for erection, hydrostatic test, and load-adjustment capability. These supports include the following types:
 - a. Horizontal (MSS Type 54): Mounted horizontally.
 - b. Vertical (MSS Type 55): Mounted vertically.
 - c. Trapeze (MSS Type 56): Two vertical-type supports and one trapeze member.

3.2 HANGER AND SUPPORT INSTALLATION

- A. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- B. Channel Support System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled channel systems.
 1. Field assemble and install according to manufacturer's written instructions.
- C. Heavy-Duty Steel Trapeze Installation: Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated, heavy-duty trapezes.
 1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
 2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D-1.1.
- D. Install building attachments within concrete slabs or attach to structural steel. Space attachments within maximum piping span length indicated in MSS SP-69. Install additional attachments at concentrated loads, including valves, flanges, guides, strainers, and expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- E. Install powder-actuated drive-pin fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
- F. Install mechanical-anchor fasteners in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- G. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
- H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- I. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- J. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.

K. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.
 - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
 - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
 - c. Do not exceed pipe stress limits according to ASME B31.9.
2. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
 - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
 - a. NPS 1/4 to NPS 3-1/2: 12 inches long and 0.048 inch thick.
 - b. NPS 4: 12 inches long and 0.06 inch thick.
 - c. NPS 5 and NPS 6: 18 inches long and 0.06 inch thick.
5. Insert Material: Length at least as long as protective shield.
6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

- A. Fabricate structural-steel stands to suspend equipment from structure above or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

3.4 METAL FABRICATION

- A. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations.
- C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 2. Obtain fusion without undercut or overlap.
 3. Remove welding flux immediately.
 4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

- A. Hanger Adjustment: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

- A. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils.
- B. Touching Up: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 09 9100 "Painting (Professional Line Products)".
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 22 0529

SECTION 22 0553 - MECHANICAL IDENTIFICATION

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 the following mechanical identification materials and their installation:

- 1. Equipment markers
- 2. Pipe markers
- 3. Valve tags
- 4. Valve schedules

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Valve numbering scheme.
- D. Valve Schedules: For each piping system. Furnish extra copies (in addition to mounted copies) to include in maintenance manuals.

1.4 QUALITY ASSURANCE

- A. ASME Compliance: Comply with ASME A13.1, "Scheme for the Identification of Piping Systems," for letter size, length of color field, colors, and viewing angles of identification devices for piping.

1.5 COORDINATION

- A. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- B. Coordinate installation of identifying devices with location of access panels and doors.
- C. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION DEVICES

- A. Equipment Markers: Engraved, color-coded laminated plastic. Include contact-type, permanent adhesive.
 - 1. Terminology: Match schedules as closely as possible.
 - 2. Data:
 - a. Name.
 - 3. Size: 2-1/2 by 4 inches for control devices, dampers, and valves; 4-1/2 by 6 inches for equipment.

2.2 PIPING IDENTIFICATION DEVICES

- A. Manufactured Pipe Markers, General: Preprinted, color-coded, with lettering indicating service, and showing direction of flow.
 - 1. Colors: Comply with ASME A13.1, unless otherwise indicated.
 - 2. Lettering: Use piping system terms indicated and abbreviate only as necessary for each application length.
 - 3. Pipes with OD, Including Insulation, Less Than 6 Inches: Full-band pipe markers extending 360 degrees around pipe at each location.
 - 4. Pipes with OD, Including Insulation, 6 Inches and Larger: Either full-band or strip-type pipe markers at least three times letter height and of length required for label.
 - 5. Arrows: Integral with piping system service lettering to accommodate both directions; or as separate unit on each pipe marker to indicate direction of flow.
- B. Pretensioned Pipe Markers: Precoiled semirigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.
- C. Shaped Pipe Markers: Preformed semirigid plastic formed to partially cover circumference of pipe and to attach to pipe with mechanical fasteners that do not penetrate insulation vapor barrier.
- D. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.
- E. Plastic Tape: Continuously printed, vinyl tape at least 3 mils thick with pressure-sensitive, permanent-type, self-adhesive back.
 - 1. Width for Markers on Pipes with OD, Including Insulation, Less Than 6 Inches: 3/4 inch minimum.
 - 2. Width for Markers on Pipes with OD, Including Insulation, 6 Inches or Larger: 1-1/2 inches minimum.

2.3 VALVE TAGS

- A. Valve Tags: Stamped or engraved with 1/4 inch letters for piping system abbreviation and 1/2 inch numbers, with numbering scheme approved by Architect. Provide 5/32 inch hole for fastener.
 - 1. Material: 0.032 inch thick brass.
 - 2. Valve-Tag Fasteners: Brass beaded chain.

2.4 VALVE SCHEDULES

- A. Valve Schedules: For each piping system, on standard-size bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
 - 1. Valve-Schedule Frames: Glazed display frame for removable mounting on masonry walls for each page of valve schedule. Include mounting screws.
 - 2. Frame: Extruded aluminum.
 - 3. Glazing: ASTM C 1036, Type I, Class 1, Glazing Quality B, 2.5-mm, single-thickness glass.

PART 3 - EXECUTION

3.1 APPLICATIONS – GENERAL

- A. Products specified are for applications referenced in other Division 22 and 23 Sections. If more than single-type material, device, or label is specified for listed applications, selection is Installer's option.

3.2 EQUIPMENT IDENTIFICATION

- A. Install and permanently fasten equipment nameplates on each major item of mechanical equipment that does not have nameplate or has nameplate that is damaged or located where not easily visible.
- B. Install equipment markers with permanent adhesive on or near each major item of mechanical equipment. Data required for markers may be included on signs, and markers may be omitted if both are indicated.
 - 1. Letter Size: Minimum 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
 - 2. Data: Distinguish among multiple units.
 - 3. Locate markers where accessible and visible. Include markers for the following general categories of equipment:
 - a. Main control and operating valves, including safety devices and hazardous units such as gas outlets
 - b. Fuel-burning units, including boilers, and unit heaters
 - c. Pumps, compressors, chillers, and similar motor-driven units
 - d. Fans, blowers, primary balancing dampers, and VAV boxes
 - e. HVAC central-station and zone-type units
 - f. Filters, water-treatment systems, and similar equipment

3.3 PIPING IDENTIFICATION

- A. Install manufactured pipe markers indicating service on each piping system. Install with flow indication arrows showing direction of flow.
 - 1. Pipes with OD, Including Insulation, Less Than 6 Inches: Pretensioned pipe markers. Use size to ensure a tight fit.
 - 2. Pipes with OD, Including Insulation, Less Than 6 Inches: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, 1-1/2 inches wide, lapped at least 1-1/2 inches at both ends of pipe marker, and covering full circumference of pipe.
 - 3. Pipes with OD, Including Insulation, 6 Inches and Larger: Shaped pipe markers. Use size to match pipe and secure with fasteners.
 - 4. Pipes with OD, Including Insulation, 6 Inches and Larger: Self-adhesive pipe markers. Use color-coded, self-adhesive plastic tape, at least 1-1/2 inches wide, lapped at least 3 inches at both ends of pipe marker, and covering full circumference of pipe.

3.4 VALVE-TAG INSTALLATION

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; plumbing fixture supply stops; shutoff valves; faucets; convenience and lawn-watering hose connections; and HVAC terminal devices and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, similar to those indicated in the following:
 - 1. Valve-Tag Size and Shape: 1-1/2 inches round.

3.5 VALVE-SCHEDULE INSTALLATION

- A. Mount valve schedule on wall in accessible location in each major equipment room.

3.6 ADJUSTING

- A. Relocate mechanical identification materials and devices that have become visually blocked by other work.

3.7 CLEANING

- A. Clean faces of mechanical identification devices and glass frames of valve schedules.

END OF SECTION 22 0553

SECTION 22 0719 - PIPING 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. This Section includes preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

1.3 SUBMITTALS

- A. Product Data: Identify thermal conductivity, thickness, and jackets for each type of product indicated.
- B. Shop Drawings: Show fabrication and installation details for the following:
 - 1. Application of protective shields, saddles, and inserts at pipe hangers for each type of insulation and hanger.
 - 2. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - 3. Removable insulation at piping specialties and equipment connections.
 - 4. Application of field-applied jackets.
- C. Samples: For each type of insulation and jacket. Identify each Sample, describing product and intended use. Submit Samples in the following sizes:
 - 1. Preformed Pipe Insulation Materials: 12 inches long by NPS 2.
 - 2. Sheet Form Insulation Materials: 12 inches square.
 - 3. Jacket Materials: 12 inches long by NPS 2.
- D. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets with requirements indicated. Include dates of tests.
- E. Installer Certificates: Signed by the Contractor certifying that installers comply with requirements.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the U.S. Department of Labor, Bureau of Apprenticeship and Training.
- B. Fire-Test-Response Characteristics: As determined by testing materials identical to those specified in this Section according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and sealer and cement material containers with appropriate markings of applicable testing and inspecting agency.
 - 1. Insulation Installed Indoors: Flame-spread rating of 25 or less, and smoke-developed rating of 50 or less.
 - 2. Insulation Installed Outdoors: Flame-spread rating of 75 or less, and smoke-developed rating of 150 or less.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Ship insulation materials in containers marked by manufacturer with appropriate ASTM specification designation, type and grade, and maximum use temperature.

1.6 COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Section 22 0529 "Hangers and Supports for Mechanical."
- B. Coordinate clearance requirements with piping Installer for insulation application.

1.7 SCHEDULING

- A. Schedule insulation application after testing piping systems and, where required, after installing and testing heat-trace tape. Insulation application may begin on segments of piping that have satisfactory test results.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Mineral-Fiber Insulation:
 - a. Johns-Manville
 - b. Knauf FiberGlass GmbH
 - c. Owens-Corning Fiberglas Corporation

2.2 INSULATION MATERIALS

- A. Mineral-Fiber Insulation: Glass fibers bonded with a thermosetting resin complying with the following:
 - 1. Preformed Pipe Insulation: Comply with ASTM C 547, Type 1, with factory-applied, all-purpose, vapor-retarder jacket.
 - 2. Blanket Insulation: Comply with ASTM C 553, Type II, without facing.
 - 3. Fire-Resistant Adhesive: Comply with MIL-A-3316C in the following classes and grades:
 - a. Class 1, Grade A for bonding glass cloth and tape to unfaced glass-fiber insulation, for sealing edges of glass-fiber insulation, and for bonding lagging cloth to unfaced glass-fiber insulation.
 - b. Class 2, Grade A for bonding glass-fiber insulation to metal surfaces.
 - 4. Vapor-Retarder Mastics: Fire- and water-resistant, vapor-retarder mastic for indoor applications. Comply with MIL-C-19565C, Type II.
 - 5. Mineral-Fiber Insulating Cements: Comply with ASTM C 195.
 - 6. Expanded or Exfoliated Vermiculite Insulating Cements: Comply with ASTM C 196.
 - 7. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.
- B. Prefabricated Thermal Insulating Fitting Covers: Comply with ASTM C 450 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.

2.3 FIELD-APPLIED JACKETS

- A. General: ASTM C 921, Type 1, unless otherwise indicated.

- B. Foil and Paper Jacket: Laminated, glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil.
- C. Standard PVC Fitting Covers: Factory-fabricated fitting covers manufactured from 20 mil thick, high-impact, ultraviolet-resistant PVC.
 - 1. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories for the disabled.
 - 2. Adhesive: As recommended by insulation material manufacturer.
- D. Aluminum Jacket: Aluminum roll stock, ready for shop or field cutting and forming to indicated sizes. Comply with ASTM B 209, 3003 alloy, H-14 temper.
 - 1. Finish and Thickness: Smooth finish, 0.010 inch thick.
 - 2. Moisture Barrier: 1 mil thick, heat-bonded polyethylene and kraft paper.
 - 3. Elbows: Preformed, 45- and 90-degree, short- and long-radius elbows; same material, finish, and thickness as jacket.

2.4 ACCESSORIES AND ATTACHMENTS

- A. Glass Cloth and Tape: Comply with MIL-C-20079H, Type I for cloth and Type II for tape. Woven glass-fiber fabrics, plain weave, presized a minimum of 8 oz./sq. yd.
 - 1. Tape Width: 4 inches.
- B. Bands: 3/4 inch wide, in one of the following materials compatible with jacket:
 - 1. Stainless Steel: ASTM A 666, Type 304; 0.020 inch thick.
 - 2. Galvanized Steel: 0.005 inch thick.
 - 3. Aluminum: 0.007 inch thick.
 - 4. Brass: 0.010 inch thick.
 - 5. Nickel-Copper Alloy: 0.005 inch thick.
- C. Wire: 0.080 inch, nickel-copper alloy; 0.062 inch, soft-annealed, stainless steel; or 0.062 inch, soft-annealed, galvanized steel.

2.5 VAPOR RETARDERS

- A. Mastics: Materials recommended by insulation material manufacturer that are compatible with insulation materials, jackets, and substrates.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Preparation: Clean and dry pipe and fitting surfaces. Remove materials that will adversely affect insulation application.

3.3 GENERAL APPLICATION REQUIREMENTS

- A. Apply insulation materials, accessories, and finishes according to the manufacturer's written instructions; with smooth, straight, and even surfaces; free of voids throughout the length of piping, including fittings, valves, and specialties.
- B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each piping system.
- C. Use accessories compatible with insulation materials and suitable for the service. Use accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Apply insulation with longitudinal seams at top and bottom of horizontal pipe runs.
- E. Apply multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.
- H. Keep insulation materials dry during application and finishing.
- I. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.
- J. Apply insulation with the least number of joints practical.
- K. Apply insulation over fittings, valves, and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated. Refer to special instructions for applying insulation over fittings, valves, and specialties.
- L. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic.
 - 1. Apply insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor retarders are indicated, extend insulation on anchor legs at least 12 inches from point of attachment to pipe and taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
 - 3. Install insert materials and apply insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by the insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect the jacket from tear or puncture by the hanger, support, and shield.
- M. Insulation Terminations: For insulation application where vapor retarders are indicated, taper insulation ends. Seal tapered ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.
- N. Apply adhesives and mastics at the manufacturer's recommended coverage rate.
- O. Apply insulation with integral jackets as follows:
 - 1. Pull jacket tight and smooth.
 - 2. Circumferential Joints: Cover with 3 inch wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip and spaced 4 inches on center.

3. Longitudinal Seams: Overlap jacket seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.
 - a. Exception: Do not staple longitudinal laps on insulation having a vapor retarder.
 4. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to flanges, unions, valves, and fittings.
 5. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor-retarder mastic.
- P. Roof Penetrations: Apply insulation for interior applications to a point even with top of roof flashing.
1. Seal penetrations with vapor-retarder mastic.
 2. Apply insulation for exterior applications tightly joined to interior insulation ends.
 3. Extend metal jacket of exterior insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal metal jacket to roof flashing with vapor-retarder mastic.
- Q. Exterior Wall Penetrations: For penetrations of below-grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal terminations with vapor-retarder mastic.
- R. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.
- S. Fire-Rated Wall and Partition Penetrations: Apply insulation continuously through penetrations of fire-rated walls and partitions.
1. Firestopping and fire-resistive joint sealers are specified in Section 07 8413 "Firestopping".
- T. Floor Penetrations: Apply insulation continuously through floor assembly.
1. For insulation with vapor retarders, seal insulation with vapor-retarder mastic where floor supports penetrate vapor retarder.

3.4 MINERAL-FIBER INSULATION APPLICATION

- A. Apply insulation to straight pipes and tubes as follows:
1. Secure each layer of preformed pipe insulation to pipe with wire, tape, or bands without deforming insulation materials.
 2. Where vapor retarders are indicated, seal longitudinal seams and end joints with vapor-retarder mastic. Apply vapor retarder to ends of insulation at intervals of 15 to 20 feet to form a vapor retarder between pipe insulation segments.
 3. For insulation with factory-applied jackets, secure laps with outward clinched staples at 6 inches on center.
 4. For insulation with factory-applied jackets with vapor retarders, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by the insulation material manufacturer and seal with vapor-retarder mastic.
- B. Apply insulation to flanges as follows:
1. Apply preformed pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation segment the same as overall width of the flange and bolts, plus twice the thickness of the pipe insulation.
 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.

4. Apply canvas jacket material with manufacturer's recommended adhesive, overlapping seams at least 1 inch, and seal joints with vapor-retarder mastic.
- C. Apply insulation to fittings and elbows as follows:
1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
 2. When premolded insulation elbows and fittings are not available, apply mitered sections of pipe insulation, or glass-fiber blanket insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire, tape, or bands.
 3. Cover fittings with standard PVC fitting covers. Overlap PVC covers on pipe insulation jackets at least 1 inch at each end. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
- D. Apply insulation to valves and specialties as follows:
1. Apply premolded insulation sections of the same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
 2. When premolded insulation sections are not available, apply glass-fiber blanket insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation. For check valves, arrange insulation for access to strainer basket without disturbing insulation.
 3. Apply insulation to flanges as specified for flange insulation application.
 4. Use preformed standard PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
 5. Use preformed heavy PVC fitting covers for valve sizes where available. Secure fitting covers with manufacturer's attachments and accessories. Seal seams with tape and vapor-retarder mastic.
 6. For larger sizes where PVC fitting covers are not available, seal insulation with canvas jacket and sealing compound recommended by the insulation material manufacturer.

3.5 FIELD-APPLIED JACKET APPLICATION

- A. Apply glass-cloth jacket, where indicated, directly over bare insulation or insulation with factory-applied jackets.
1. Apply jacket smooth and tight to surface with 2 inch overlap at seams and joints.
 2. Embed glass cloth between two 0.062 inch thick coats of jacket manufacturer's recommended adhesive.
 3. Completely encapsulate insulation with jacket, leaving no exposed raw insulation.
- B. Foil and Paper Jackets: Apply foil and paper jackets where indicated.
1. Draw jacket material smooth and tight.
 2. Apply lap or joint strips with the same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Apply jackets with 1-1/2 inch laps at longitudinal seams and 3 inch wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-retarder mastic.
- C. Apply metal jacket where indicated, with 2 inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches on center and at end joints.

3.6 PIPING SYSTEM APPLICATIONS

- A. Insulation materials and thicknesses are specified in schedules at the end of this Section.

- B. Items Not Insulated: Unless otherwise indicated, do not apply insulation to the following systems, materials, and equipment:

1. Flexible connectors
2. Vibration-control devices
3. Fire-suppression piping
4. Drainage piping located in crawl spaces, unless otherwise indicated
5. Below-grade piping, unless otherwise indicated
6. Chrome-plated pipes and fittings, unless potential for personnel injury
7. Air chambers, unions, strainers, check valves, plug valves, and flow regulators

3.7 FIELD QUALITY CONTROL

- A. Inspection: Owner will engage a qualified inspection agency to perform the following field quality-control inspections, after installing insulation materials, jackets, and finishes, to determine compliance with requirements:
- B. Insulation applications will be considered defective if sample inspection reveals noncompliance with requirements. Remove defective Work and replace with new materials according to these Specifications.
- C. Reinstall insulation and covers on fittings and valves uncovered for inspection according to these Specifications.

3.8 INSULATION APPLICATION SCHEDULE – GENERAL

- A. Refer to insulation application schedules for required insulation materials, vapor retarders, and field-applied jackets.
- B. Application schedules identify piping system and indicate pipe size ranges and material, thickness, and jacket requirements.

3.9 INTERIOR INSULATION APPLICATION SCHEDULE

- A. Service: Domestic hot, recirculated hot water and tempered water.
1. Operating Temperature: 60 to 140 deg F.
 2. Insulation Material: Mineral fiber.
 3. Insulation Thickness: Apply the following insulation thicknesses:
 - a. Copper Pipe, 1 inch and less: 3/4 inch thick.
 - b. Copper Pipe, 1-1/4 inches to 2 inches: 1 inch thick.
 - c. Copper, Galvanized Pipe, 2-1/2 inches to 6 inches: 1 inch thick.
 4. Field-Applied Jacket: None.
 5. Vapor Retarder Required: No.
 6. Finish: None.
- B. Service: Domestic cold water.
1. Operating Temperature: 35 to 60 deg F.
 2. Insulation Material: Mineral fiber.
 3. Insulation Thickness: Apply the following insulation thicknesses:
 - a. Copper Pipe, 1 inches to 2 inches: 1 inch thick.
 - b. Copper, Steel Pipe, 2-1/2 inches and larger: 1 inch thick.
 - c. Copper Galvanized Pipe, 2-1/2 inches to 6 inches: 2 inches thick.

4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.
6. Finish: None.

C. Service: Heating hot-water supply and return.

1. Operating Temperature: 100 to 200 deg F.
2. Insulation Material: Mineral fiber.
3. Insulation Thickness: Apply the following insulation thicknesses:
 - a. Copper Pipe, 1-1/4 inches and Less: 1-1/2 inch thick.
 - b. Steel, Copper Pipe, 1-1/2 inches and Larger: 2 inches thick.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: No.
6. Finish: None.

END OF SECTION 22 0719

SECTION 22 1101 - SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes soil and waste, sanitary drainage and vent piping inside the building and to locations indicated.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Soil, Waste, and Vent Piping: 10 foot head of water.

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Shop Drawings: For solvent drainage system, include plans, elevations, sections and details.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.
- B. Flexible Transition Couplings for Underground Nonpressure Piping: ASTM C 1173 with elastomeric sleeve. Include ends of same sizes as piping to be joined and include corrosion-resistant metal band on each end.

2.2 CAST-IRON SOIL PIPING

- A. Hubless Pipe and Fittings: ASTM A 888 or CISPI 301.
 - 1. Couplings: ASTM C 1277 assembly of metal housing, corrosion-resistant fasteners, and ASTM C 564 rubber sleeve with integral, center pipe stop.
 - a. Heavy-Duty, Type 304, Stainless-Steel Couplings: ASTM A 666, Type 304, stainless-steel shield; stainless-steel bands; and sleeve.
 - 1) NPS 1-1/2 to NPS 4: 3 inch wide shield with 4 bands.
 - 2) NPS 5 to NPS 10: 4 inch wide shield with 6 bands.

PART 3 - EXECUTION

3.1 EXCAVATION

- A. Refer to Division 31 sections for excavating, trenching, and backfilling.

3.2 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground pressure piping, unless otherwise indicated.
- C. Aboveground, Soil, Waste, and Vent Piping: Use the following piping materials for each size range:
 - 1. NPS 1-1/4 and NPS 1-1/2: Use NPS 1-1/2 hubless, cast-iron soil piping and one of the following:
 - a. Couplings: Standard-duty, Type 304, stainless steel.
 - 2. NPS 1-1/4 and NPS 1-1/2: Steel pipe; cast-iron, threaded drainage fittings; and threaded joints.
 - 3. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:
 - a. Couplings: Standard-duty, Type 304, stainless steel.
 - 4. NPS 5 and NPS 6: Hubless, cast-iron soil piping and one of the following:
 - a. Couplings: Heavy-duty, Type 304, stainless steel.

3.3 PIPING INSTALLATION

- A. Refer to Section 22 0510 "Basic Mechanical Materials and Methods" for basic piping installation.
- B. Install cleanouts and extend to where building sanitary drains connect to building sanitary sewers.
- C. Install cast-iron sleeve with water stop and mechanical sleeve seal at each penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Section 22 0510 "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.
- D. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
- E. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- F. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:
 - 1. Building Sanitary Drain: 1/4 inch/foot downward in direction of flow for piping NPS 3 and smaller; 1/8 inch/foot downward in direction of flow for piping NPS 4 and larger.
 - 2. Horizontal Sanitary Drainage Piping: 1/4 inch/foot downward in direction of flow.
 - 3. Vent Piping: 1/8 inch/foot down toward vertical fixture vent or toward vent stack.

- G. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.
- H. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.4 JOINT CONSTRUCTION

- A. Refer to Section 22 0510 "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Cast-Iron, Soil-Piping Joints: Make joints according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
 - 1. Hubless Joints: Make with rubber gasket and sleeve or clamp.
- C. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 HANGER AND SUPPORT INSTALLATION

- A. Refer to Section 22 0529 "Hangers and Supports for Mechanical" for pipe hanger and support devices. Install the following:
 - 1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 - 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.
 - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- B. Install supports according to Section 22 0529 "Hangers and Supports for Mechanical."
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8 inch minimum rods.
- E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
 - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8 inch rod.
 - 2. NPS 3: 60 inches with 1/2 inch rod.
 - 3. NPS 4 and NPS 5: 60 inches with 5/8 inch rod.
 - 4. NPS 6: 60 inches with 3/4 inch rod.
- F. Install supports for vertical cast-iron soil piping every 15 feet.

3.6 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
 - 1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.

2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
 - C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
 - D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
 1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
 3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping, except outside leaders, on completion of roughing-in. Close openings in piping system and fill with water to point of overflow, but not less than 10 foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.
 4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1 inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
 5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
 6. Prepare reports for tests and required corrective action.

3.7 CLEANING

- A. Clean interior of piping. Remove dirt and debris as work progresses.
- B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.
- C. Place plugs in ends of uncompleted piping at end of day and when work stops.

END OF SECTION 22 1101

SECTION 22 1102 - DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes domestic water piping from locations indicated to fixtures and equipment inside the building.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing domestic water piping systems with the following minimum working-pressure ratings, unless otherwise indicated:
 - 1. Domestic Water Distribution Piping: 80 psig.

1.4 SUBMITTALS

- A. Product Data: For pipe, tube, fittings, and couplings.
- B. Water Samples: Specified in "Cleaning" Article in Part 3.
- C. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

1.5 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.
- B. Comply with NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances," and NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for combined fire-protection and domestic water service piping to building.
- C. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic, potable domestic water piping and components. Include marking "NSF-pw" on piping.
- D. Comply with NSF 61, "Drinking Water System Components-Health Effects; Sections 1 through 9," for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

- A. Refer to Part 3 "Piping Applications" Article for applications of pipe, tube, fitting, and joining materials.

2.2 COPPER TUBING

- A. Hard Copper Tube: ASTM B 88, Types L, water tube, drawn temper.
 - 1. Copper Pressure Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought- copper, solder-joint fittings. Furnish wrought-copper fittings if indicated.

2. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.
3. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces and solder-joint or threaded ends.
4. Copper, Grooved-End Fittings: ASTM B 75 copper tube or ASTM B 584 bronze castings.
 - a. Copper-Tubing, Keyed Couplings: Copper-tube dimensions and design similar to AWWA C606. Include ferrous housing sections, gasket suitable for hot water, and bolts and nuts.

2.3 VALVES

- A. Refer to Section 22 0523 "General-Duty Valves" for bronze and cast-iron, general-duty valves.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below, unless otherwise indicated.
- B. Flanges may be used on aboveground piping, unless otherwise indicated.
- C. Aboveground Domestic Water Piping: Use the following piping materials for each size range:
 1. NPS 1-1/2 and Smaller: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
 2. NPS 2: Hard copper tube, Type L; copper pressure fittings; and soldered joints.
 3. NPS 2-1/2 to NPS 6: Hard copper tube, Type L; copper pressure fittings; and soldered joints.

3.2 VALVE APPLICATIONS

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
 1. Shutoff Duty: Use bronze ball valves for piping NPS 2 and smaller. Use cast-iron butterfly or gate valves with flanged ends for piping NPS 2-1/2 and larger.
 2. Hot-Water-Piping, Balancing Duty: Memory-stop balancing valves.
 3. Drain Duty: Hose-end drain valves.

3.3 PIPING INSTALLATION

- A. Refer to Section 22 0510 "Basic Mechanical Materials and Methods" for basic piping installation.
- B. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Refer to Section 22 0510 "Basic Mechanical Materials and Methods" for sleeves and mechanical sleeve seals.
- C. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside building at each domestic water service. Refer to Section 22 0519 "Meters and Gages for Piping" for pressure gages.
- D. Install aboveground domestic water piping level with 0.25 percent slope downward toward drain and plumb.
- E. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

F. Perform the following steps before operation:

1. Close drain valves, hydrants, and hose bibbs.
2. Open shutoff valves to fully open position.
3. Open throttling valves to proper setting.
4. Remove plugs used during testing of piping and plugs used for temporary sealing of piping during installation.

G. Check plumbing specialties and verify proper settings, adjustments, and operation.

1. Water-Pressure Regulators: Set outlet pressure at 80 psig maximum, unless otherwise indicated.

H. Energize pumps and verify proper operation.

3.4 JOINT CONSTRUCTION

- A. Refer to Section 22 0510 "Basic Mechanical Materials and Methods" for basic piping joint construction.
- B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

3.5 VALVE INSTALLATION

- A. Install sectional valve close to water main on each branch and riser serving plumbing fixtures or equipment. Use ball valves for piping NPS 2 and smaller. Use butterfly valves for piping NPS 2-1/2 and larger.
- B. Install shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.
- C. Install drain valves for equipment, at base of each water riser, at low points in horizontal piping, and where required to drain water piping.
1. Install hose-end drain valves at low points in water mains, risers, and branches.
 2. Install stop-and-waste drain valves where indicated.
- D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping NPS 2 and smaller and butterfly valves for piping NPS 2-1/2 and larger.

3.6 HANGER AND SUPPORT INSTALLATION

- A. Refer to Section 22 0548 "Vibration and Seismic Controls for Mechanical" for seismic-restraint devices.
- B. Refer to Section 22 0529 "Hangers and Supports for Mechanical" for pipe hanger and support devices. Install the following:
1. Vertical Piping: MSS Type 8 or Type 42, clamps.
 2. Individual, Straight, Horizontal Piping Runs: According to the following:
 - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
 - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
 - c. Longer Than 100 Feet, if Indicated: MSS Type 49, spring cushion rolls.

3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Install supports according to Section 22 0529 "Hangers and Supports for Mechanical."
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced 1 size for double-rod hangers, to a minimum of 3/8 inch.
- F. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.7 CONNECTIONS

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment and machines to allow service and maintenance.
- C. Connect domestic water piping to exterior water service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to service piping with shutoff valve, and extend and connect to the following:
1. Water Heaters: Cold-water supply and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
 2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code.
 3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

3.8 FIELD QUALITY CONTROL

- A. Inspect domestic water piping as follows:
1. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
 2. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
 - a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
 - b. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
 3. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
 4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- B. Test domestic water piping as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
 2. Leave uncovered and unconcealed new, altered, extended, or replaced domestic water piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.

3. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
4. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
5. Prepare reports for tests and required corrective action.

3.9 ADJUSTING

- A. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
 1. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide flow of hot water in each branch.

3.10 CLEANING

- A. Clean and disinfect potable and nonpotable domestic water piping as follows:
 1. Purge new piping and parts of existing domestic water piping that have been altered, extended, or repaired before using.
 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction or, if methods are not prescribed, procedures described in either AWWA C651 or AWWA C652 or as described below:
 - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
 - b. Fill and isolate system according to either of the following:
 - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
 - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
 - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
 - d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- B. Prepare and submit reports of purging and disinfecting activities.
- C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

END OF SECTION 22 1102

SECTION 22 4000 – PLUMBING FIXTURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following plumbing fixtures and related components.

1. Fixture Supports
2. Water Tempering Valves
3. Protective Shielding Guards
4. Lavatory Faucets
5. Lavatories
6. Water Closet Flushometers
7. Toilet Seats
8. Urinal Wall Carriers
9. Urinals
10. Urinal Flush Flushometers
11. Lavatory Support Systems
12. Water Closets
13. Electric Water Coolers

1.3 DEFINITIONS

- A. Accessible Fixture: Plumbing fixture that can be approached, entered, and used by people with disabilities.
- B. Fitting: Device that controls flow of water into or out of plumbing fixture. Fittings specified in this Section include supplies and stops, faucets and spouts, showerheads and tub spouts, drains and tailpieces, and traps and waste pipes. Piping and general-duty valves are included where indicated.

1.4 SUBMITTALS

- A. Product Data: Include selected fixture and trim, fittings, accessories, appliances, appurtenances, equipment, and supports and indicate materials and finishes, dimensions, construction details, and flow-control rates for each type of fixture indicated.
- B. Shop Drawings: Diagram power, signal, and control wiring and differentiate between manufacturer-installed and field-installed wiring.
- C. Maintenance Data: For plumbing fixtures to include in maintenance manuals specified in Division 1.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain plumbing fixtures, faucets, and other components of each category through one source from a single manufacturer.
 1. Exception: If fixtures, faucets, or other components are not available from a single manufacturer, obtain similar products from other manufacturers specified for that category.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- C. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities"; Public Law 90-480, "Architectural Barriers Act"; and Public Law 101-336, "Americans with Disabilities Act"; about plumbing fixtures for people with disabilities.
- D. Regulatory Requirements: Comply with requirements in U.S. Architectural & Transportation Barriers Compliance Board's "Uniform Federal Accessibility Standards (UFAS), 1985-494-187" about plumbing fixtures for people with disabilities.
- E. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.
- F. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.
- G. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.
- H. Comply with the following applicable standards and other requirements specified for plumbing fixtures:
 - 1. Enameled, Cast Iron Fixtures: ASME A112.19.1M.
 - 2. Hand Sinks: NSF 2 construction.
 - 3. Vitreous-China Fixtures: ASME A112.19.2M.
 - 4. Water Closet, Flushometer: ASSE 1037, ANSI/ASME 112.19.6.
 - 5. Urinal Flushometer: ASSE 1037, ANSI/ASME 112.19.6.
- I. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:
 - 1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
 - 2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
 - 3. Faucet Hose: ASTM D 3901.
 - 4. Faucets: ASME A112.18.1M.
 - 5. Hose-Connection Vacuum Breakers: ASSE 1011.
 - 6. Hose-Coupling Threads: ASME B1.20.7.
 - 7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
 - 8. NSF Materials: NSF 61.
 - 9. Pipe Threads: ASME B1.20.1.
 - 10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
 - 11. Supply and Drain Fittings: ASME A112.18.1M.
- J. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:
 - 1. Atmospheric Vacuum Breakers: ASSE 1001.
 - 2. Brass and Copper Supplies: ASME A112.18.1M.
 - 3. Manual-Operation Flushometers: ASSE 1037.
 - 4. Tubular Brass Drainage Fittings and Piping: ASME A112.18.1M.
- K. Comply with the following applicable standards and other requirements specified for miscellaneous components:
 - 1. Disposers: ASSE 1008 and UL 430.
 - 2. Hose-Coupling Threads: ASME B1.20.7.
 - 3. Off-Floor Fixture Supports: ASME A112.6.1M.
 - 4. Pipe Threads: ASME B1.20.1.
 - 5. Plastic Toilet Seats: ANSI Z124.5.
 - 6. Supply and Drain Protective Shielding Guards: ICC A117.1.

- L. ARI Standard: Comply with ARI 1010, "Self-Contained, Mechanically Refrigerated Drinking-Water Coolers," for water coolers and with ARI's "Directory of Certified Drinking Water Coolers" for type and style classifications.
- M. ASHRAE Standard: Comply with ASHRAE 34, "Designation and Safety Classification of Refrigerants," for water coolers. Provide HFC 134a (tetrafluoroethane) refrigerant, unless otherwise indicated.

1.6 COORDINATION

- A. Coordinate roughing-in and final plumbing fixture locations, and verify that fixtures can be installed to comply with original design and referenced standards.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. For fixture descriptions in other Part 2 articles where the subparagraph titles "Products," and "Manufacturers" introduce a list of manufacturers and their products or manufacturers only, the following requirements apply for product selection:
 - 1. Products: Subject to compliance with requirements, provide one of the products specified in other Part 2 articles.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified in other Part 2 articles.

2.2 FIXTURE SUPPORTS

- A. Wall Hung Lavatory Support, Type II, lavatory carrier with concealed arms and tie rod.
 - 1. Manufacturers:
 - a. Zurn
 - b. Josam
 - c. Tyler Pipe, Wade Division
 - d. J. R. Smith
 - e. MI-Fab
 - 2. Accessible Fixture Support: Include rectangular steel uprights.

2.3 WATER TEMPERING VALVES

- A. Manufacturers:
 - 1. Sparco, Inc.
 - 2. Watts Industries, Inc.; Water Products Division
 - 3. Conbraco Industries, Apollo Division 34D
 - 4. Armstrong Rada
 - 5. Wilkins
 - 6. Symmons
- B. General: Manually adjustable, thermostatically controlled water tempering valve; bronze body; and adjustable temperature setting ASSE1070.

- C. System Water Tempering Valves: Piston or discs controlling both hot- and cold-water flow, capable of limited anti-scald protection. Include threaded inlets and outlet.

1. Finish: Rough bronze.

- D. Limited-Volume, Water Tempering Valves: Solder-joint inlets and NPS 3/4 maximum outlet.

2.4 PROTECTIVE SHIELDING GUARDS

- A. Protective Shielding Guard, Barrier Free/BF PSG-1: Manufactured, plastic covering for hot- and cold-water supplies and trap and drain piping and complying with ADA requirements and ASTM E84.

1. Manufacturers:

- a. Plumberex Pro-2000 Series
- b. True Bro Lav-Guard
- c. Sanitary Dash
- d. Skal-Gard
- e. Just Manufacturing Company, model J-ADA-125/150

2.5 LAVATORY FAUCETS

- A. Lavatory Faucet, LF-1: Touch operation, cast center set spout hands free. Coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor. Battery powered.

1. Manufacturers:

- a. Delta Series
- b. American Standard 6055.205
- c. Kohler

2. Maximum Flow Rate: 0.5 gpm, unless otherwise indicated.
3. Body Material: Copper or brass underbody with brass cover plates.
4. Finish: Polished chrome plate.
5. Type: Single-control mixing.
6. Centers: 4 inches.
7. Mounting: Deck, exposed.
8. Handle(s): None.
9. Spout: Rigid.
10. Spout Outlet: Aerator.
11. Vandal resistant.
12. Battery powered (CR-P2 Lithium).

2.6 LAVATORIES

- A. Lavatories, LAV-1: Wall hanging, enameled, cast-iron, vitreous-china fixture.

1. Manufacturers:

- a. Kohler Company "Kingston", model no. K-1728
- b. American Standard, Inc.

2. Type: With back.
3. Size: 19-1/4" L x 17-1/4" W.
4. Faucet Hole Punching: Three, 4-inch centers, hole(s).
5. Faucet Hole Location: Top.
6. Color: White.

7. Faucet: LF-1.
8. Supplies: NPS 3/8 chrome-plated copper with stops.
9. Drain: Fixed grid strainer.
10. Drain Piping: Offset, NPS 1-1/4 by NPS 1-1/2 chrome-plated cast-brass trap; 0.032-inch-thick tubular brass waste to wall; and wall escutcheon.
11. Protective Shielding Guard on water and drain line. PSG-1
12. Tempering Device: Water mixing valve.
13. Fixture Support: Concealed arms.
14. Mixing Valve: Water mixing valve.

2.7 WATER CLOSET FLUSHOMETERS

- A. Flushometer, WCFV-1: Brass body with corrosion-resistant internal components, battery powered, sensor operated dual flush with control stop with check valve and polished chrome-plated finish on exposed parts.

1. Manufacturers:
 - a. Sloan, model ECOS 8111-1.6/1.1
2. Internal Design: Diaphragm operation.
3. Style: Exposed.
4. Inlet Size: NPS 1.
5. Trip Mechanism: Sensor and dual override buttons.
6. Consumption: 1.6/1.1 gallons/flush.
7. Tailpiece Size: NPS 1-1/2 inch and standard length to top of bowl.

2.8 TOILET SEATS

- A. Toilet Seat, TS-1: Solid plastic with STA-TITE commercial fastening system.

1. Manufacturers:
 - a. Bemis, model 1955CT or 2L2155T
2. Configuration: Open front without cover.
3. Size: Elongated.
4. Class: Heavy-duty commercial.
5. Hinge Type: STA-TITE commercial fastening system.
6. Color: White.

2.9 URINALS - GENERAL

- A. Vitreous china with extended sides and 14 in. elongated rim. Color white unless noted otherwise. With wall hangers.

2.10 URINALS AND ACCESSORIES

- A. Urinals, UR-1: Wall hanging, 1/8 GPF, back-outlet, vitreous-china fixture designed for flushometer valve operation. Fixture shall be installed to comply with all ADA requirements where designated.

1. Manufacturers:
 - a. American Standard, Inc.
 - b. Kohler Company, "Bardon"
 - c. Sloan, SU-1009
 - d. Zurn

2. Type: Siphon jet with extended shields.
3. Strainer or Trapway: Integral cast strainer with integral trap.
4. Design Consumption: 0.25 gal./flush.
5. Color: White.
6. Supply Spud Size: NPS 3/4.
7. Outlet Size: NPS 2.
8. Flushometer: FV-A.
9. Fixture Support: URS-1.

B. Urinals, UR-2: Same as type UR-1, ADA compliant.

C. Urinal Support, URS-1: Fully compatible with urinal installation. Cast iron or steel frame, complying with load and deflection requirements of ASME Standard A112.6.1M. Tubular legs, lugs for floor and wall attachment, threaded fixture studs and hardware for hanger and bearing plate.

1. Manufacturers:
 - a. Josam
 - b. J. R. Smith 637 with Option M31 for Accessible Fixture Supports
 - c. Wade
 - d. Watts
 - e. Zurn Z-1222
2. Accessible Fixture Support: Include rectangular steel uprights.

2.11 URINAL FLUSHOMETERS

A. Flushometer, URFV-1: Brass body with corrosion-resistant internal components, battery powered, sensor activated with override button, control stop with check valve and polished chrome-plated finish on exposed parts.

1. Manufacturers:
 - a. Sloan, model ECOS 8186-1
2. Internal Design: Diaphragm operation.
3. Style: Exposed.
4. Inlet Size: NPS 3/4.
5. Trip Mechanism: Sensor and override button.
6. Consumption: 1 gallon/flush.
7. Tailpiece Size: NPS or 3/4 inch and standard length to top of bowl.

2.12 WATER CLOSETS

A. Water Closets, WC-1: Floor mounted, floor-outlet, vitreous china fixture designed for flushometer valve operation. Fixture shall be installed to comply with all ADA requirements.

1. Manufacturers:
 - a. Sloan, model ST-2029
 - b. American Standard, Inc.
 - c. Mansfield
 - d. Kohler Company
2. Bowl Type: Elongated with siphon-jet design. Include bolt caps matching fixture.
3. Height: Standard, barrier free accessible.
4. Design Consumption: 1.1/1.6 gallons/flush.

5. Color: White.
6. Flushometer: WCFV-1.
7. Fixture Support: WCS-1.
8. Toilet Seat: TS-1.
9. Permanent hydrophobic antimicrobial glaze.

2.13 FIXTURE STOPS

- A. Stops: Lead free, chrome plated brass for use in potable water distribution.

1. Manufacturer:
 - a. Brasscraft, model SCR14XC for straight
 - b. Brasscraft, model SCR19XC for angle
2. Machined one-piece brass body.
3. Multi-turn stop.
4. Large, removable, loose key handle.
5. 1/2 compression x 3/8 compression.
6. 40 °F to 140 °F.
7. Pressure: 125 psi maximum.

2.14 ELECTRIC WATER COOLER

- A. Electric Water Cooler, EWC-1 (surface mount): Certified to NSF/ANSI 61-G. Bi-level surface mounted units; one mounted high and one mounted at ADA height. Each unit shall deliver a minimum of 8 gph of water at 50 °F, cooled from 80 °F. Each unit shall have front mounted push pads requiring less than 5 pounds force to active water flow. Units shall include automatic stream regulator, elevated anti-squirt bubbler with stream guard and 1-1/4" tail piece. R-134a refrigeration system shall be hermetically sealed with integral air-cooled condenser. Top shall be stainless steel with integral strainer. Skirts shall be stainless steel. Unit shall be 115V, 1 phase with cord. Non-filtered cooler. Provide a bottle filling station including touchless electronic sensor and visual user interface display and saved bottle counter. ADA compliant.

1. Manufacturer:
 - a. Elkay, model EZSTL8WSSK
 - b. Halsey-Taylor
 - c. Haws
 - d. Oasis International

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine roughing-in for water soil and for waste piping systems and supports to verify actual locations and sizes of piping connections and that locations and types of supports match those indicated, before plumbing fixture installation. Use manufacturer's roughing-in data if roughing-in data are not indicated.
- B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FIXTURE INSTALLATION

- A. Assemble fixtures, trim, fittings, and other components according to manufacturers' written instructions.

- B. Install water-less urinals per manufacturer's requirements.
- C. For wall-hanging fixtures, install off-floor supports affixed to building substrate.
 - 1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
 - 2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
 - 3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.
- D. Install back-outlet, wall hanging fixtures onto waste fitting seals and attach to supports.
- E. Install wall-hanging fixtures with tubular waste piping attached to supports.
- F. Install counter-mounting fixtures in and attached to casework.
- G. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.
- H. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.
- I. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.
- J. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.
- K. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.
- L. Install toilet seats on water closets.
- M. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.
- N. Install traps on fixture outlets.
 - 1. Exception: Omit trap on fixtures with integral traps.
 - 2. Exception: Omit trap on indirect wastes, unless otherwise indicated.
- O. Install disposer in outlet of sinks indicated to have disposer.
- P. Install escutcheons at piping wall ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Refer to Section 15050 "Basic Mechanical Materials and Methods" for escutcheons.
- Q. Set service basins in leveling bed of cement grout. Refer to Section 15050 "Basic Mechanical Materials and Methods" for grout.
- R. Seal joints between fixtures and walls, floors, and counters using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Refer to Section 07920 "Joint Sealants" for sealant and installation requirements.

3.3 INSTALLATION OF WATER CLOSETS – STANDARD AND BARRIER FREE

- A. Mounting Heights:
 - 1. Water Closets – Standard: 15" to 17" from top of toilet seat to finished floor.

2. Water Closets – Barrier Free: 18" from top of toilet seat to finished floor.
3. Urinals – Standard: 24" from rim to finished floor.
4. Urinals – Barrier Free: 17" from rim to finished floor, 48" maximum from operated flush valve to finished floor.
5. Electric Water Cooler – Barrier Free: 36" maximum rim height, 27" minimum knee clearance.

- B. Flush Valve: Mount flush valve handle on wide side of stall/room.

3.4 INSTALLATION OF LAVATORIES/SINKS - STANDARD AND BARRIER FREE

- A. General: Unless otherwise noted on drawings, locate lavatory in compliance with ADA requirements.
- B. Countertop: Coordinate with architectural trades.
- C. Wall Hung: Conceal lavatory fixture support arms with deep drawn secure escutcheons. Securely bolt and anchor supports to the supporting surfaces.
- D. Install a water tempering valve for each lavatory, kitchen hand sink and sink faucet.

3.5 INSTALLATION OF PLUMBING FIXTURES

- A. Individual water line branches, waste lines, vents and traps for connection to individual fixtures, fixture fittings and specialties shall be per the following schedule or as indicated on drawings, whichever is greater (sizes are given in inches).

Item	Waste	Vent	Trap	Cold	Hot
Urinal	2	1-1/2	--	1	--
Water Closet	4	2	--	1-1/2	--
Lavatory	1-1/2	1-1/2	1-1/4	3/4	3/4
Electric Water Cooler	1-1/4	1-1/2	1-1/4	1/2	--

3.6 CONNECTIONS

- A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect water supplies from water distribution piping to fixtures.
- C. Connect drain piping from fixtures to drainage piping.
- D. Supply and Waste Connections to Plumbing Fixtures: Connect fixtures with water supplies, stops, risers, traps, and waste piping. Use size fittings required to match fixtures. Connect to plumbing piping.
- E. Supply and Waste Connections to Fixtures and Equipment Specified in Other Sections: Connect fixtures and equipment with water supplies, stops, risers, traps, and waste piping specified. Use size fittings required to match fixtures and equipment. Connect to plumbing piping.
- F. Ground equipment.
1. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.7 FIELD QUALITY CONTROL

- A. Verify that installed fixtures are categories and types specified for locations where installed.

- B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

3.8 ADJUSTING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Operate and adjust disposers. Replace damaged and malfunctioning units.
- C. Adjust water pressure at faucets and flushometer valves to produce proper flow and stream.
- D. Replace washers and seals of leaking and dripping faucets and stops.

3.9 CLEANING

- A. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Do the following:
 - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
 - 2. Remove sediment and debris from drains.

3.10 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

END OF SECTION 22 4000

SECTION 26 0500 – COMMON WORK RESULTS FOR ELECTRICAL

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 work of this Section.
- B. This Section shall apply to all Division 26 Sections and to the following Division 28 Sections: fire alarm systems, mass notification systems, and emergency response systems.

1.2 SUMMARY

- A. This Section includes general administrative and procedural requirements for electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 01 Sections.
 - 1. Codes and standards
 - 2. Quality assurance
 - 3. Examination of drawings and premises
 - 4. Substitutions
 - 5. Alternates
 - 6. Permits, fees, and inspections
 - 7. Changes involving Electrical Work
 - 8. Submittals
 - 9. Project record documents
 - 10. Delivery, storage, and handling
 - 11. Warranty
 - 12. Scope of work specified in Division 26 and Division 28 sections
 - 13. Related work specified in other Divisions
 - 14. Systems provided by Owner
- B. Part II – Products:
 - 1. This Section includes basic requirements for materials and installations for electrical work, including but not limited to:
 - a. Sealing of openings
 - b. Sleeves
 - c. Expansion fittings
- C. Part III – Execution:
 - 1. This section includes basic requirements for installations for electrical work.
 - a. Electrical demolition work
 - b. Temporary services
 - c. Cutting and patching
 - d. Chases and recesses
 - e. Equipment foundations and supports
 - f. Coordination with other trades
 - g. Assembly and connection of equipment
 - h. Field quality control

1.3 CODES AND STANDARDS

- A. The electrical characteristics, physical properties, design, performance characteristics, methods of construction, all material, and the installation techniques shall be in accordance with the latest issue of the various, applicable Standard Specifications of the following recognized authorities:
1. ADA – Americans with Disabilities Act
 2. AEIC – Association of Edison Illuminating Companies
 3. ANSI – American National Standards Institute
 4. ASTM – ASTM International, formerly known as American Society for Testing and Materials
 5. BICSI – Building Industry Consulting Service International
 6. FCC – Federal Communications Commission
 7. ICEA – Insulated Cable Engineers Association
 8. IEC – International Electrotechnical Commission
 9. IEEE – Institute of Electrical and Electronics Engineers
 10. MBC – Michigan Building Code
 11. MIOSHA – Michigan Occupational Safety and Health Administration
 12. NEC – National Electrical Code
 13. NETA – InterNational Electrical Testing Association
 14. NEMA – National Electrical Manufacturers Association
 15. NFPA – National Fire Protection Association
 16. OSHA – Occupational Safety and Health Administration
 17. UL – UL, LLC, formerly known as Underwriters Laboratories, Inc.

1.4 QUALITY ASSURANCE

- A. Furnish all labor, materials, equipment, technical supervision, and incidental services required to complete, test, and leave ready for operation the electrical systems as specified in the Division 26 Sections, Division 28 Sections that this section applies to per paragraph 1.1 Related Documents, and as indicated on Drawings.
1. The Electrical Drawings indicate the general design and extent of the electrical system. Comply with the Drawings as closely as actual construction of the building and the work of other Trades permit.
- B. Perform all work in a first class and workmanlike manner in accordance with the latest accepted standards and practices for the Trades involved.
1. All equipment of the same or similar systems shall be by the same manufacturer.
- C. Regulatory Requirements:
1. Codes, Standards, Ordinances, and Regulations: Perform all work in accordance with applicable Federal, State, and local ordinances and regulations. Perform all work to comply with Codes and Standards identified in these Specifications.
 - a. Notify the Architect/Engineer before submitting a proposal should any changes in Drawings or Specifications be required to comply with the above codes, standards, ordinances, and regulations. After entering into a contract, make all changes required to comply with the above codes, standards, ordinances, and regulations without additional expense to the Owner.
 - b. Barrier-Free Regulations: All materials and installations shall comply with the requirements of the State of Michigan Barrier-Free Regulations and with the Americans with Disabilities Act (ADA).
- D. Field Measurements:
1. Drawings are not intended to be scaled for roughing-in or to serve as shop drawings. Take all field measurements required for fitting the installation to the building.

- E. Sequencing and Scheduling: Sequence and schedule work in order to avoid interference with the work of other Trades. Be responsible for removing and relocating any work which in the opinion of the Owner's Representatives causes interference.

1.5 EXAMINATION OF DRAWINGS AND PREMISES

- A. Before submitting the Bid, examine the Architectural, Mechanical, and other Trades' Drawings and Specifications.
 - 1. Notify the Architect/Engineer should any discrepancies occur between the other Trades and the electrical work.
 - 2. No additional charges will be allowed because of failure to make this examination or to include all materials and labor required for the electrical work specified in other Trades' documents.
 - 3. The Architectural Drawings take precedence in all matters pertaining to the building structure, the Mechanical Drawings take precedence in all matters pertaining to the Mechanical Trades, and the Electrical Drawings take precedence in all matters pertaining to the Electrical Trades. However, where there are conflicts or differences between the Drawings for the various Trades, report such conflicts or differences to the Architect/Engineer who shall determine the course of action to be taken.
- B. Before submitting the Bid, examine the premises to determine existing conditions for performing the electrical work.
 - 1. Notify the Architect/Engineer should any discrepancies occur between the existing conditions and the electrical work.
 - 2. No additional charges will be allowed because of failure to make this examination or to include all materials and labor required to complete the electrical work.

1.6 SUBSTITUTIONS

- A. Base Bid shall be in accordance with materials and products specified. Any exceptions to this shall be approved in writing by the Architect/Engineer ten (10) days or more prior to bidding.

1.7 ALTERNATES

- A. Mandatory Alternates:
 - 1. The Contractor shall refer to Alternates listed in Division 01 and Proposals and shall submit price quotations for the alternates that apply to the electrical work.
- B. Voluntary Alternates:
 - 1. Voluntary alternates may be submitted for consideration with listed addition or deduction to the Bid but will not affect the awarding of the Contract.

1.8 PERMITS, FEES, AND INSPECTIONS

- A. Obtain all permits, licenses, inspections, and tests required. At the completion of the work, obtain and send certificates of inspections and approvals to the Architect/Engineer.
 - 1. Pay all fees and expenses for permits, licenses, tests, and inspections.
 - 2. A copy of the final approved inspection certificates for electrical work specified in all Division 26 Sections and Division 28 Sections that this section applies to per paragraph 1.1 Related Documents shall be provided as a requirement prior to final payment.

1.9 CHANGES INVOLVING ELECTRICAL WORK

- A. The design of the electrical systems is based on the mechanical and building equipment specified and scheduled on the Drawings.
 - 1. Where equipment changes are made that involve additional electrical work (increased motor horsepower or increased unit full load amperes, requirements for a disconnect switch scheduled to be part of the equipment, requirements for a starter scheduled to be part of the equipment, additional wiring of equipment, etc.) the Mechanical or respective Trades involved shall compensate the Electrical Trades for the cost of the additional work required.

1.10 SUBMITTALS

- A. The following is in addition to the requirements for submittals in Division 01.
- B. Material List: Submit a complete list of all materials and equipment indicating their manufacturer for approval by the Architect/Engineer within 15 days after award of contract and prior to submittal of shop drawings.
- C. Construction Schedule: Submit a construction schedule including milestone dates and lead times for major electrical equipment.
- D. Provide equipment submittals in the form of letters of intent, product data or, shop drawings as specified for all materials provided on the project.
- E. Submittal Preparation: Place a permanent label or title block on each submittal for identification. Indicate the name of the entity that prepared each submittal on the label or title block.
 - 1. Provide a space approximately 4" x 5" on the label or beside the title block on shop drawings to record the review and approval markings and the action taken.
 - 2. Include the following information on the label for processing and recording action taken.
 - a. Project Name
 - b. Date
 - c. Name and address of Architect/Engineer
 - d. Name and address of Contractor
 - e. Name and address of Subcontractor
 - f. Name and address of Supplier
 - g. Name of Manufacturer
 - h. Number and title of appropriate Specification Section
 - i. Drawing number, identification mark, fixture type, panelboard number, specification section number, and detail references, or as noted on the Electrical Drawings.
- F. Equipment submittals shall be reviewed by the Electrical Contractor for completeness and accuracy and prior to submitting to the Architect/Engineer for review. Submittals shall be dated and signed by the Electrical Contractor. Note on the submittal any and all exceptions or changes to the Drawings and Specifications required by the submittal to meet the specified products.
- G. Partial submittals for equipment shall not be permitted. Where partial submittals are transmitted to the Architect/Engineer, they will be returned "Rejected".
- H. Where the equipment submittals consist of manufacturer's standard detail drawings or schedules and contain data for a variety of similar equipment, indicate the data pertinent to the equipment furnished for this project only. Standard detail drawings and schedules not clearly indicating which data is associated with this Project shall be returned "Rejected".

- I. Where accessories and/or options are specified and do not appear as part of manufacturer's standard detail drawings or schedules, state each accessory that is to be provided with the equipment on the standard detail drawings or schedules.
- J. The letter of intent shall state that the product is exactly as specified with no exceptions and that the product is being manufactured by one of the specified manufacturers. The letter of intent shall include the specification section number, the product description, and the name of the selected manufacturer. The aforementioned information shall be typed on the Electrical Contractor's letterhead.
- K. Lighting fixture submittals shall be submitted as one (1) package including all fixtures intended to be used for this Project.
- L. CADD files of the Electrical Drawings will be provided by the Architect/Engineer for this Contractor's use in preparing submittals. Refer to Division 01 for the forms and procedures for requesting electronic files/media.
- M. Layout Shop Drawings: Prepare layout shop drawings drawn to scale in electronic format and submit electronic copies in .PDF and .DWG formats to the Architect/Engineer for review. Refer to Division 01 for submittals and quantities.
 - 1. Layout shop drawings shall show building floor plans to scale and shall include lighting and power distribution systems, all details of electrical construction, routing of conduits, wiring, circuiting, and related information necessary for the installation and future maintenance of the electrical wiring systems.
- N. No apparatus or equipment shall be shipped from stock or fabricated until their equipment submittals have been reviewed and approved by the Architect/Engineer. By the review of submittals, the Architect/Engineer does not assume responsibility for actual dimensions or for the fit of completed work in position, nor does such review relieve Electrical Trades of full responsibility for the proper and correct execution of the work required.

1.11 PROJECT RECORD DOCUMENTS

- A. Submit final project record documents as described in Division 01.
- B. As-Built Drawings: At the completion of the work, submit to the Architect/Engineer the revised set of drawings in electronic file format indicating all changes from the bid documents using redlines, bubbles, or another approved method. The Drawings shall contain all title block information as originally issued by the Architect/Engineer with the addition of the Electrical Contractor's company name, address, telephone number, company's project number, date of issuance by the Electrical Contractor, and issued for "As-Built" in title.
- C. Operation and Maintenance Manuals: The manuals shall contain operating instructions, service instructions, parts lists, etc., which are shipped with electrical equipment. At the completion of the work, transmit these items to the Owner. If this information is not shipped with the equipment, obtain it from the manufacturer.
- D. Maintenance Materials: Retain all portable and detachable portions of the installation such as keys, tools, manuals, etc., until the completion of the work and then transmit them to the Owner and obtain itemized receipt. This receipt shall be provided as a requirement prior to final payment.
- E. Record Documents Manual: At the completion of the work, furnish and deliver to the Owner and Architect/Engineer two (2) electronic sets on USB flash drive of the record documents manual.
 - 1. One (1) copy of all shop drawings and product data
 - 2. One (1) copy of operation and maintenance manuals
 - 3. One (1) copy of as-built drawings

1.12 DELIVERY, STORAGE, AND HANDLING

- A. Storage and Protection: Provide adequate storage space for all electrical equipment, conduit, and materials delivered to the job site under a weather protected enclosure. Location of the space will be designated by the Owner's Field Representative. Equipment set in place in unprotected areas must be provided with temporary protection.
 - 1. Be responsible for the care and protection of electrical equipment until it has been fully tested and accepted.
 - 2. Protect materials with permanent factory finish from damage by covering.
 - 3. Protect conduit openings with temporary plugs or caps.

1.13 WARRANTY

- A. Warranty: Provide a one-year parts and labor warranty from date of substantial completion for all equipment and installation. Comply with requirements of Division 01.
 - 1. A copy of the warranty on the Electrical Contractor's letterhead shall be provided as a requirement prior to final payment.

1.14 SCOPE OF WORK SPECIFIED IN DIVISION 26 AND DIVISION 28 SECTIONS

- A. Furnish all labor, materials, equipment, technical supervision, and incidental services required to complete, test, and leave ready for operation the electrical systems as specified in the Division 26 Sections, Division 28 Sections that this section applies to per paragraph 1.1 Related Documents, and as indicated on Drawings.
- B. Provide control wiring greater than 100 volts for temperature, pressure, and level control devices and for solenoid valves, control relays, MCC control wiring, and all power wiring required for equipment specified hereinafter.
- C. Provide empty raceway systems consisting of conduits, wireways, surface raceways, nylon pull strings, outlet boxes, pull boxes, cover plates, underfloor ducts, and cable trays as indicated for telephone, data, and audio/video wiring, for work specified in all Division 27 Sections, and for work specified Division 28 Sections that this section does not apply to per paragraph 1.1 Related Documents.

1.15 RELATED WORK SPECIFIED IN OTHER SECTIONS

- A. Excavating, trenching, and backfilling for electrical – Division 31, except as specified in Division 26 Sections and Division 28 Sections that this section applies to per paragraph 1.1 Related Documents.
- B. Furnishing and mounting of all electric motors – Divisions 14, 21, 22 and 23.
- C. Furnishing, mounting, and wiring of all electro-mechanical temperature, pressure, level, and flow control devices, high and low temperature limit switches, door limit switches, and solenoid valves – Divisions 22, 23 and 25.
- D. Furnishing and wiring of low voltage thermostats – Division 23.
- E. Furnishing and installing low voltage instrumentation and control wiring – Divisions 21, 22 and 23, except where otherwise indicated.
- F. Furnishing and mounting of starters, disconnect switches, control wiring, and integral controls on package self-contained building service equipment – Divisions 14, 21, 22 and 23, except as otherwise indicated.
- G. Furnishing and installing field prime and finish painting – Division 09, except as specified in Division 26 Sections and Division 28 Sections that this section applies to per paragraph 1.1 Related Documents.

1.16 SYSTEMS PROVIDED BY OWNER

- A. Furniture including final connections to the furniture.
- B. Telephone equipment and wiring – Division 27.
- C. Audio/Video equipment and wiring – Division 27.
- D. Data LAN equipment, wiring, and computers – Division 27.

PART 2 - PRODUCTS

2.1 SEALING OF OPENINGS

- A. Seal openings around electrical materials (conduit, raceways, cable trays, panels, etc.) with fire and smoke stop systems where floors, fire rated walls, and smoke barriers are penetrated. Fiberglass is not acceptable. Fire and smoke stop systems shall be UL listed and shall have a fire rating equal to or greater than the penetrated barrier. Fire and smoke stop systems shall be in conformance with Division 07.

2.2 SLEEVES

- A. Provide conduit sleeves where conduits pass through concrete floors, walls, beams, and ceilings.
- B. Sleeves shall be galvanized rigid steel conduit. Do not use aluminum conduit. Where specific sizes are not indicated on the Drawings, sleeves shall be sized to provide one-half (1/2) inch clearance around the outside surface of the item for which they were installed. They shall be cut flush with wall surfaces and shall extend one inch, or as directed, through floor. Sleeves shall be packed with approved non-combustible packing material and sealed with sealant to prevent passage of air, liquid, or fumes from one area to another. The filler and sealant materials used shall be rated at least equal in fire resistance to the construction material being penetrated. Floor sleeves shall be sealed between floor and sleeve with concrete grout.

2.3 EXPANSION FITTINGS

- A. Provide expansion fittings in all conduits, cable trays, and feeder bus duct runs that cross building expansion joints, both in concrete slabs and where exposed, and provide bonding jumpers where required to maintain electrical continuity.

PART 3 - EXECUTION

3.1 ELECTRICAL DEMOLITION WORK

- A. General: Perform electrical demolition work in a systematic manner. Use such methods as outlined below to complete work indicated on the Drawings.
- B. Obtain approval from the Owner prior to interrupting existing services. All service interruptions shall be at a time suitable to the Owner. Where the Owner approves service interruptions at times resulting in premium time work to this Contractor, this Contractor shall include the premium time in his Base Bid.
- C. The associated raceway system (conduit, boxes, supports, etc.) and wire of equipment indicated to be demolished shall be removed from the equipment back to the source as noted below:
 - 1. Power: Remove raceway system and wire back to the panel or power source.
 - a. When the circuit originates from the panel and serves no other loads, remove raceway system and wire back to the panel, and relabel the associated circuit breaker or fused switch as "spare".

- b. When the circuit originates from a panel but continues on to other loads not intended to be demolished, remove raceway system and wire back to first junction box.
 - c. When the removal of the circuit to the equipment to be demolished affects "downstream" devices not indicated to be demolished, re-feed "downstream" devices.
- 2. Fire alarm wiring: Remove as indicated on the Drawings. Fire alarm system shall remain operational during building occupied hours in all tenant occupied spaces.
- 3. Data system wiring, telephone wiring, or other auxiliary systems wiring: Remove raceway system and wiring back to communication room or other source.
- 4. Raceway systems in walls to remain: Abandon raceway systems in place and install blank cover plates.
- 5. Raceway systems above accessible ceilings or other accessible locations: Remove raceway systems.
- D. Perform a circuit trace prior to deactivating feeders and branch circuits to ensure maintaining electrical power in adjacent unrenovated area.
- E. Conduit being demolished that is installed in floor slabs shall be cut 1/2 inch below the floor, and the floor shall be patched.
- F. Where applicable, existing in-place raceway systems (conduit, boxes, supports, etc.) may be reused for new work providing that the installation is in accordance with requirements for new work found in Division 26 Sections and Division 28 Sections that this section applies to per paragraph 1.1 Related Documents.
- G. Where equipment or fixtures are removed, outlets shall be properly blanked-off and conduits shall be capped. After alterations are completed, the entire installation shall present a "finished" look, as approved by the Architect/Engineer. The original function of the present electrical work to be modified shall not be changed unless required by the specific revisions to the system as specified or as indicated.
- H. Materials salvaged from this work shall not be reused except where reuse is specifically indicated.
- I. Existing fixtures and electrical equipment removed, not reused, and not specifically indicated to be turned over to the Owner shall be legally and properly disposed of off Owner's property.
- J. Existing fixtures and electrical equipment specifically indicated to be turned over to the Owner shall be disconnected, removed, and turned over to the Owner in an undamaged condition to an onsite storage area as directed by the Owner.

3.2 TEMPORARY SERVICES

- A. Provide temporary lighting, power, and telephone service as described in Division 01.
- B. The existing building will be occupied during construction. Maintain electrical services and provide necessary temporary connections and their removal at no additional expense. The existing service shall not be removed until the new services have been installed and made operational in order to minimize shutdown time during transfer of services. The Electrical Contractor shall be responsible for installing and maintaining a temporary service to the existing electrical equipment. Route temporary service in a manner that does not interfere with the convenience of the Owner.

3.3 CUTTING AND PATCHING

- A. Refer to Division 01 for requirements for cutting, patching, and refinishing work necessary for the installation of electrical work.
- B. Provide miscellaneous cutting and patching of the existing building construction for the installation of the Electrical Work.

- C. The cutting of holes through the existing building construction shall only be done by the use of abrasive saws and rotary coring machines. The use of hammer and drill points will not be permitted. The openings shall not be cut larger than necessary for the installation of the electrical work. Openings shall then be grouted in. Where existing piping, etc., is removed, the unused openings shall be grouted in.
- D. The drilling or punching of structural members, such as holes through beams or columns, shall not be done without the specific permission of the Architect/Engineer.
- E. Cutting of holes through floors and walls shall be done only at such locations as directed by the Architect/Engineer.
- F. Cooperate with the other Trades so that all cutting and repairing in any given area will be done simultaneously.
- G. Electrical work which may interfere with building systems uncovered by the cutting of new openings in the present building including but not limited to piping, ducts, or other mechanical equipment as well as conduits and outlets shall be removed at the direction of the Architect/Engineer.

3.4 CHASES AND RECESSES

- A. Provide sizes and locations of chases and recesses affecting the electrical work for provision by the General Trades.

3.5 EQUIPMENT FOUNDATIONS AND SUPPORTS

- A. Furnish foundations and supports for electrical equipment and materials as required by codes, as listed hereinafter, and shown or noted on the Drawings.
- B. Provide necessary inserts, rods, structural steel frames, brackets, platforms, etc., for equipment suspended from ceilings or walls, such as conduits, transformers, panels, etc.
- C. Inserts for equipment support shall be lead shield anchors for small work and expansion shields for large work. Wooden plugs will not be allowed. Do not use metal roof decking and cellular floors for supporting equipment.

3.6 COORDINATION WITH OTHER TRADES

- A. Install work in order to avoid interferences with the work of other Trades. The Electrical Contractor shall be responsible for removing and relocating any work which, in the opinion of the Owner's Representative, causes interferences.
- B. Should construction conditions prevent the installation of switches, conduit, outlet boxes, junction boxes, conductors, lighting fixtures, and/or other related equipment at locations shown on the Drawings, minor deviations may be permitted, shall be as directed by the Architect/Engineer and shall be made without additional cost to Owner.
- C. The Electrical Trades shall be responsible for all damage to other work caused by their work or through the neglect of their workers.
 - 1. All patching and repairing of any such damaged work shall be performed by the Trades which installed the work, but the cost shall be paid by the Electrical Trades.

3.7 ASSEMBLY AND CONNECTION OF EQUIPMENT

A. Assembly of Equipment:

1. The Contract Drawings and Specifications indicate items to be purchased and installed which are noted by a manufacturer's name, catalog number and/or brief description.
2. The catalog number may not designate all the accessory parts and appurtenances required for the particular use or function.
3. Arrange with the manufacturer for the purchase of all items required for the complete installation and efficient operation.

B. Equipment Connections:

1. Connections to equipment, motors, elevator controllers, lighting fixtures, etc., shall be made in accordance with the shop drawings and rough-in measurements furnished by the manufacturers of the particular equipment furnished.
2. Any and all additional connections not shown on the Drawings but called for by the equipment manufacturer's shop drawings or required for the successful operation of the particular equipment furnished shall be installed as part of this Contract at no additional charge to the Owner.

3.8 FIELD QUALITY CONTROL

A. Testing Ducts and Conduits: Ducts and conduits which are installed underground or concealed in concrete floor slab, foundations, etc., shall be cleared of foreign material and obstructions after installation and before conductor or pull wires are draw-in by wire brushing, swabbing, and employing an iron or hardwood mandrel which is 1/4" smaller in diameter than the internal diameter of the duct or conduit. Pulling wires shall be left in empty conduits.

B. Tests and Inspection:

1. When the systems are completed, operate equipment as directed by Architect/Engineer. Replace all faulty equipment. Make necessary adjustments before final acceptance.
2. Perform all tests required by State, City, County and/or other agencies having jurisdiction.
3. Provide all materials, equipment, etc., and labor required for tests.
4. Perform cable and equipment testing as specified.

C. Cleaning:

1. Keep premises free from accumulation of waste materials and rubbish. At the completion of the work, remove all rubbish from and about the building, and leave the electrical systems clean and ready for use.
2. Final clean-up shall include washing of fixture lenses, switchboards, substations, transformers, motor control centers, distribution panels, lighting panels, etc., to remove shipping and/or construction dust and debris. Fixture reflectors and/or lenses with water marks or cleaning streaks will not be accepted.

D. Painting:

1. In general, no painting is required by Electrical Trades other than touch-up of factory-finished electrical equipment.
2. All factory finished electrical equipment shall be cleaned at the completion of the work. Equipment showing rust or mars shall be thoroughly cleaned and sanded, prime coated, and touched up with enamel of color to match original finish.

END OF SECTION 26 0500

SECTION 26 0519 – LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (0-1,000V)

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 work of this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Conductors and cabling for building and structure electrical systems 600 volts and less.
 - 2. Wire and cable systems as required, and all material and equipment, including wire, cable, connectors, lugs, fittings, and identification, as indicated or specified.
- B. Related Sections including the following:
 - 1. Wiring for electronic safety and security is specified in Division 28.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Letter of Intent: Submit a letter of intent stating compliance with drawings, specifications, and code:
 - 1. Wire and cable, except interlocked armor cable
 - 2. Connectors
 - 3. Lugs
 - 4. Terminal blocks
 - 5. Insulating tape
 - 6. Miscellaneous
- C. Product Data: Submit complete product data on each item:
 - 1. Interlocked armor cable
 - 2. Interlocked armor cable fittings
- D. Samples: Submit samples on request of the Architect-Engineer.
- E. Submit test data for wire and cable upon request of the Architect-Engineer. Do not install wire and cable for which test data has been requested until test data is approved.

1.4 QUALITY ASSURANCE

- A. Wire, Cable and Components: Listed by Underwriters' Laboratories as meeting NFPA 70 National Electrical Code requirements and be so labeled.
- B. Furnish wire and cable on which standard factory tests established by AEIC, ANSI, ASTM, ICEA and NEMA have been performed.
- C. Furnish tests on cables as specified in Section 260570.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Deliver all wire and cable to the site on reels or in coils, plainly marked for complete identification, including the wire or cable size, the number of conductors, type of wire or cable, length, weight, thickness and character of the insulation and the name of the manufacturer.

PART 2 - PRODUCTS

2.1 WIRE AND CABLE

- A. General Requirements: Furnish wire and cable per standard specifications established for such material and construction by ASTM, ANSI, ICEA and NEMA, where applicable. All conductors shall be copper unless otherwise specified. Minimum size of conductors shall be No. 12 AWG, except 120 volt control conductors which may be No. 14 AWG and 90 volt and less shall be as specified. Furnish conductor sizes as indicated. Conductors shall be stranded for sizes No. 14 AWG and larger. Conductors smaller than No. 14 AWG shall be as specified in the sections requiring use of such conductors.
 - 1. Manufacturer: Provide products of one of the following:
 - a. Cerrowire
 - b. Encore Wire
 - c. Prysmian Group
 - d. Republic Wire
 - e. Southwire
- B. Wire for Final Connection to LED Fixtures with Remote Drivers: Stranded copper, NEC Type SF-2 fixture wire rated 200 degC, 600 volts.
- C. Wire for Use in LED Fixture Wiring Channels: Stranded copper, NEC Type RHH, THHN, or XHHW insulation rated 90 degC in dry locations, 600 volts.
- D. Wire for Exposed Cord Connection to LED Fixtures: Three conductor stranded copper, NEC Type SO or SOO flexible cord rated 60 degC, 600 volts.
- E. Wire for General Interior Use: Single conductor, annealed copper, 600 volts.
 - 1. No. 10 AWG and smaller: NEC Type THHN/THWN insulation rated 90 degC in dry locations and 75 degC in wet locations or NEC Type THHN/THWN-2 or XHHW-2 insulation rated 90 degC in dry and wet locations.
 - 2. No. 8 AWG and larger: NEC Type THHN/THWN-2 or XHHW-2 insulation rated 90 degC in dry and wet locations.
- F. Wire for General Exterior Use: Single conductor, annealed copper, NEC Type XHHW-2 rated 90 degC in dry and wet locations, 600 volts.
- G. Wire for Underground Duct or Conduit: Single conductor, annealed copper, NEC Type XHHW-2 rated 90 degC in dry and wet locations, 600 volts.
- H. Wire for Use in High Temperature Areas as Indicated: Single conductor, annealed copper, NEC Type FEP or PFA insulation rated 200 degC, 600 volts.
- I. Cable types MC, MI, NM, NMC and NMS shall not be used unless specifically noted on the drawings or in the specifications.

2.2 CONNECTORS FOR SPLICING COPPER CONDUCTORS

- A. Connectors for Straight Splicing (Butt Splice) Conductors Up To and Including No. 8 AWG: Uninsulated solderless compression 2-way type, copper, electro tin plated, rated 90 degC, 600 volts.
 - 1. Manufacturer: Provide one of the following:
 - a. ABB "Sta-Kon"
 - b. Hubbell Burndy "Hylink"
 - c. Panduit
- B. Connectors for Straight Splicing (Butt Splice) Conductors No. 6 AWG and Larger: Uninsulated solderless compression 2-way type, high conductivity copper, electro tin plated, rated 90 degC, 600 volts.
 - 1. Manufacturer: Provide one of the following:
 - a. ABB "Color-Keyed"
 - b. Hubbell Burndy "Hylink"
- C. Connectors for Pigtail Splicing Conductors Up To and Including No. 8 AWG: Solderless type with a metallic insert connector within a plastic insulating cover having a temperature rating of 105 degC, 600 volts.
 - 1. Manufacturer: Provide one of the following:
 - a. 3M Scotchlok
 - b. Buchanan
 - c. Ideal
- D. Connectors for 3-Way Splicing Conductors No. 6 AWG and Larger: Uninsulated solderless compression 3-way type, high conductivity copper, electro tin plated, rated 90 degC, 600 volts.
 - 1. Manufacturer: Provide one of the following:
 - a. ABB Blackburn
 - b. Hubbell Burndy
- E. Connectors for termination of motor loads to branch circuits: Set screw type, multitap, clear insulation for termination inspection.
 - 1. Manufacturer: Provide one of the following:
 - a. ABB Blackburn
 - b. Hubbell Burndy "UNITAP"

2.3 LUGS FOR TERMINATING COPPER CONDUCTORS

- A. Lugs for Terminating Power Conductors Up To and Including No. 8 AWG: Solderless type, manufacturer's standard, unless otherwise specified.

- B. Lugs for Terminating Power Conductors No. 6 AWG and Larger: Solderless compression type, one hole for No. 6 AWG through No. 4/0 AWG inclusive, and two hole for larger sizes, copper, electro tin plated, rated 90 degC, 600 volts.

1. Manufacturer: Provide one of the following:

- a. ABB "Color-Keyed"
- b. Hubbell Burndy "Hylug"

- C. Lugs for Terminating Control and Switchboard Wiring: Solderless compression type with tinned ring tongue.

1. Manufacturer: Provide one of the following:

- a. ABB "Sta-Kon"
- b. Hubbell Burndy "Hylug"

2.4 INTERLOCKED ARMOR CABLE FITTINGS

- A. Terminators: Armor grounding type, non-watertight for indoor use and watertight for outdoor use.

1. Manufacturer: Provide one of the following:

- a. 3M
- b. ABB T&B
- c. Eaton

2.5 TERMINAL BLOCKS

- A. Terminal Blocks for Use in Control Wiring of Control Panels and Terminal Cabinets: Molded barrier type rated 30 amperes, 600 volts, with washer head binding screws and white marking strip.

1. Manufacturer: Provide one of the following:

- a. Eaton
- b. Marathon Special Products
- c. Rockwell Automation Allen-Bradley

2.6 INSULATING TAPE

- A. General Use Tape:

- 1. Tape shall be vinyl all weather designed for continuous operation in -18°C to 105°C applications and shall be 7 mils thick.
- 2. Manufacturer: Provide one of the following:
 - a. 3M Scotch "Super 33+ Vinyl Electrical Tape"

- B. High Temperature Area Tape:

- 1. Tape shall be woven glass cloth designed for continuous operation in Class B (130°C) applications and shall be 17 mils thick.

2. Manufacturer: Provide products of one of the following:

- a. 3M Scotch "Glass Cloth Electrical Tape 27"
- b. Plymouth Rubber "77 Plyglas"

- C. Arc and Fireproofing Tape:

1. Tape shall be flexible unsupported elastomer providing arc fault protection, flame resistant self-extinguishing to prevent flame propagation, and 30 mils thick.
2. Manufacturer: Provide products of the following:
 - a. 3M Scotch "Fire-Retardant Electric Arc Proofing Tape 77"

2.7 MISCELLANEOUS

- A. Wire Labels for Identification of Conductors.

1. Manufacturer: Provide products of one of the following:
 - a. ABB EZ CODE
 - b. Brady

PART 3 - EXECUTION

3.1 GENERAL

- A. Install all wiring in raceway systems unless otherwise specified. Install wiring only in completed raceway systems and when systems are protected from the weather. Install conductors continuous, without splices, between equipment, where possible. Where splices are required, make up splices in boxes; do not use fittings for same.
- B. Install phase and neutral conductors of each branch or feeder circuit in a single conduit except where paralleling circuits are indicated. Install paralleling circuits of identical makeup and length as the paralleled circuit, and terminate conductors at the same location, mechanically and electrically, at both ends, to ensure equal division of the total current between conductors.
- C. All 120 volt branch circuits exceeding 100 feet in length shall be minimum size No. 10 AWG.
- D. All 277 volt branch circuits exceeding 200 feet in length shall be minimum size No. 10 AWG.
- E. For interior branch circuits, provide a separate neutral conductor for each phase conductor for circuits supplying 120 volt convenience receptacles and LED drivers. Sharing neutrals between phase conductors shall not be permitted.
- F. Install conductors in such a manner that the bending radius of any wire or cable is not less than the minimum recommended by ICEA and/or the manufacturer. Do not exceed manufacturer's recommended values for maximum pulling tension applied to any wire or cable.
- G. Connect all power wiring to equipment such that phasing shall be A-B-C-N left to right, top to bottom and front to back, where possible, and permanently identify phasing on the structure or housing adjacent to bus. Phase identification A-B-C is equivalent to transformer phase identification X1-X2-X3 and H1-H2-H3.
- H. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

- I. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- J. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values.
- K. Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
 - 1. Use oxide inhibitor in each splice, termination, and tap for aluminum conductors.

3.2 COLOR CODING, CONDUCTOR AND CABLE IDENTIFICATION

- A. Provide single conductor cables having black or solid color coded insulation for power feeders and subfeeders. Identify individual feeder and subfeeder conductors as to phase connection and voltage by means of wire labels and color coding at each pull box, junction box, manhole, handhole, vault, lighting fixture handhole, splice and termination.
- B. Refer to Section 260553 "Identification for Electrical Systems" for conductor and cable identification requirements.

3.3 SPLICES AND TERMINATIONS

- A. Splice and terminate conductors with connectors and lugs as specified for the specific size and type of conductor. Do not splice armored cable except where cable lengths are limited by reel capacity. Do not splice direct burial cable underground. Indent all compression type connectors and lugs with tools as recommended by the connector or lug manufacturer.
- B. Thoroughly clean wire ends before connectors or lugs are applied. Before installing a compression connector or lug on an aluminum conductor, apply an aluminum joint compound to the exposed conductor and wire brush through the compound to remove the aluminum oxide film. Install the connector or lug immediately after wire brushing the conductor.
- C. Whenever aluminum or copper lugs are terminated on aluminum bus, use a Belleville washer and two tin or cadmium plated washers, one on each side in combination with aluminum joint compound on all contacting surfaces. Tighten bolts until Belleville washer is flat.
- D. Insulate all bare surfaces of conductors with a minimum of four layers (half lap in two directions) of electrical insulating tape. On larger splices and terminals, build up connection with electrical insulating putty before applying tape, to eliminate both sharp edges and voids.
- E. Terminate all armored cables at equipment with an approved type of armored cable terminator and terminate cable ground conductors on equipment ground bus. Where splices are required in armored cables, use metal pull box specified in Section 26 0533 and located outside of and adjacent to the tray, not in the tray.

END OF SECTION 26 0519

SECTION 26 0526 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

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 work of this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Ground Rods
 - 2. Grounding Busbars
 - 3. Grounding Conductors:
 - a. For General Use Above Grade: Bare copper.
 - b. For General Use Below Grade: Bare copper.
 - c. In Underground Ducts or Conduits: Insulated copper.
 - d. In Conduit with Copper Phase Conductors: Insulated copper.
 - e. In Conduit with Aluminum Phase Conductors: Insulated aluminum.
 - f. For Isolated Grounding Systems: Insulated.
 - 4. Grounding Connections:
 - a. In Earth or Inaccessible Locations: Exothermic welded type.
 - b. To Structural Steel Used for Main Building Framing: Exothermic welded type.
 - c. To Non-Permanently Fixed Equipment: Lugs bolted to the equipment.
 - d. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - e. Connections to Ground Rods at Test Wells: Bolted connectors.
 - f. All Other Locations: Bolted connectors.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Ground electrical system neutrals and non-current carrying parts of electrical equipment per the minimum requirements of NFPA 70 National Electrical Code, except where additional requirements are indicated or specified.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70 National Electrical Code by a Nationally Recognized Testing Laboratory (NRTL) acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Letter of Intent: Submit a letter of intent stating compliance with drawings, specifications, and code:
 - 1. Grounding conductors
 - 2. Grounding connector

PART 2 - PRODUCTS

2.1 GROUNDING CONDUCTORS

- A. Bare Grounding Conductors: Stranded annealed copper.
- B. Insulated Copper Grounding Conductors: Single conductor, stranded annealed copper, NEC Type THHN/THWN insulation rated 90 degC in dry locations and 75 degC in wet locations or NEC Type THHN/THWN-2 or XHHW-2 insulation rated 90 degC in dry and wet locations, 600 volts, color-coded green. Conductor No. 10 AWG and smaller may be solid in lieu of stranded.
- C. Insulated Aluminum Grounding Conductors: Single conductor, compact stranded ASTM B800 AA-8000 series aluminum alloy, NEC Type XHHW-2 insulation rated 90 degC in dry and wet locations, 600 volts, color-coded green.
- D. Flexible Braid Grounding Strap: Copper tape, braided conductors terminated with copper ferrules, size as required for equivalent wire conductor.
 - 1. Manufacturer: Provide products of one of the following:
 - a. ABB Blackburn
 - b. Hubbell Burndy
 - c. nVent Erico
- E. Manufacturer: Provide products of one of the following, unless otherwise noted:
 - 1. Cerrowire
 - 2. Encore Wire
 - 3. Prysmian Group
 - 4. Republic Wire
 - 5. Southwire

2.2 GROUNDING CONNECTIONS

- A. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
 - 1. Manufacturer: Provide products of one of the following:
 - a. ABB Blackburn
 - b. Hubbell Burndy
 - c. nVent Erico
- B. Mechanical-Type Bus-Bar Connectors: Cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.
- C. Compression-Type Bus-Bar Connectors: Copper or copper alloy, with two wire terminals.
- D. Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.
- E. Cable-to-Cable Connectors: Compression type, copper or copper alloy.
- F. Conduit Hubs: Mechanical type, terminal with threaded hub.

G. Manufacturers: Provide products of the following, unless otherwise noted:

1. ABB Thomas & Betts including Blackburn
2. Emerson Appleton
3. Emerson O-Z/Gedney
4. Hubbell Anderson
5. Hubbell Burndy
6. nVent Erico
7. Penn Union

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install conductors of minimum size required by NFPA 70 National Electrical Code except where sizes exceeding the requirements are indicated.
- B. Thoroughly clean all bonding surfaces of non-conducting materials. Where bolted connections are used, treat surfaces with a corrosion-inhibiting compound.
- C. Where insulated conductors are used, thoroughly tape all exposed splices and connections. Encapsulate below grade splices and connections so that bare conductors are not in contact with earth.
- D. Where metallic conduit is used for mechanical protection of a ground conductor, bond conductor to the conduit at each end.
- E. For electrical system neutral grounding, do not use conductor sizes smaller than No. 8 AWG.
- F. Where non-metallic conduit is used, install a ground conductor in the conduit with the circuit conductors. The ground conductor may be a separate conductor, a conductor of a multi-conductor cable, or wires in the interstices of cabled circuit conductors. Size the ground conductors per NEC requirements except where noted otherwise.
- G. Lighting branch circuits in EMT or flexible conduit and lighting fixture cord and plug assemblies shall have an equipment grounding conductor.
- H. Provide an equipment grounding conductor, within the raceway along with phase conductors, for all feeders and branch circuits.
- I. Provide an equipment grounding conductor within all flexible conduits.
- J. The metallic enclosures and exposed noncurrent-carrying metal parts of all electrical equipment shall be grounded by connection with an equipment grounding conductor. This includes boxes, panels, lighting fixtures, ballasts and poles, receptacles, etc.

END OF SECTION 26 0526

SECTION 26 0529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel slotted support systems.
 - 2. Conduit and cable support devices.
 - 3. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:
 - a. Slotted support systems, hardware, and accessories.
 - b. Clamps.
 - c. Hangers.
 - d. Sockets.
 - e. Eye nuts.
 - f. Fasteners.
 - g. Anchors.
 - h. Saddles.
 - i. Brackets.
 - 2. Include rated capacities and furnished specialties and accessories.
- B. Shop Drawings: For fabrication and installation details for electrical hangers and support systems.
 - 1. Hangers. Include product data for components.
 - 2. Slotted support systems.
 - 3. Equipment supports.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Ductwork, piping, fittings, and supports.
 - 3. Structural members to which hangers and supports will be attached.
 - 4. Size and location of initial access modules for acoustical tile.
 - 5. Items penetrating finished ceiling, including the following:
 - a. Luminaires.
 - b. Speakers.

- c. Sprinklers.
- d. Access panels.

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch-diameter holes at a maximum of 8 inches o.c. in at least one surface.
 - 1. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
 - 2. Material for Channel, Fittings, and Accessories: Galvanized steel.
 - 3. Channel Width: Selected for applicable load criteria.
 - 4. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 5. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 6. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:
 - 1. NECA 1.
 - 2. NECA 101
 - 3. NECA 102.
 - 4. NECA 105.
 - 5. NECA 111.
- B. Comply with requirements in Section 07 8413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.
- C. Comply with requirements for raceways and boxes specified in Section 26 0533 "Raceways and Boxes for Electrical Systems."
- D. Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- E. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 - 1. Secure raceways and cables to these supports with single-bolt conduit clamps.
- F. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings, and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.
- B. Raceway Support Methods: In addition to methods described in NECA 1, EMT may be supported by openings through structure members, according to NFPA 70.

- C. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- D. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 - 1. To Wood: Fasten with lag screws or through bolts.
 - 2. To New Concrete: Bolt to concrete inserts.
 - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 - 4. To Existing Concrete: Expansion anchor fasteners.
 - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 - 6. To Steel: Beam clamps complying with MSS SP-69.
 - 7. To Light Steel: Sheet metal screws.
 - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- E. Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

3.3 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
- B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

END OF SECTION 26 0529

SECTION 26 0533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

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 work of this Section.

1.2 SUMMARY

- A. Raceway systems as required, and all equipment and material, including conduit, fittings, boxes, wireways, and cable trays, as indicated or specified.

1.3 SUBMITTALS

- A. Product Data: Submit complete data on each item. Coordinate the items, as they relate to the work, prior to submittal. Shop drawings shall include:
 - 1. Conduit and fittings
 - 2. Boxes
 - 3. Wireways
- B. Submit Owner's Operation and Maintenance Manuals for systems and equipment as follows:

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Work in Hazardous Areas in accordance with Article 500 of the National Electrical Code.

PART 2 - PRODUCTS

2.1 CONDUIT

- A. Rigid Galvanized Steel (RGS) Conduit, Elbows, and Couplings: Zinc-coated hot dip galvanized threaded steel per ANSI C80.1 "Specification for Rigid Steel Conduit, Zinc-Coated" and UL6. Each length of conduit shall be threaded on both ends.
 - 1. Manufacturer: Provide products of one of the following:
 - a. Allied
 - b. Republic
 - c. Wheatland
- B. Intermediate Metal Conduit (IMC), Elbows and Couplings: Zinc-coated hot dip galvanized per UL 1242. Each length of conduit shall be threaded on both ends.
 - 1. Manufacturer: Provide products of one of the following:
 - a. Allied
 - b. Republic
 - c. Wheatland

- C. Electrical Metallic Tubing (EMT): Zinc-coated steel per ANSI C80.3-1977 "Specification for Electrical Metallic Tubing, Zinc-Coated".

1. Manufacturer: Provide products of one of the following:

- a. Allied
- b. Republic
- c. Wheatland

- D. Flexible Steel Conduit: Per UL-1, "Flexible Steel Conduit".

1. Manufacturer: Provide products of one of the following:

- a. Anaconda
- b. Electriflex

- E. Liquid-Tight Flexible Steel Conduit: Per UL-1, "Flexible Steel Conduit", with a PVC jacket.

1. Manufacturer: Provide products of one of the following:

- a. Anaconda
- b. Sealtite
- c. Electriflex

2.2 ELECTRICAL PLASTIC CONDUIT

- A. Thin Wall Conduit: Type A, UL-rated for concrete encasement underground, construct of polyvinyl chloride compound C-2000, and UL-listed in accordance with NEC Article 347.

- B. PVC Conduit and Tubing Fittings: NEMA TC 3, mate and match to conduit or tubing type and material.

- C. Conduit and Tubing Accessories: Provide conduit, tubing and duct accessories of types, sizes and materials, complying with manufacturer's published product information, which mate and match conduit and tubing.

- D. Manufacturers: Provide products of one of the following:

- 1. Cantex
- 2. Prime Conduit, Inc.
- 3. National Pipe

2.3 CONDUIT FITTINGS

- A. Fittings for Rigid Galvanized Steel or Intermediate Metal Conduit: Cast or malleable iron bodies, cadmium or zinc-plated, with taper threads, screw attached cover plates, and gaskets when located in areas requiring gaskets as specified in Part 3.

1. Manufacturer: Provide products of one of the following:

- a. Appleton Form 35
- b. Crouse-Hinds Form 8
- c. Steel City/Thomas & Betts
- d. Topaz

- B. Expansion Fittings for Rigid Galvanized Steel or Intermediate Metal Conduit: Cast or malleable iron bodies, with threaded end caps for receiving fixed and movable conduits, metallic pressure packing and copper bonding jumper assembly, and providing for a minimum of 2 inches movement of the conduit in either direction.
1. Manufacturer: Provide products of one of the following:
 - a. Appleton Type XJ
 - b. Crouse-Hinds Type XJ
 - c. O-Z Type AX
 - d. Thomas & Betts Type XJG
- C. Couplings and Connectors for EMT: Zinc-plated steel, compression or set screw type.
1. Manufacturer: Provide products of one of the following:
 - a. Appleton
 - b. ETP
 - c. Midwest
 - d. Steel City/Thomas & Betts
- D. Conduit Unions on Continuous Run:
1. Manufacturer: Provide products of the following:
 - a. Erickson
- E. Expansion Fittings for EMT:
1. Manufacturer: Provide products of the following:
 - a. Thomas & Betts Type XJG
- F. Fittings for Flexible Steel Conduit: Malleable iron or steel, zinc or cadmium plated, securing the conduit by clamping action around the periphery of the conduit. Do not furnish fittings that anchor the conduit by means of set screws.
1. Manufacturer: Provide products of one of the following:
 - a. Appleton
 - b. ETP
 - c. Steel City/Thomas & Betts
- G. Fittings for Liquid-Tight Flexible Steel Conduit: Designed to maintain the liquid-tight feature of the installation.
1. Manufacturer: Provide products of one of the following:
 - a. Appleton ST Series
 - b. ETP
 - c. Thomas & Betts 5331 to 5360
- H. Locknuts for Rigid Steel or Intermediate Metal Conduit: Malleable iron or steel, zinc or cadmium plated.

- I. Bushings for 1 Inch and Smaller Rigid Steel Conduits, Intermediate Metal Conduits or Aluminum Conduits: Insulating plastic type of non-burnable thermosetting phenolic, conforming to Underwriters' Laboratories requirements. Do not furnish non-rigid plastic bushings.
- J. Bushings for 1-1/4 Inch and Larger Rigid Steel or Intermediate Metal Conduits: Malleable iron or steel, zinc or cadmium plated, with insulating insert of thermosetting plastic as specified for smaller conduit bushings, molded and locked into the bushing ring.

2.4 OUTLET BOXES

- A. Sheet Steel Boxes: Galvanized or sherardized stock not less than No. 14 gage, with knockout openings, single or multiple gang, with extensions, adapters, plaster rings, tile covers, fixture studs and cover plates. Furnish accessories with same gage and finish as specified for boxes, except where special finishes are specified for covers and device plates in Section 26 2726. Provide sizes per NEC requirements for wiring space, except where minimum sizes are specified under Part 3.

- 1. Manufacturer: Provide products of one of the following:

- a. Appleton
 - b. RACO
 - c. Steel City

- B. Cast or Malleable Iron Boxes: Galvanized or cadmium plated, single or multiple gang, with taper threaded hubs, adapters and cover plates. Furnish cast metal, galvanized or cadmium plated accessories, except where special device plates are specified in Section 26 2726. Furnish gaskets when located in areas requiring gaskets as specified in Part 3. Provide sizes per NEC requirements for wiring space, except where minimum sizes are specified under Part 3.

- 1. Manufacturer: Provide products of one of the following:

- a. Appleton
 - b. Crouse-Hinds
 - c. Pyle-National
 - d. Russelstoll
 - e. Steel City/Thomas & Betts

- C. Aluminum or Aluminum Alloy Boxes: Single or multiple gang, with taper threaded hubs, adapters and cover plates. Furnish cast aluminum or aluminum alloy accessories, except where special device plates are specified in Section 26 2726. Furnish gaskets when located in areas requiring gaskets as specified in Part 3. Provide sizes per NEC requirements for wiring space, except where minimum sizes are specified under Part 3.

- 1. Manufacturer: Provide products of one of the following:

- a. Appleton
 - b. Crouse-Hinds
 - c. Pyle-National
 - d. Russelstoll

2.5 PULL AND JUNCTION BOXES

- A. Boxes Less than 5 Inches by 5 Inches: Conform to requirements specified for Outlet Boxes.

- B. Sheet Metal Boxes: Code gage, full seam welded with bent-in flanges seam welded at corner joints, screw fastened cover of same gage as box. Fasten cover with brass machine screws. Galvanize box and cover after fabrication. Provide sizes conforming to NEC requirements for wiring space, except where boxes of larger size are indicated. Furnish gaskets when located in areas requiring gaskets as specified in Part 3.
- C. Cast or Malleable Iron Boxes: Code gage, with threaded hubs or conduit bosses for field drilling and tapping, screw fastened cover of same gage as box. Fasten cover with brass machine screws. Galvanize box and cover after fabrication. Provide sizes conforming to NEC requirements for wiring space, except where boxes of larger size are indicated. Furnish gaskets when located in areas requiring gaskets as specified in Part 3.

- 1. Manufacturer: Provide products of one of the following:

- a. Hoffman
- b. O-Z

- D. Aluminum or Aluminum Alloy Boxes: Code gage, with threaded hubs or conduit bosses for field drilling and tapping, screw fastened cover of same gage as box. Fasten cover with stainless steel machine screws. Provide sizes per NEC requirements for wiring space, except where boxes of larger size are indicated. Furnish gaskets when located in areas requiring gaskets as specified in Part 3.

- 1. Manufacturer: Provide products of one of the following:

- a. Hoffman
- b. O-Z

2.6 SURFACE RACEWAY

- A. Where necessary to run exposed on existing walls and/or ceilings in finished areas, use surface raceway series type, as required for each individual circuit, or as shown on drawing. Paint the new surface raceway to match the existing surface.

- 1. Manufacturer: Provide products of one of the following:

- a. Hubbell
- b. Mono-Systems
- c. Wiremold

2.7 MISCELLANEOUS

- A. Trapeze Hangers

- 1. Manufacturer: Provide products of one of the following:

- a. Kindorf
- b. Powerstrut
- c. Unistrut

- B. Shielding Paint

- 1. Manufacturer: Provide products of one of the following:

- a. Thomas & Betts "KopR-Shield"

C. Sealant: Single component, non-sage urethane:

1. Manufacturer: Provide products of one of the following:

- a. Sika Corporation "Sikaflex 1a"
- b. Pecora Corporation "Dynatrol 1"
- c. Sonneborn "Sonolastic NP-1"
- d. Tremco "Dymonic"

PART 3 - EXECUTION

3.1 CONDUIT SYSTEMS

- A. Install RGS conduit for all feeders 2" in diameter or larger.
- B. Install RGS conduit for conduit in "unfinished" or "open" areas up to 10'-0" above finished floor.
- C. Install RGS conduit for conduits passing through foundation walls with a 3 inch minimum concrete wall around the conduits and five (5) feet both sides of the wall.
- D. Electrical Plastic Conduit (PVC) for conduits routed below the building floor slab.
- E. Install RGS conduits for conduits imbedded in the floor slab. Maximum size of conduits imbedded in floor slabs shall be 1-1/4" diameter unless otherwise specified. Conduits imbedded in floor slabs shall not cross each other.
- F. Install RGS conduit for conduit elbows used to transition from below the slab and for all RGS conduit imbedded in the slab to vertical risers passing through the floor slab.
- G. Install RGS conduits for all exposed exterior locations and wet locations.
- H. EMT compression type connectors and couplings shall be used for all EMT conduits routed in damp locations or when the use of EMT in lieu of RGS is approved by the Engineer for exposed exterior locations. The use of set screw connectors and couplings is permitted for all other EMT raceways where equipment ground wires exist.
- I. Install EMT concealed in wall cavities in offices and similarly "finished areas," above suspended ceilings and in "unfinished areas" 10'-0" above finished floor.
- J. Install flexible conduit in lieu of RGS or EMT for service to individual recessed fixtures, 1/2 inch minimum size. Use liquid-tight type of flexible conduit in lieu of non-jacketed flexible conduit in damp or wet locations.
- K. Install liquid-tight flexible steel conduit for final connection to distribution transformers for final connections to all motors and other equipment subject to vibration or movement. Flexible conduits shall not exceed 6'-0" in length.
- L. Install conduit systems as indicated, as required by the NEC, and as specified. Install conduit sizes as indicated. Where conduit sizes are not indicated, install sizes per NEC requirements, except do not use conduit sizes smaller than 3/4 inch. The use of 1/2" conduit is permitted from receptacle outlet boxes and switch outlet boxes to the nearest junction mounted in the ceiling space. 3/4" conduit minimum shall be used from the panelboards to the junction boxes and between junction boxes. Use 1/2 inch fixture stems optionally, unless otherwise indicated.
- M. Install conduit concealed in office and similar finished areas, and exposed in all other areas unless otherwise indicated or specified.

- N. Install all exposed and concealed conduit runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings. Keep conduit at least six inches away from parallel runs of high temperature surfaces, such as steam or hot water pipes and do not run conduit directly under cold water lines.
- O. Conduits routed below floor slabs shall have a minimum of 3 inches of sand cover and shall not be required to be run parallel to building walls.
- P. Group conduit for common support, where indicated and elsewhere as directed by the Architect-Engineer.
- Q. Do not install crushed or deformed conduits and avoid trapped runs in damp or wet locations. Take care to prevent the entrance of water and the lodging of concrete, plaster, dirt or trash in conduit, boxes, fittings and equipment during the course of construction. Free conduit of obstructions or replace the conduits. Where conduit joints occur in concrete slabs, or in damp or wet locations, make joints watertight by applying an approved compound on the entire thread area before assembling. Draw up all conduit joints as tightly as possible. Cap exposed empty conduits which do not terminate in outlets, panels, cabinets, etc. with standard galvanized plumbers pipe caps. Plug empty conduits which terminate flush with floors or walls with flush coupling and brass plug.
- R. Install conduit sleeves for all exposed conduits and cables passing through walls, ceilings or floors, and fill the void between sleeve and conduit with sealant flush with the end of the sleeve to seal the opening.
 - 1. For conduit sleeves passing through fire rated walls, floors or ceilings, comply with requirements of Section 078413 "Through-Penetration Firestop Systems".
- S. Terminate conduit stubbed up through concrete floors for connections to free standing equipment with a coupling flush with finish floor, and extend rigid conduit to equipment, except that where required, use flexible conduit from a point 6 inches above the floor.
- T. Make changes in direction of runs with symmetrical bends, fittings or pull boxes. Do not use bends around outside corners; use fittings for same. Install elbows, bends and offsets having a minimum radius of curvature of 24 inches for 2 inch and 2-1/2 inch conduit, and 36 inches for 3 inch and larger conduit. Except where conduit runs are shown in exact detail, install pull points at not greater than 200 foot intervals in straight runs. Where bends are included between pull points, reduce this maximum permissible 200 foot separation between pull points by 50 feet for each 90 degree bend and 25 feet for each 45 degree bend. Figure deductions for all other angle bends on a similar basis. When bends are made in the field, make bends with an approved hickey or conduit bending machine. Make bends in 1-1/4 inch and larger conduits with standard conduit ells where possible.
- U. Provide conduit nipples with two independent sets of threads. Do not use running threads on any part of the conduit system. Where conditions require joining two fixed conduits into a continuous run, use a conduit union, in place of running threads and coupling.
- V. Install expansion fittings in exposed conduit runs of excessive length, where conduits cross building expansion joints, and where indicated.
- W. Install double locknuts and bushings on all rigid conduit terminations into threadless openings. Increase length of conduit threads at terminations sufficiently to permit the bushing to be fully seated against the end of the conduit.
- X. Use one hole malleable iron galvanized pipe straps for support of single conduits, or clevis type hangers. Support groups of conduit on trapeze hangers. Use threaded rod or pipe for hanger support. Do not use perforated strap or wire for conduit or hanger support. Use beam clamps or malleable iron or wrought steel with hook rods to grip the beam flange for conduit or hanger support; do not use C-clamp type fittings. Support exposed conduit at least every 8 feet if smaller than 2 inch, and every 10 feet if 2 inch and larger unless otherwise noted.

3.2 OUTLET, SWITCH, JUNCTION AND PULL BOXES

- A. Outlet Boxes for Use with Rigid Steel Conduit in Non-Hazardous Areas: Sheet steel for flush or concealed work in dry locations; cast or malleable iron in exposed, damp or wet locations. Do not use sheet steel outlet boxes in utility or factory areas.
- B. Outlet Boxes for Use with Aluminum Conduit: Sheet steel for flush or concealed work in dry non-concrete locations and cast aluminum or aluminum alloy in exposed locations.
- C. Outlet Boxes for Use with Electrical Metallic Tubing: Sheet steel for flush or concealed work; cast or malleable iron for exposed locations.
- D. Flush Mounted Boxes: For single gang outlets and two gang outlets, use boxes not less than 4 inches square and 2-1/8 inches deep with single gang and two gang plaster reducing ring. For multiple outlets, use gang type boxes not less than 2-1/4 inches deep. Plaster rings shall not be less than 3/4 inches deep. For ceiling outlets in concrete slabs, use boxes not less than 3 inches deep.
- E. Gaskets: Provide cover gaskets for boxes in damp or wet locations and in factory areas.
- F. Pull and Junction Boxes for Use with Each Type of Conduit: As specified for outlet boxes for each conduit type under above paragraphs.
- G. Install boxes in the wiring or raceway systems as required for pulling of wires, making connections, and mounting of devices and fixtures.
- H. Install extension rings, adapters, raised covers and plaster rings on flush mounted boxes as required. Equip flush mounted boxes in masonry block or tile walls with tile covers.
- I. Install separate concealed boxes for semi-flush or recessed fixtures when required by the fixture terminal operating temperature. Make boxes readily accessible on removal of the fixture or provide ceiling access panels as approved by the Architect-Engineer.
- J. Locate outlets in offices and other finished areas with due regard for the finish and interior architectural treatment so that outlets are centered with respect to panels, joints or moldings, and so that plaster rings, frames and tile covers are properly located with respect to the finished surface.
- K. Install outlets for wall switches controlling lighting on the latch side of door where possible.
- L. Support boxes independent of conduit and secure rigidly in place. Install boxes used for fixture support such that they are capable of carrying 100 pounds.
- M. In concrete, anchor boxes securely to reinforcing steel and to forms to prevent shifting when concrete is placed.
- N. Above suspended ceilings, support boxes to the building steel or structural floor above and independent of the ceiling pads; flush mounted boxes for suspended ceilings fasten boxes to the ceiling support system by bar hanger or other approved support; flush boxes in drywall ceilings fasten boxes to ceiling support system by bar hanger or other approved support system.

3.3 WIREWAYS

- A. Install wireways at locations indicated. Where wireways are located on surfaces susceptible to moisture on exterior masonry or concrete walls, do not install wireway in contact with such surfaces; support wireways with not less than 1/4 inch air separation from the surface.
- B. Provide supports at a maximum of 5 foot intervals.

- C. Where pendant supports are indicated or required, provide 1/2 inch diameter threaded rods with beam clamps as specified for conduit supports. Provide lateral bracing at not greater than 10 foot intervals.

END OF SECTION 26 0533

SECTION 26 0553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

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. Equipment identification nameplates
 - 2. Raceway identification
 - 3. Armored and metal-clad cable identification
 - 4. Power and control cable identification
 - 5. Cable ties
 - 6. Miscellaneous identification products

1.3 ACTION SUBMITTALS

- A. Product Data: Letter of intent.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 [and IEEE C2].
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 EQUIPMENT IDENTIFICATION NAMEPLATES

- A. Engraved, Plastic Laminate or Laminated Acrylic: Punched or drilled for screw mounting. Black engraved letters on a white face. Minimum letter height shall be 1/4 inch.

2.2 RACEWAY IDENTIFICATION

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits as specified voltages:
 - 1. Black letters on a yellow field for 250V or less.
 - 2. Black letters on a red field for over 250V and less than 600V.
 - 3. Black letters on an orange field for circuits over 600V.
 - 4. Legend for Systems below 600V: Indicate voltage.
- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- D. Snap-Around Labels for Raceways Carrying Circuits at 600 V or Less: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- E. Metal Tags: Brass or aluminum, 2 by 2 by 0.05 inch, with stamped legend, punched for use with self-locking cable tie fastener.

2.3 ARMORED AND METAL-CLAD CABLE IDENTIFICATION

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Colors for Raceways Carrying Circuits at 600 V and Less:
 - 1. Black letters on a yellow field for 250v or less.
 - 2. Black letters on a red field for over 250v and less than 600v.
- C. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.4 POWER AND CONTROL CABLE IDENTIFICATION

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.
- C. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeve, with diameter sized to suit diameter of raceway or cable it identifies and to stay in place by gripping action.
- D. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

- E. Write-On Tags: Polyester tag, 0.015 inch thick, with corrosion-resistant grommet and cable tie for attachment to conductor or cable.
 - 1. Marker for Tags: Permanent, waterproof, black ink marker recommended by tag manufacturer.
 - 2. Marker for Tags: Machine-printed, permanent, waterproof, black ink marker recommended by printer manufacturer.

2.5 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 - 3. Temperature Range: Minus 40 to plus 185 deg F.
 - 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
 - 1. Minimum Width: 3/16 inch.
 - 2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
 - 3. UL 94 Flame Rating: 94V-0.
 - 4. Temperature Range: Minus 50 to plus 284 deg F.
 - 5. Color: Black.

2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

- F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50 foot maximum intervals in straight runs, and at 25 foot maximum intervals in congested areas.
- G. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- H. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
 - 1. Outdoors: UV-stabilized nylon.
 - 2. In Spaces Handling Environmental Air: Plenum rated.

3.2 EQUIPMENT IDENTIFICATION NAMEPLATES

- A. Equipment Identification Nameplates: On each unit of equipment, install unique designation label that is consistent with one line diagram tag nameplates, wiring diagrams, schedules, and the Operation and Maintenance Manual
 - 1. Labeling Instructions:
 - a. Indoor and Outdoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/4 inch high letters on 1-1/2 inch high label.
 - b. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - c. Fasten nameplates with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 - 2. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits.
 - b. Enclosures and electrical cabinets
 - c. Access doors and panels for concealed electrical items
 - d. Emergency system boxes and enclosures
 - e. Motor starters
 - f. Power transfer equipment
 - g. Remote-controlled switches, dimmer modules, and control devices

3.3 RACEWAYS AND CONDUCTOR IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Metal-Clad Cables, 600 V or Less, for Service, Feeder, and Branch Circuits 100 amperes or more and 120 volts or more to ground:
 - 1. Self-adhesive vinyl tape applied in bands. Install labels at 30 foot maximum intervals.
- B. Accessible Raceways, Cables, Junction Box Cover Plates and Pull Box Covers:
 - 1. Self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
 - a. Emergency power
 - b. Power

C. Conductor Identification, 600 V or Less:

1. Identify individual phase conductors, neutral conductor and ground conductor of branch power and lighting circuits as to phase and system voltage by means of color coding in conformance with Sections 200-6 and 210-5 of the NEC.
2. Use the following identification scheme unless there are existing schemes being utilized by the Owner:

Phase			Neutral		Equipment Grounding Conductor	System
A	B	C	Normal Power	Emergency Power		
X	Y	Z	N	N	GRD.	Any Voltage
Black	Red	Blue	White	White/Red tracer	Green	120/208 Volt
Brown	Orange	Yellow	Gray	Gray/Red tracer	Green/Yellow Tracer	277/480 Volt

3. Where color schemes deviate from above, submit color schemes for approval of the Architect-Engineer prior to implementation. Provide conductor color coding by means of colored insulating materials or by means of colored wire labels attached to individual conductors in all outlet, pull or junction boxes and at all terminations.
 4. Install color coding scheme labels at each switchboard, panelboard, distribution panel, power panel and motor control center.
 5. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Tags shall be 1/8 inch thick lead die-stamped tags with punched ears. Fasten tags around the cable group or conduit with No. 12 AWG copper wire.
- E. Identify cables in cable tray at intervals of 40 feet, at each side of walls, and at terminations and splices by means of strip aluminum with raised letters.
- F. Identify cables entering or exiting conduits, passing through pull boxes, at each pullbox and at each termination location.
- G. Auxiliary Systems Conductor Identification:
1. Identify field-installed alarm, control, and signal connections.
 2. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 3. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 4. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- H. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
1. Comply with 29 CFR 1910.145.
 2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.

4. For equipment with multiple power or control sources, apply to door or cover of equipment including, but not limited to, the following:
 - a. Power transfer switches.
 - b. Controls with external control power connections.
- I. Operating Instruction Signs:
 1. Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- J. Install instructional sign using adhesive-film-type labels.

END OF SECTION 26 0553

SECTION 26 0923 – LIGHTING CONTROL DEVICES

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 the following:
 - 1. The objective of this section is to ensure the proper installation of the following lighting control devices:
 - a. Wall switch occupancy sensors
 - b. Indoor occupancy sensors
 - c. Emergency power transfer devices
 - 2. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensors, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system with automatic emergency power transfer, as described herein.
 - 3. The occupancy sensor based lighting control devices shall accommodate all conditions of space utilization and all irregular work hours and habits.
 - 4. The location and quantities of sensors shown on the Drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. Provide additional sensors as required to properly and completely cover the respective room.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Provide installation details for occupancy and light-level sensors.
 - 1. Lighting plans indicating location, orientation, and coverage area of each sensor and each power transfer device. The locations and quantities of sensors and transfer devices indicated on the Drawings are diagrammatic and indicate only the rooms which are to be provided with sensors and emergency lighting. Provide layout shop drawings indicating all power transfer devices and all sensors including any additional sensors required to properly and completely cover the respective areas. Include locations of power transfer devices (PTD).
 - 2. Interconnection diagrams showing field-installed wiring.
- C. Operation and Maintenance Data: For each type of product to include in emergency, operation, and maintenance manuals.

1.4 WARRANTY

- A. Contractor shall warrant all equipment furnished in accordance with this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The suppliers obligation shall include repair or replacement, and testing without charge to the owner, all or any parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. The warranty shall commence upon the owner's acceptance of the project. Warranty shall be for a minimum period of one (1) year.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Products supplied shall be from a single manufacturer that has been continuously involved in the manufacturing of occupancy sensors for a minimum of five (5) years. Mixing of manufacturers shall not be allowed.
- C. All components shall be U.L. listed and meet all state and local applicable code requirements.
- D. Wall switch products shall be capable of withstanding the effects of inrush current. Submittals shall clearly indicate the method used.
- E. It shall be the contractor's responsibility to make all proper adjustments to assure owner's satisfaction with the occupancy sensor system.
- F. It shall be the manufacturer's responsibility to verify all proper adjustments and train owner's personnel to ensure owner's satisfaction with the occupancy system. A minimum of four (4) hours at the jobsite building shall be included for training.

1.6 COORDINATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.
- B. Contractor shall coordinate all work described in this section with all other applicable plans and specifications, including but not limited to wiring, conduit, fixtures, HVAC systems and building management systems.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. All products shall be provided by one of the following:
 - 1. Leviton
 - 2. Sensor Switch
 - 3. Watt Stopper

2.2 ULTRASONIC OCCUPANCY SENSORS

- A. The ultrasonic occupancy sensors shall be capable of detecting presence in the floor area to be controlled by detecting Doppler shifts in transmitted ultrasound.
- B. Ultrasonic sensing shall be volumetric in coverage with a frequency of 32.768 kHz at $\pm 0.002\%$. They shall utilize Advanced Signal Processing which automatically adjusts the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled areas.
- C. Sensors of varying frequencies shall not be allowed so as to prevent sensors from interfering with each other and to assure compatibility in the event more sensors are added.

- D. Sensors shall have temperature and humidity resistant, 32 kHz tuned ultrasonic receivers. Receivers shall have less than a 6dB shift in the humidity range of 10% to 90% and less than a 10dB shift in the temperature range of -20° to 60°C.
- E. Detection shall be maintained when a person of average size and weight moves only within or a maximum distance of twelve inches either in a horizontal or vertical manner at the approximate speed of 12 inches per second. The sum of this distance, volume and speed represent the average condition ultrasonic sensors must meet in order for the lights to not go off when a person is reading or writing while seated at a desk.
- F. Sensors shall have a DIP switch override-ON function for use in the event of failure. The LED is maintained ON so as to be visible from the floor as a constant reminder that the automatic function has been by-passed.
- G. Sensors shall have a DIP switch controlled, digital time delay that shall be adjustable from 15 seconds to 30 minutes. Sensors shall have user-adjustable sensitivity setting. Sensors shall cover 360°. Sensitivity and timer controls shall be accessible from the front of the sensor and shall be concealed by a hinged cover.
- H. Provide ceiling-mounted recessed ultrasonic occupancy sensors in the following spaces:
 - 1. Toilet rooms.
 - 2. Corridors.
- I. Manufacturer: Provide the following:
 - 1. Leviton
 - 2. Sensor Switch CM Series
 - 3. Watt Stopper WT Series

2.3 DUAL TECHNOLOGY OCCUPANCY SENSOR

- A. The Dual Technology sensor shall be capable of detecting presence in the control area by detecting Doppler shifts in transmitted ultrasound and passive infrared (PIR) heat changes.
- B. Sensor shall utilize Dual Sensing Verification Principle for coordination between ultrasonic and PIR technologies. Detection verification of both technologies must occur in order to activate lighting systems. Upon verification, detection by either shall hold lighting on.
- C. Sensor shall have a retrigger feature in which detection by either technology shall instantly turn the lighting system back on within 5 seconds of being switched off.
- D. Ultrasonic sensing shall be volumetric in coverage with a frequency of 40 KHz. It shall utilize Advanced Signal Processing which automatically adjusts the detection threshold dynamically to compensate for constantly changing levels of activity and air flow throughout controlled space.
- E. Detection shall be maintained when a person is seated and performing normal work tasks, such as reading or writing at a desk.
- F. Sensor shall be capable of corner mounting to a wall or ceiling in order to eliminate detection through open doorways and outside of controlled area. To provide superior small motion detection and immediate activation upon entry, coverage of both technologies must be complete and overlapping throughout the controlled area.

- G. To avoid false ON activations and to provide high sensitivity to minor motion, Pulse Count Processing and Detection Signature Analysis shall be used to examine the frequency, duration, and amplitude of a signal, to respond only to those signals caused by human motion.
- H. Sensor shall utilize mixed signal technology to provide immunity to RFI and EMI.
- I. The PIR technology shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. The lens shall be Poly IR4 material to offer superior performance in the infrared wavelengths and filter short wavelength IR, such as those emitted by the sun and other visible light sources. The lens shall have grooves facing in to avoid dust and residue build up which affects IR reception. To ensure high sensitivity to small motion at the desktop, the standard lens shall be 30 element with 15 layers horizontally and 4 layers vertically and shall cover up to 2,000 square feet for walking motion when mounted at a ceiling height of 10 feet.
- J. Sensor shall have a DIP switch controlled, digital time delay of 30 sec to 30 min. Sensor shall have a DIP switch override-ON function for use in the event of a failure. Each sensing technology shall have an independent sensitivity adjustment and LED indicator that remains active at all times in order to verify detection within the area to be controlled.
- K. Sensor shall have an additional single-pole, double-throw isolated relay with normally open, normally closed, and common outputs. The isolated relay shall be used with HVAC control, data logging, and other control options.
- L. Sensor shall incorporate field-selectable logic configurations which allows for space utilization changes and/or other special field conditions.
- M. Sensors shall be field adjusted to operate as follows:
 - 1. Manual on via wall switch when wall switch indicated.
 - 2. Auto on when no wall switch is indicated.
 - 3. Auto off with time delay set to 5 minutes.
 - 4. Hold on when either technology detects occupancy.
 - 5. Off when both technologies indicate no occupancy.
- N. Provide ceiling-mounted recessed dual technology occupancy sensors in the following spaces:
 - 1. Classrooms
 - 2. Media Center
 - 3. All instructional spaces
 - 4. Open offices
 - 5. Conference rooms
- O. Manufacturer: Provide the following:
 - 1. Leviton
 - 2. Sensor Switch CM-PDT-10-R
 - 3. Watt Stopper DT-300
- P. Provide wall mounted dual technology occupancy sensors in the following spaces:
 - 1. Classrooms.
 - 2. Mechanical rooms.

Q. Manufacturer: Provide the following:

1. Leviton
2. Sensor Switch WV-PDT-16-R-BR
3. Watt Stopper DT-200

2.4 POWER PACKS

- A. Power pack shall be a self-contained transformer and relay module. Power pack shall have ½" snap-in nipple for ½" knockouts and mounting on outside of enclosure.
- B. Power pack shall have dry contacts capable of switching 20 amp ballast and incandescent load @ 120 VAC, 60 Hz; 20 amp ballast @ 277 VAC, 60 Hz; 1 hp @ 120-250 VAC, 60 Hz. Power pack shall have primary dual-voltage inputs of 120/277 VAC. Power pack shall provide a 24 VDC, 150 mA output, with the relay connected.
- C. Power pack shall be capable of parallel wiring without regard to AC phases on primary. Power pack can be used as a stand-alone, low voltage switch, or can be wired to sensor for auto control.
- D. Power pack shall have hold-ON and hold-OFF inputs for integration with lighting control panels, building management systems, and other building systems.
- E. Power pack shall have overcurrent protection if the low voltage current drawn exceeds 150 mA. In the event of an overcurrent, the low voltage output current shuts down and the LED will blink to indicate a fault condition. Power pack shall utilize Zero Crossing Circuitry to protect from the effects of inrush current and increase product longevity.
- F. Power pack shall have an LED to indicate status of relay.
- G. Power pack shall be UL 2043 plenum rated and shall have low voltage Teflon coated leads, rated for 300 volts.
- H. Manufacturer: Provide the following:
 1. Leviton
 2. Sensor Switch MP-20
 3. Watt Stopper B Series

2.5 UNIT EMERGENCY POWER TRANSFER DEVICE (PTD)

- A. Device shall be UL 924 Listed and consist of a voltage sensor and automatic switching device, suitable for mounting in the ballast channel of a fixture. Device shall automatically switch lighting fixtures between normal and emergency power circuits depending on availability of source and be designed for fail-safe operation. Device shall consist of relay switching circuitry and fusing in one 8"x1.18"x1.18" galvanized steel case. Device shall be rated for ballast loads, suitable for connection to 20 amp circuits, rated 120 or 277 volts as required. Device shall control lighting in conjunction with occupancy sensors, photocells, time clocks and other control devices and shall be warranted for five (5) years.
- B. Provide fixture mounted transfer devices in fixture channel of emergency lighting fixtures. Refer to drawings for exact quantity and locations.
- C. Manufacturer: Provide products of one of the following:
 1. Bodine Cat No. GTD
 2. Iota Cat. No. ETS

- 3. LVS, Inc. Cat No. EPC-A
- 4. Nine 24, Inc. Cat No. BLTC-1

2.6 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: No. 12 AWG (minimum), complying with Division 26 Sections.
- B. Power Wiring to Supply Side of Emergency Power Transfer Devices No. 12 AWG (minimum), complying with Division 26 Sections.
- C. Control wiring between sensors and control units shall be Class II, 18-24 AWG, stranded U.L. Classified, PVC insulated and TEFLON jacketed cable suitable for use in plenums.
- D. Minimum acceptable wire gauge from the circuit control hardware relays shall be #14 AWG.

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. It shall be the contractor's responsibility to locate and aim sensors in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas per the manufacturer's recommendations. Rooms shall have one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the Drawings are diagrammatic and indicate only the room which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room.
- B. It is the contractor's responsibility to arrange a pre-installation meeting with the manufacturer's factory authorized representative, at the owner's facility, to verify placement of sensors and installation criteria.
- C. Proper judgment shall be exercised in executing the installation so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components. The contractor shall also provide, at the owner's facility, the training necessary to familiarize the owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.
- D. Sensors or Power Pack shall have one spare contact in each room for HVAC control.

3.2 EMERGENCY POWER TRANSFER DEVICE INSTALLATION

- A. For control of fixtures in one room or area with independent room lighting control, install device inside of the fixture ballast channel. Install caution labels indicating two power sources at the device and at each load or fixture supplied by the device. Do not install behind the wall switch. Extend independent emergency raceway and wiring to emergency fixtures.

3.3 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 16 Sections. All wiring shall be installed in conduit. Minimum conduit size shall be 3/4 inch.
- B. Wiring Within Enclosures: Bundle, lace, and train conductors to terminal points. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.

- C. Size conductors according to lighting control device manufacturer's written instructions, unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.4 IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Sections.
- B. All emergency power systems junction box covers, conduit couplings and panels shall be painted orange.

3.5 FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 - 1. After installing sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 - 2. Operational Test: Verify actuation of each sensor and adjust time delays.
- B. Remove and replace lighting control devices where test results indicate that they do not comply with specified requirements.
- C. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 FACTORY COMMISSIONING

- A. Upon completion of the installation, the system shall be completely commissioned by the manufacturer's factory authorized technician who will verify all adjustment and sensor placement to ensure a trouble-free occupancy-based lighting control system. This service shall be provided with the base bid contract.
- B. The electrical contractor shall provide both the manufacturer and the electrical engineer with ten (10) working days written notice of the scheduled commissioning date.

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two (2) visits to site outside normal occupancy hours (4 hour minimum duration each) for this purpose.

3.8 TRAINING

- A. The Contractor shall provide a training session for the Owner's Representative for one (1) four (4) hour period (minimum) at a jobsite location determined by the Owner.
- B. The training session shall be conducted by a manufacturer's qualified representative. The training program shall consist of instruction on the operation, adjustment, and maintenance of the lighting control devices.

END OF SECTION 26 0923

SECTION 26 2726 - WIRING DEVICES

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 work of this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Lighting control and receptacle services as required, and all materials and equipment, including switches, receptacles, device plates, multi-outlet assemblies, photoelectric controllers, time switches, lighting contactors and low voltage control systems, as indicated or specified.

1.3 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. Product Data: Submit product data on each item. Coordinate the items, as they relate to the work, prior to submittal. Include the following:
 - 1. Wall switches and plates
 - 2. All receptacles and clock outlets including device plates.
 - 3. Multi-outlet assemblies

PART 2 - PRODUCTS

2.1 WALL SWITCHES

- A. Switches for Controlling Lighting Directly on AC Systems in General: Toggle-operated, ivory, specification grade, composition base, heavy duty, flush, quiet type, with provision for back and side wiring, and rated 20 amperes, 120/277 volts AC.
 - 1. Manufacturer: Provide one of the following:
 - a. Arrow-Hart 1990 Series
 - b. Bryant 4900 Series
 - c. General Electric GE5950 Series
 - d. Hubbell 1220 Series
 - e. Pass & Seymour 20AC Series
- B. Key-Operated Switches for Controlling Lighting Directly on AC Systems: Identical to toggle-operated switches specified above except for key operation. Furnish 4 keys to the Owner.

- C. Switches for Controlling Lighting Directly on AC Systems and Located in Posts of Movable Metal Partitions: Toggle-operated, brown, interchangeable type, composition base, flush type, rated 20 amperes, 120/277 volts AC.

1. Manufacturer: Provide one of the following:

- a. Arrow-Hart QT-91
- b. General Electric GE7651-1
- c. Pass & Seymour ACD201

2.2 CONVENIENCE RECEPTACLES

- A. 20 Ampere Duplex Convenience Receptacles for 120 Volt, Single Phase Service: Two straight blade, 2 pole, 3 wire, NEMA configuration 5-20R receptacles rated 20 amperes, 125 volts, NEMA performance standard, specification grade, for back and side wiring, ivory color.

1. Manufacturer: Provide one of the following:

- a. Arrow-Hart 5362
- b. Bryant 5362
- c. General Electric GE4108-1
- d. Hubbell 5362
- e. Pass & Seymour 5362

- B. 20 Ampere Duplex Ground Fault Circuit Interrupter (GFCI) Convenience Receptacles for 120 Volt, Single Phase Service: Two straight blade, 2 pole, 3 wire grounding, NEMA configuration 5-20R receptacles rated 20 amperes, 125 volts, NEMA performance standard, specification grade, with provisions for back and side wiring, brown color.

- 1. Units shall have a test and reset button on the face of the receptacles and visible indication of a tripped condition.
- 2. Units shall have line and load terminal screws such that connection to load terminals shall provide feed through ground fault protection for "downstream" receptacles and/or loads connected to these terminals.
- 3. All receptacles shall be Underwriters' Laboratories, Listed under 498 Receptacle requirements and 943 Class A requirements.

- a. Manufacturer: Provide one of the following:

- 1) Arrow-Hart GF5342
- 2) Bryant GFR53FT
- 3) Hubbell GF5362
- 4) Pass & Seymour 2091-S

2.3 DEVICE PLATES

- A. Device Plates in Offices and Other Finished Areas: Stainless steel No. 302 finish.
- B. Device Plates in Factory, Utility and Similar Areas: Zinc or cadmium plated steel.
- C. Device Plates in Wet or Damp Areas and Outdoors: Weatherproof type. Provide spring-hinged gasketed covers on outdoor receptacles suitable for wet locations as defined in NEC Article 406.8.
- D. Screws: Provide screws having a finish matching the plate.

2.4 MULTI-OUTLET ASSEMBLIES

- A. Multi-Outlet Systems of Receptacles: Consisting of receptacles and wiring installed in an all steel wireway system suitable for the use indicated. Locate and space receptacles and furnish lengths of wireway system as indicated. Provide necessary fittings such as couplings, clips, ends and covers. Furnish standard gray finish raceway system components. Provide receptacles as indicated and specified.
 - 1. Manufacturer: Provide the following:
 - a. Wiremold

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Mount equipment at locations indicated.
- B. Install receptacles and switches in outlet boxes as specified in Section 26 0533 "Raceways and Boxes for Electrical Systems" unless otherwise specified in this Section. Mount receptacles and switches at uniform heights above the floor for various areas as indicated.
- C. Install plates on flush mounted outlets with all four edges in continuous contact with finished wall surfaces without the use of plaster mats or similar devices. Do not use plaster or similar fillings. Install plates vertically, unless otherwise noted, with an alignment tolerance of 1/16 inch.

END OF SECTION 26 2726

SECTION 26 5119 - LED INTERIOR LIGHTING

PART 1 - 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 solid-state luminaires that use LED technology.
 - 2. Materials.
 - 3. Finishes.
 - 4. Lighting fixture supports.
- B. Related Requirements:
 - 1. Section 26 0529 "Hangers and Supports for Electrical Systems."
 - 2. Section 26 0553 "Identification for Electrical Systems."
 - 3. Section 26 0943 "Digital Lighting Controls" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multiple lighting relays and contactors.

1.3 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.
- H. L70: Point in time where light fixture output is 70% of initial light output.
- I. MacAdam Ellipse: Color consistency of LEDs from chip to chip.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture indicated.
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, finishes and listings.
 - 3. Include physical description and dimensions of luminaires.
 - 4. Include emergency lighting units, including batteries and chargers.
 - 5. Include life, output (delivered lumens, CCT, and CRI), and energy efficiency data.
 - 6. Provide finish samples for all finishes specified with custom or non-standard colors.

7. Photometric data, including IES file, and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing and Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps and accessories identical to those indicated for the lighting fixture as applied in this Project, IES LM-79 and IES LM-80.
 - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
 - b. Testing Agency Certified Data: For indicated luminaires, photometric data certified by a qualified independent testing agency. Photometric data for remaining luminaires shall be certified by manufacturer.
 8. LED drivers. Original manufacturer's cut sheet for specific driver used for each lighting fixture type.
- B. Shop Drawings: For custom luminaires.
1. Include plans, elevations, sections and mounting and attachment details.
 2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 3. Include diagrams for power and control wiring.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing laboratory providing photometric data for luminaires.
- B. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Product Certificates: For each type of luminaire.
- D. Product Test Reports: For each luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency or by a qualified testing agency.
- E. Sample warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
 1. A complete submittal package of all lighting products provided as part of this project. This includes, but is not limited to, lighting fixtures and all installed components (drivers, emergency battery packs, etc.).

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Complete Fixtures: One for every 50 of each type. Furnish at least one of each type.
 2. LED Drivers: One for every 50 of each type provided within each fixture type.
 3. Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
 4. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
- B. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
- C. Provide luminaires from a single manufacturer for each luminaire type.
- D. Each luminaire type shall be within a three-step MacAdam Ellipse centered on the black body curve to ensure color consistency among luminaires.
- E. Comply with NFPA 70.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

1.10 WARRANTY

- A. Manufacturer and installer agree to provide and install replacement fixtures for any components or fixtures (drivers, LED modules, etc.) that fail prior to Substantial Completion and project commissioning.
- B. Warranty: Manufacturer and Installer agree to repair or replace components, including driver/power supplies and thermal management, of luminaires that fail in materials or workmanship within specified warranty period.
- C. Warranty Period: Five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Luminaires shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

2.2 LUMINAIRE REQUIREMENTS

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Recessed Fixtures: Comply with NEMA LE 4.
- C. CRI of minimum 80. CCT of 3500K or as indicated in the Lighting Fixture Schedule.
- D. Lamps dimmable from 100 percent to 0 percent of maximum light output or as indicated in the Lighting Fixture Schedule.
- E. Internal Driver: Driver shall be individually fused with fuses accessible from outside of the fixture chassis.

- F. LED (Light Engine): Complies with IEC and FCC Standards with ratings and compliances as stated below, or as indicated in Lighting Fixture Schedule.
1. LED Color Temperature: 3500°K.
 2. Minimum rated lifetime of L70 @ 50,000 hours based on IES LM-80 testing.
 3. Operating Temperature: -40°C to +50°C (-40°F to 122°F).
 4. Operating Hours: Designed for 60,000+ hours of maintenance free operation.
 5. Warranty: Minimum 5-year warranty. If 15% or more of light emitting diodes fail to illuminate within the 5-year warranty period the manufacturer shall replace the light fixture. 5-year no color shift warranty.
 6. IP66 rated.
 7. Tested in compliance with IES LM-79, LM-80 and TM-21.
 8. Minimum ETL listed.
- G. Driver: Complies with IEC and FCC standards with ratings and compliances as stated below, or as indicated in Lighting Fixture Schedule.
1. Driver: Components are fully encased in potting material for moisture resistance.
 2. Operating Temperature: -40°C to +50°C (-40°F to 122°F).
 3. Operating Hours: Designed for 60,000+ hours of maintenance free operation.
 4. Provides transient voltage protection in accordance with IEEE/ANSI C62.41.2 guidelines.
 5. Warranty: 5-year warranty.
 6. Minimum ETL listed.

2.3 FINISHES

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

2.4 LUMINAIRE FIXTURE SUPPORT COMPONENTS

- A. Comply with requirements in Section 26 0529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A 641/A 641 M, Class 3, soft temper, zinc-coated steel, 12 gauge.
- D. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.
- F. All fixture support hardware shall be finished to match luminaire in finished spaces. This includes, but is not limited to, surface mounted junction boxes used as final connection point to fixture mounted, stem hangers, conduit stems and threaded rod.

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 luminaire to verify actual locations of luminaire and electrical connections before fixture installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 TEMPORARY LIGHTING

- A. If approved by the Architect, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting.

3.3 INSTALLATION

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls, and secure according to manufacturer's written instructions and approved submittal materials, unless otherwise indicated. There shall be no gaps between adjacent fixtures or between luminaires and surrounding surfaces. Lenses, reflectors and trims of luminaires shall be properly and uniformly aligned.
- C. Supports:
 - 1. Sized and rated for luminaire weight.
 - 2. Provide support for luminaire without causing deflection of ceiling or wall.
 - 3. Luminaire mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and vertical force of 400 percent of luminaire weight.
- D. Flush-Mounted Luminaire Support:
 - 1. Secured to outlet box.
 - 2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
 - 3. Trim ring flush with finished surface.
- E. Wall-Mounted Luminaire Support:
 - 1. Attached to a minimum 20 gauge backing plate attached to electrical box.
 - 2. Do not attach luminaires directly to gypsum board.
- F. Suspended Luminaire Support:
 - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
 - 2. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
 - 3. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
 - 4. Continuous Rows of Luminaires: Suspend from cable installed according to fixture manufacturer's written instructions and details on drawings.
 - 5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.
- G. Ceiling-Grid-Mounted Luminaires:
 - 1. Secure to any required outlet box.
 - 2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
 - 3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

3.4 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 0553 "Identification for Electrical Systems."

3.5 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation and that luminaires are switched according to the Drawings.
 - 2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.
 - 3. A visual inspection shall be performed to verify cleanliness and alignment of the fixtures. Misalignment and light leaks shall be corrected and rattles due to ventilation system vibration shall be eliminated.
- B. Luminaire will be considered defective if it does not pass operation tests and inspections.
- C. Prepare test and inspection reports.

3.6 STARTUP SERVICE

- A. Comply with requirements for startup specified in Section 26 0943 "Relay-Based Lighting Controls."

3.7 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
 - 1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
 - 2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
 - 3. Adjust the aim of luminaires in the presence of the Architect.

END OF SECTION 26 5119

SECTION 28 4621.11 - DIGITAL, ADDRESSABLE FIRE ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to work of this section.
- B. Specification Section 26 0519 "Low Voltage Electrical Power Conductors and Cables (0-1000V)".
- C. Specification Section 26 0526 "Grounding and Bonding for Electrical Systems".
- D. Specification Section 26 0533 "Raceways and Boxes for Electrical Systems".

1.2 SUMMARY

- A. Major items of work and equipment included under this Specification Section are fire alarm control panel (complete with integrated emergency communication), fire pull stations, speaker/strobes, smoke detectors, duct smoke detectors, wiring and supervision for a fully functional fire alarm system. Provide all equipment, devices, appliances, wiring, and materials necessary for a complete and expandable fire detection and alarm system which adheres to applicable codes and standards.
- B. Coordinate with and provide submittals to the Michigan Bureau of Fire Services.
- C. Maintain the existing fire alarm system in service while the new work is installed, tested and made operational. Construction project will be multi-phased; coordinate all system operations accordingly to maintain coverage of occupied areas throughout construction.
- D. Provide a new fire alarm system with the following features:
 - 1. A main fire alarm control panel (FACP).
 - 2. Node and notification appliance circuit (NAC) panels.
 - 3. Automatic and manual initiating devices.
 - 4. Audible and visual notification appliances.
 - 5. Control inputs and outputs to ventilation systems.
 - 6. Status monitoring of fire pump controllers, sprinkler flow switches, and sprinkler valve tamper switches.
 - 7. Alarm, supervisory, trouble and maintenance alert outputs to the building management system.
 - 8. Raceways, junction boxes, wiring and accessories as shown on the drawings and as required for a complete and operable system.
 - 9. System programming in accordance with the system's sequence of operation.
 - 10. Remote annunciators.
 - 11. Non-battery backed power to door hold-open devices.
 - 12. Emergency voice/alarm communications.
 - 13. Water flow and gate supervisory switches.
 - 14. Modules/devices as required to provide cellular communication functionality in addition to dedicated POTS line.

1.3 DEFINITIONS

- A. FACP: Fire Alarm Control Panel
- B. FAAP: Fire Alarm Annunciator Panel

C. NICET: National Institute for Certification in Engineering Technologies

D. Definitions in NFPA 72 apply to fire alarm terms used in this Section

1.4 SYSTEM DESIGN REQUIREMENTS

A. The system shall be device addressable and power limited.

B. Provide a fire alarm control panel with the following:

1. Digital display.
2. Multiple pushbutton keypad.
3. LED status indicating lights.
4. Audible status signals.
5. Output relays.
6. Battery charger and batteries.
7. RS-232 communications card.

C. Evaluate and document the appropriate signaling line circuit class designation.

1. In general, provide Class B signaling line circuits except where an applicable code requires a different circuit class.
2. Provide sufficient spare capacity on each signaling line circuit for an additional 25 percent of initiating and control devices.

D. Evaluate and document the appropriate notification appliance circuit class designation.

1. In general, provide Class B notification appliance circuits except where an applicable code requires a different circuit class.
2. Size the control panel power supplies, amplifiers, and batteries for 25 percent spare capacity calculated with 1 watt speaker loads, and 150 ma strobe light loads.
3. Provide sufficient spare capacity on each notification appliance circuit for an additional 25 percent of notification appliances.

E. The system shall supervise the following circuits and components:

1. Initiating device circuits.
2. Signaling line circuits.
3. Notification appliance circuits.
4. Addressable initiating and control devices.
5. Control output wiring.
6. Auxiliary control switches.
7. System node panels, NAC panels, remote annunciators, and remote microphone panels.
8. Primary power supply.
9. Secondary power supply.

F. Provide 120 volts AC primary power to the system from a dedicated power branch circuit.

G. Provide a control panel battery charger capable of fully charging a 200 amp-hour battery within 24 hours.

H. Provide sufficient secondary power battery capacity to operate the entire system (except the door hold-open devices) upon the loss of primary power for a period of 24 hours in a normal supervisory mode followed by 5 minutes of evacuation alarm operation.

1. Emergency Voice/Alarm Communications: Provide sufficient battery capacity for 24 hours of operation in a normal supervisory mode followed by 15 minutes of voice/alarm operation.

2. The system shall automatically transfer to and from the secondary power batteries upon an interruption of primary power without initiating a nuisance alarm.
 3. The system shall delay initiating a trouble condition for two seconds upon a transfer to or from primary power to avoid nuisance trouble conditions during emergency generator testing.
- I. Provide smoke and heat detectors as required by code and as shown, including the following.
1. Provide two heat detectors, one in front and one behind, each unit substation transformer.
 2. Provide a smoke detector in each mechanical, electrical and telecommunications.
 3. Provide duct smoke detectors where required by code. When not in plain view or when more than 10 feet above the floor, provide duct detector remote alarm indicators and test switches mounted in plain view.
- J. Provide sufficient audible notification appliances to achieve a sound level of 15 dBA above ambient sound level, but not less than 60 dBA nor more than 110 dBA in all occupiable spaces. The sound level in mechanical rooms shall be not less than 90 dBA. The sound shall be a three-pulse temporal pattern evacuation tone.
- K. Provide visual notification appliances in accordance with the intensity and spacing requirements of NFPA 72.
1. Provide strobes in all public areas including multi-person offices.
 2. Do not provide strobes in exit stair enclosures.
 3. Combine speakers with strobes when both are required at the same location.
 4. Synchronize strobes when more than two appliances are in any point of view and are less than 55 feet apart.
 5. Provide strobes in mechanical rooms and other areas that have an average ambient noise level exceeding 95 dBA.
- L. Provide a waterproof speaker/strobe with waterproof back box on the exterior of the building between 8 and 12 feet above each fire department connection. Audible sound shall be 90 dBA minimum at 10' and visual intensity shall be 110 candelas. Program this device to alarm upon sprinkler system water flow only, and to cease operation upon termination of water flow.
- M. Provide individually addressable monitor modules to monitor non-addressable initiating devices and status contacts of other systems.
1. Monitor modules shall use Class B initiating device circuits to monitor the initiating devices and status contacts.
- N. Provide panel auxiliary relay contacts and individually addressable control module contacts, including the required panel control logic programming, to interface with control circuits of other systems and equipment.
1. Provide normally closed duct smoke detector contacts to shut down ventilation systems.
 2. Provide normally closed auxiliary relay or control module contacts to release electrically held door locks and door hold-opens, and to disable electrically operated door proximity sensors.
- O. Assign each initiating device and control module a unique device address. Label each device with its unique address using a clear adhesive backed nylon or Mylar tape with black text. Install the label on the base of any device with a removable or replaceable head.
- P. Provide surge protective devices for the system.

1.5 SYSTEM PERFORMANCE REQUIREMENTS

- A. Under normal conditions, the control panel digital display shall display a "SYSTEM NORMAL" message and the current time and date.

- B. Should an abnormal condition be detected, the appropriate alarm, supervisory, or trouble panel LED shall flash and the appropriate panel audible signal shall sound.
- C. The appropriate panel alarm, supervisory, trouble, or supervisory maintenance alert output relay contact shall close and send a signal through the alarm transmitter to local fire department.
- D. The fire alarm control panel shall manage all input and output signals through software programming and hardware configuration. In addition to managing and supervising the fire alarm devices.
- E. The panel shall display the following information relative to the abnormal condition:
 - 1. Custom location label (40 characters minimum).
 - 2. Type of initiating device.
 - 3. Type of abnormal condition (alarm, supervisory or trouble).
- F. If the abnormal condition is an alarm, the following actions shall occur:
 - 1. Audible notification appliances shall sound throughout the building.
 - 2. Visible notification appliances shall flash throughout the building.
 - 3. Control outputs to mechanical systems shall perform their programmed functions.
 - 4. Control outputs shall interrupt power to electrically operated door hardware devices.
 - 5. Power to door hold-open devices shall de-energize.
- G. Pressing the appropriate Acknowledge pushbutton shall acknowledge the alarm, supervisory or trouble condition unless the system is in the silence inhibit mode. Once acknowledged, the appropriate LED shall latch on and the panel audible signal shall be silenced.
- H. If the abnormal condition is an alarm, pressing the Silence pushbutton shall silence the audible notification appliances and stop the visual notification appliances from flashing.
- I. Upon a subsequent abnormal condition from another device, the appropriate panel LED shall flash, the panel audible signal shall again pulse and the panel display shall show the new abnormal condition.
- J. After all of the points have been acknowledged and silenced, the LED's shall glow steady and the panel audible signals shall be silenced. The total number of alarms, supervisory, and trouble conditions shall be displayed along with a prompt to review each list chronologically. The end of the list shall be indicated.
- K. Pressing the System Reset pushbutton shall return the system to its normal state if the abnormal conditions have been remedied.
 - 1. The display shall step the user through the reset process with simple English language messages. Messages including "IN PROCESS", "RESET COMPLETED", and "SYSTEM NORMAL" shall provide operator assurance of the sequential steps as they occur.
 - 2. The ventilation system motors shall restart sequentially.
 - 3. The outputs to control circuits of other systems and equipment shall return to normal.
- L. Should an abnormal condition continue to exist, the system shall remain in an abnormal state. The system control relays shall not reset. The panel LED's shall remain on. The display shall indicate the total number of alarm, supervisory and trouble conditions present in the system along with a prompting to review the points. These points shall not require acknowledgment if they were previously acknowledged.
- M. Should a trouble condition continue to exist, the trouble audible signal shall resound at preprogrammed time intervals to act as a reminder that the fire alarm system is not 100 percent operational. Both the time interval and the trouble audible signal shall be programmable to suit the Owner's application.

- N. Should the Alarm Silence Inhibit function be active, the System Reset pushbutton shall be ignored and a "RESET INHIBITED" message shall be displayed for a short time to indicate that action was not taken. For operator assurance, a "RESET NO LONGER INHIBITED" message shall be displayed when the inhibit function times out.
- O. The activation of any pull station, smoke detector, heat detector, kitchen suppression system or water flow switch shall cause the following events to occur.
 - 1. Flash all system strobes with a synchronized sequence.
 - 2. List the device and location of the alarm via LCD displays on the control panel and remote annunciator (as indicated by drawings).
 - 3. Close all smoke barrier doors.
 - 4. Activate alarm contacts.
 - 5. Activation of any duct smoke detector shall shut down the associated unit.
 - 6. The operation of any system tamper or low-pressure switch will sound a supervisory tone within the control panel and light a dedicated supervisory LED. The supervisory tone may be silenced but a visual indication (LED) will remain active until the condition is cleared a manual reset of the system must be performed to restore the system to normal.
 - 7. Any wiring disarrangement, open circuit or a ground condition will sound a trouble tone within the control panel, light a dedicated trouble LED and display the fault condition on the main control panel LCD display. Trouble tone may be silenced but a visual indication will remain active until the condition is cleared. Upon correction of the condition, the system shall restore itself to normal.

1.6 CODES AND STANDARDS

- A. Comply with the current versions of the following codes and standards as applicable:
 - 1. ANSI/IEEE C2, "National Electrical Safety Code".
 - 2. MBC, "Michigan Building Code".
 - 3. MEC, "Michigan Electrical Code".
 - 4. MMC, "Michigan Mechanical Code".
 - 5. "Michigan Rehabilitation Code".
 - 6. NFPA 13, "Standard for the Installation of Sprinkler Systems".
 - 7. NFPA 72, "National Fire Alarm Code".
 - 8. NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems".
 - 9. UL 217, "Single and Multiple Station Smoke Detectors".
 - 10. UL 268, "Smoke Detectors for Fire Protective Signaling Systems".
 - 11. UL 268A, "Smoke Detectors for Duct Applications".
 - 12. UL 464, "Audible Signal Appliances".
 - 13. UL 521, "Heat Detectors for Fire Protective Signaling Systems".
 - 14. UL 864, "Control Units for Fire Protective Signaling Systems".
 - 15. UL 1480, "Speakers for Fire Protective Signaling Systems".
- B. For classrooms, comply with the applicable sections of NFPA 101, "Life Safety Code" as adopted and amended by the Michigan Bureau of Fire Services.
- C. For systems that provide partial evacuation or relocation of occupants rather than full evacuation, comply with the NFPA 72 requirements related to survivability from attack by fire.
 - 1. Designate each notification appliance circuit to serve no more than one notification zone.
 - 2. Protect power supply and notification appliance circuits from fire until they enter the notification zone they serve.
 - 3. Monitor the integrity of audible and visual notification appliance power supplies, audio generators, amplifiers and circuits.
 - 4. Monitor the integrity of Fire Department telephone communications circuits.

1.7 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 01 Specification Sections.
- B. A complete set of shop drawings shall be submitted to the State of Michigan (SOM) Office of Fire Safety for approval in accordance with Act 144 of 1982. Shop drawings shall be approved by the SOM and all SOM comments reflected on the documents prior to submission of the shop drawings to the Engineer for approval. Shop drawings submitted to the Engineer prior to SOM approval will be returned - Rejected.
- C. Shop Drawings shall be prepared by persons with the following qualifications:
 - 1. Trained and certified by manufacturer in fire-alarm system design.
 - 2. NICET-certified fire-alarm technician, Level III minimum.
 - 3. Licensed or certified by authorities having jurisdiction.
- D. The Contractor shall submit complete sets of documentation within 30 calendar days after award of purchase order. Indicate the type, size, rating, style, catalog number, manufacturers' names, photos, and/or catalog data sheets for all items to ensure compliance with these Specifications. This equipment shall be subject to his approval and no equipment shall be ordered without this approval. Equipment devices are shown on the Contract Drawings, provide shop drawings as follows:
- E. Product Data: For each type of product indicated.
- F. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire-alarm Systems" Chapter in NFPA 72.
 - 2. Shop drawings shall include:
 - a. Fire-alarm system description
 - b. Fire-alarm control panel (FACP) including layout of all modules
 - c. Fire-alarm initiation devices
 - d. Fire-alarm signal devices
 - e. Fire-alarm one-line diagram
 - f. Fire-alarm wiring details
 - g. Fire-alarm module drawings
 - 3. System Operation Description: Detailed description for this Project, including method of operation and supervision of each type of circuit and sequence of operation for manually and automatically initiated system inputs and outputs. Manufacturer's standard descriptions for generic systems are not acceptable.
 - 4. Device Address List: Coordinate with final system programming.
 - 5. System riser diagram with device addresses, conduit sizes, and cable and wire types and sizes.
 - 6. Include voltage drop calculations for notification appliance circuits.
 - 7. Wiring diagram:
 - a. Power, signal, and control wiring. Include diagrams for equipment and for system with all terminals and interconnections identified. Show the wiring color code.
 - b. On all addressable systems, all devices on a loop shall be documented in a sequential order that the trunk enters and leaves them.
 - c. On all non-addressed device loops, all devices shall have numbers assigned to each device which is directly related to their wiring sequence.
 - d. Show all break-out boxes.
 - 8. Batteries: Size calculations. Battery size shall be a minimum of 125% of the calculated requirement.

9. Duct Smoke Detectors: Performance parameters and installation details for each detector, verifying that each detector is listed for the complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
 10. Include documentation for smoke and heat detectors indicating compliance with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 11. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.
 12. Voice/Alarm Signaling Service: Equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
 13. Floor Plans: Indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.
 14. Control Module: Provide calculations indicating circuit loading with 20% spare capacity.
- G. Qualification Data: For qualified Installer.
- H. Field quality-control reports.
- I. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
 2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
 3. Record copy of site-specific software.
 4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
 - a. Frequency of testing of installed components.
 - b. Frequency of inspection of installed components.
 - c. Requirements and recommendations related to results of maintenance.
 - d. Manufacturer's user training manuals.
 5. Manufacturer's required maintenance related to system warranty requirements.
 6. Three complete sets of fire alarm system schematics, maintenance manuals of all system components and modules, and schematics of all modules and circuit boards. Include abbreviated operating instructions and 11" x 17" building drawings with device layout for mounting in plastic folder inside FACP. Device addressing shall be included on the 11" x 17" building drawings for maintenance.
 7. Three copies of the device list and certificate of completion.
- J. Software and Firmware Operational Documentation:
1. Software operating and upgrade manuals.
 2. Program Software Backup: On magnetic media or compact disk, complete with data files.
 3. Device address list.
 4. Printout of software application and graphic screens.
- K. As-Built Drawings:
1. Contractor shall submit as-built drawings as specified in Division 01 - General Requirements.
 2. The Contractor shall submit as-built drawings indicating the location of all devices, addresses, junction boxes, and conduit runs; including conduit size, circuiting and circuit numbers, and number of wires in each run; and the number and sequential wiring of speakers and strobes. The drawings shall be separate from the electrical drawings. Provide "as-built" drawings in electronic AutoCAD .dwg format and Adobe Acrobat .pdf format.

- L. At Contract close-out deliver six (6) copies of the following to the Owner's Representative within thirty (30) days of date of system acceptance:
 - 1. Installation and programming manuals covering the installed system.
 - 2. Point-to-point diagrams of the entire system as installed. Number all conductors and show all terminations and splices.
 - 3. The application program listing for the system as installed at the time of acceptance.
 - 4. Name, address, and telephone of the authorized factory representative.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.
- C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
- D. 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.
- E. Each fire alarm system component shall be listed under the appropriate standard of Underwriters Laboratories and shall bear a UL label.
- F. Guarantee:
 - 1. The Contractor shall provide a written guarantee stating that all work performed and material furnished is free from all defects in workmanship, and material for a period of two years after the equipment has been accepted by the Owner. Final payment or Certificate of Substantial Completion, whichever is issued first, shall constitute Owner acceptance.
 - 2. A 24 hour telephone number or numbers shall be provided for quick service engineering assistance concerning hardware and software problems. There shall be provisions made for getting an expert on the scene quickly should the need arise, minimum 8 hour on site response time.

1.9 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 - 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

1.10 MAINTENANCE

- A. Maintenance and Service Contract: Submit a maintenance and service contract with service rates covering all labor and materials necessary to repair damages to the system. The service contract shall include a differentiation between and definitions of "emergency" and "non-emergency" service with applicable rates for each.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Provide products by one of the following:

1. Edwards (EST)

2.2 FIRE ALARM CONTROL PANEL

- A. A new Edwards (EST) Mass Notification and Fire Alarm control panel to be installed over the 2022-2023 school year. Reference IDS project No. 22138-1000. Coordinate with Eagle Security to expand system as required to accommodate additional devices as indicated on drawings.
- B. The panel shall display only those primary controls and displays essential to operation during a fire alarm condition.
- C. The panel shall include an LCD digital display, with a minimum of 80 characters.
1. The display shall be backlit for enhanced readability. It shall not be lit during an AC power failure unless an alarm condition occurs or there is keypad activity.
 2. The display shall support both upper and lower case letters. Lower case letters shall be used for soft key titles and for prompting the user. Uppercase letters shall be used for system status information. A cursor shall be visible when entering information.
- D. A panel audible signal shall sound during alarm, supervisory or trouble conditions. This audible signal shall sound differently during each condition to distinguish one condition from another. The audible signal shall also sound differently during each key press to provide audible feedback (chirp) indicating that the key has been pressed properly.
- E. The system program shall be stored in a non-volatile flash EPROM memory within the panel. Loss of primary and secondary power shall not erase the program stored in memory.
1. The program shall be capable of selective input/output control functions.
 2. The program shall enable initiating devices to be individually configured on site to provide either alarm and trouble, supervisory and trouble, alarm only, supervisory only, trouble only, current limited alarm, no alarm, normally closed device monitoring, a non-latching circuit or an alarm verification circuit.
 3. The program shall enable initiating devices to be disabled or enabled individually.
- F. The panel or the field devices shall determine the alarm decision for each detector by comparing the detector value to stored values.
1. The panel shall automatically maintain a constant smoke obscuration sensitivity in percent of smoke obscuration format for each detector.
 2. The panel shall maintain a moving average of each smoke detectors smoke chamber value to automatically compensate for dust and dirty conditions that could affect detection operation.
 3. The smoke obscuration sensitivity shall be adjustable to within 0.3 percent of either limit of the UL window (0.5 percent to 4.0 percent) to compensate for any environment.
 4. When a detector's average value reaches a predetermined value, a "MAINTENANCE ALERT" condition shall be audibly and visually indicated at the panel. The LED on the detector base shall glow steady giving a visible indication at the detector location. If a dirty detector is left unattended and its average value increases to a second predetermined value, a "TROUBLE" condition shall be indicated at the panel. To prevent nuisance alarms, these dirty conditions shall in no way decrease the amount of smoke obscuration necessary for system activation.
 5. The panel shall continuously perform an automatic self-test routine on each detector which shall functionally check detector electronics and ensure the accuracy of the obscuration values being

- transmitted to the panel. Any detector that fails this test shall indicate a "SELF TEST ABNORMAL" or "TROUBLE" condition at the panel.
6. Each detector shall be scanned by the panel for its type identification to prevent inadvertent substitution of another detector type. The panel shall operate with the installed device but shall initiate a "WRONG DEVICE" or "TROUBLE" condition until the proper type is installed or the programmed detector type is changed.
 7. An operator at the panel, having a proper access level, shall have the ability to manually access the following information for each detector.
 - a. Device type.
 - b. Device status.
 - c. Present average value.
 - d. Peak detection values.
 - e. Present sensitivity selected.
 - f. Detector range (normal, dirty, etc.).
 8. An operator at the panel, having a proper access level, shall have the ability to perform the following for each detector:
 - a. Enable or disable the point.
 - b. Clear peak detection values.
 - c. Clear verification tally.
 - d. Control a detector's relay driver output.
 9. The panel shall be programmable to automatically change the sensitivity settings of each detector based on time-of-day and day-of-week (for example, to be more sensitive during unoccupied periods and less sensitive during occupied periods). There shall be seven sensitivity settings available for each detector.
 10. The panel shall be programmable for a pre-alarm or two-stage function. This function allows an indication to occur when, for example, a detector with a 3 percent set point reaches a threshold of 1.5 percent smoke obscuration.
 11. Smoke detectors shall be provided with the ability for alarm verification. When in alarm verification mode, only a verified alarm shall initiate the alarm sequence operation.
 - a. The activation of a smoke detector shall initiate an alarm verification operation whereby the panel resets the activated detector and waits for a second alarm activation. If, within an adjustable time delay, a second alarm is reported from the same or any other smoke detector, the system shall process the alarm. If no second alarm occurs within the time delay, the system shall resume normal operation.
 - b. The alarm verification shall operate only on smoke detector alarms. Other activated initiating devices shall be processed immediately. The alarm verification operation shall be selectable by device.
 - c. The panel shall have the capability to display the number of times a device has gone into a verification mode.
 - d. Detectors in alarm verification mode shall have the ability of being divided into different groups whereby any two activations from a group shall cause the panel to follow its programmed alarm sequence.
- G. The panel shall have four pass code controlled access levels. Pass codes shall be entered using the panel keypad.
1. To maintain security when entering a pass code, the digits entered shall not be displayed.
 2. When a correct pass code is entered, an "ACCESS GRANTED" message shall be displayed. The access level shall be in effect until the keypad is inactive for 10 minutes or the operator logs out.
 3. Should an invalid code be entered, the operator shall be notified with a message and shall be allowed up to two more chances to enter a valid code. After three unsuccessful tries, an "ACCESS DENIED" message shall be displayed.

4. Access to a level shall only allow the operator to perform actions within that level and actions of lower levels, not actions of higher levels.
5. Access levels shall be associated with the following functions:
 - a. Alarm silence.
 - b. System reset.
 - c. Set time and date.
 - d. On/Off/Auto control selection.
 - e. Manual control.
 - f. Disable and enable circuits and devices.
 - g. Clear historical logs.
 - h. Walk test.
 - i. Change alarm verification.
 - j. Change detector sensitivity.
 - k. Function keys.
6. An access level shall also be associated with acknowledge keys. If the operator presses an Acknowledge key with insufficient access, an error message shall be displayed. The points on the log shall scroll with each key press, but the points shall not be acknowledged.
- H. The panel shall have the ability to store a minimum of 300 events in an alarm log plus a minimum of 300 events in a separate trouble log. These events shall be stored in a battery protected random access memory. Real time and date shall accompany history event recordings.
- I. The panel shall supervise subordinate module LED's for burnout or disarrangement. Should a problem occur, the panel shall display the module and LED location numbers to facilitate location of that LED.
- J. The panel shall have function keys programmed as follows for disabling and enabling circuits or groups of devices for maintenance or testing purposes. While circuits or devices are disabled, the panel shall indicate "TROUBLE".
 1. F1: Disable smoke detectors.
 2. F2: Disable duct smoke detectors.
 3. F3: Disable sprinkler system flow switches.
 4. F4: Disable speaker/strobes or speakers/strobes by floor.
- K. The system shall be capable of being walk tested by one person.
 1. The activation of an initiating device under test shall be silently logged as an alarm or supervisory condition in the historical log. The panel shall automatically reset itself after logging the abnormal condition.
 2. The momentary disconnection of an initiating device or notification appliance shall be silently logged as a trouble condition in the historical log. The panel shall automatically reset itself after logging the trouble condition.
 3. The walk test sequence shall have the ability to activate the notification appliances for a maximum of 2 seconds upon the activation of an initiating device under test. If this option is selected, any momentary opening of the initiating device circuit or a notification appliance circuit shall cause the notification appliances to sound for 4 seconds to indicate the trouble condition.
 4. Should the walk test mode be on for an inappropriate amount of time, the panel shall automatically revert to normal mode.
 5. Should an abnormal condition occur from an active point not in walk test mode, the system shall perform its standard programmed alarm, supervisory or trouble sequences.
- L. The panel enclosure shall be equipped with opaque door panels and locks providing security from tampering.

2.3 NODE AND NAC PANELS

- A. Node and NAC panels shall be modular with solid state, microprocessor based electronics, operator interfaces, power supplies, audio generators, amplifiers, battery chargers and batteries as required. All components shall be supervised.
- B. Furnish and install the proper quantity of NAC panels required to support the system devices. Locate NAC panels in secured maintenance spaces (i.e. electrical rooms, janitor closets, etc.). Furnish and install all 120 volt power to panels and smoke detection adjacent to each panel.

2.4 BATTERIES

- A. Batteries shall be lead calcium and supervised so that a failure produces a "TROUBLE" signal.

2.5 ADDRESSABLE MONITOR MODULES

- A. Monitor modules for individual two wire contact monitoring shall be individually addressable, suitable for two wire operation, with a DIP switch or electronic addressing means, and a programmable latch feature for monitoring momentary contacts. Monitor modules shall monitor a single normally open dry contact using a Class B, Style B, initiating device circuit.
- B. Monitor modules for zone or four wire device monitoring shall be individually addressable, suitable for four wire operation utilizing 24 volt DC power from the panel, and with a DIP switch or electronic addressing means. Zone monitor modules shall monitor multiple normally open dry contacts using a Class B, Style B, two wire initiating device circuit, or monitor a four wire device using a Class B, Style D, four wire initiating device circuit.

2.6 ADDRESSABLE CONTROL MODULES

- A. An addressable control module shall be provided for interfacing normally open direct contact devices to an addressable initiating circuit. Modules shall be used for control of overhead fire or smoke doors, electromagnetic door holders and elsewhere as required.
- B. The module shall be supervised and uniquely identified by the control panel. Device identification shall be transmitted to the control panel for processing according to the program instructions. Should the module become non-operational, tampered with, or removed, a discrete trouble signal, unique to the device, shall be annunciated at the control panel.
- C. The module shall be capable of being programmed for its "address" location on the addressable device circuit. The module shall be compatible with all other addressable devices on the same addressable control circuit.

2.7 VISUAL ALARM STROBES

- A. Strobes shall be mounted in flame retardant, thermoplastic housing with xenon strobe light listed under UL 1971, protected by a Lexan lens for mounting on a standard 4 x 4 inch electrical box. Strobes shall have a high intensity flashing light, field adjustable to produce a minimum of 15, 30, 60, 75 or 110 candela at the rate of one flash per second and shall meet the requirements of the Americans with Disabilities Act (ADA). The word FIRE shall be engraved in minimum 1-inch (25-mm) high letters on the lens. Visual components shall operate from the 24 VDC polarized indicating circuits. Visual alarm strobes shall be semi-flush mounted, except as noted. Devices shall be white on ceilings and walls.
- B. Provide a clear polycarbonate cover at each outdoor alarm strobe. The unit shall be UL tested and listed for this use. The unit shall not obstruct a visual alarm.
- C. Provide wire guard for all devices located in gyms, cafeterias or other areas where subject to harm.

2.8 AUDIO VISUAL ALARM SPEAKER-STROBES

- A. Speaker-strobes shall be UL 1480 listed, mounted in flame retardant, thermoplastic housing with electronic light source protected by a Lexan lens for mounting on a standard 4 x 4 inch electrical box. Both audio and visual components shall operate from the 24V DC polarized indicating circuits.
- B. Speakers shall be rated 125 to 12,000 Hertz, include four taps rated at from 1/4 to 2 watts, produce a sound level of 82 dBA at 10 feet when set at the 1/2 watt tap, and with a semi-flush body capable of wall or ceiling mounting.
- C. Speakers for locations with high ambient noise may be high efficiency horns rated 500 to 6,000 Hertz minimum, 10 watts minimum, include four or more taps, produce a sound level of 106 dBA minimum at 1 meter when set at the 1 watt tap, and be capable of wall or ceiling mounting.
- D. In areas where more than two strobes are in a common field of view, they shall be synchronized or else spaced more than 55 feet apart.
- E. Provide wire guard for all devices located in gyms, cafeterias or other areas where subject to harm.

2.9 EMERGENCY VOICE/ALARM COMMUNICATIONS

- A. Emergency voice/alarm communications shall include audio control modules for evacuation tone and voice message generation, controls to choose total building or selected areas communications, audio amplifiers, a local microphone, and a remote microphone. All of the components shall be located in or adjacent to the fire alarm control panel.
- B. The audio control module default mode shall provide for automatic total building fire alarm evacuation. The evacuation tone shall consist of a three-pulse temporal pattern followed by a pre-recorded fire alarm voice message. At the end of each voice message, the evacuation tone shall resume. The evacuation tone and voice message shall sound alternately until the alarm silence pushbutton at the fire alarm control panel or remote annunciator has been pressed. Audio tones and voice messages shall be digitally transmitted between nodes.
- C. The audio control modules shall provide for manual total building or selected area live voice communications. Upon keying of the local or a remote microphone, a three second continuous alert tone shall sound over the speakers indicating a live voice message will occur.
- D. The evacuation and alert tones shall be digitally generated by programmable software so that changes can be made without component rewiring. The pre-recorded voice messages shall be stored digitally in non-volatile EPROM memory.
- E. Audio amplifiers shall have a frequency response of 125 Hz to 12,000 Hz minimum.
- F. Microphones shall be of a hand-held, push-to-talk, noise-canceling type with a frequency range of 200 Hz to 4000 Hz and a self-winding five foot coiled cable. An LED shall indicate the microphone push-to-talk pushbutton has been pressed and the speaker circuits are ready for transmission.

2.10 WIRE AND CABLE

- A. Refer to Specification Sections 26 0519 "Low-Voltage Electrical Power Conductors and Cables (0-1000V)" and 26 0533 "Raceways and Boxes for Electrical Systems".
- B. Wire and cable for fire alarm systems shall be UL listed and labeled as complying with NFPA 70, Article 760.
 - 1. All fire alarm cabling, regardless of use, shall be stranded.
 - 2. Field devices shall be wired with non-shielded cable.

3. Wiring above accessible ceilings and within otherwise similarly protected areas may be open wiring routed in J-hooks.
- C. Initiating Device or Signaling Line Circuits and Annunciator Communication Circuit:
1. Point addressable wiring shall be one pair of #16 AWG minimum THHN twisted pair stranded copper cable. Install conductors of size required by manufacturer except that where larger sizes are otherwise indicated, provide these sizes.
 2. Each initiating device circuit shall have a separate circuit number and labeled at every point the circuit is accessible.
- D. Notification Appliance Circuit:
1. Notification appliance circuits shall be one pair of #14 AWG minimum THHN twisted pair stranded copper cable. Install conductors of size required by manufacturer except that where larger sizes are otherwise indicated, provide these sizes.
 2. Notification appliance circuits shall be wired with different color, colors not already used in the fire alarm system, or circuits shall be numbered with wire markers on each end of each wire at every termination and joint. Wire markers shall be related to the fire alarm circuit or module connector numbers in the fire alarm control panel.
- E. Provide two #14 AWG minimum THHN stranded copper wire to devices requiring power such as door magnets. Circuits shall be numbered with wire markers on each end of each wire at every termination and joint. Wire markers shall be related to the fire alarm circuit or module connector numbers in the fire alarm control panel. Larger conductor sizes shall be used if required to serve the load.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

- A. Smoke or Heat Detector Spacing:
1. Detector spacing for smooth ceilings shall not exceed the rating of the detector.
 2. Detector spacing for beamed ceilings shall be altered according to the depth of the beams and the height of the ceiling.
 3. Spacing of heat detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas, shall be determined according to Appendix A in NFPA 72.
 4. Spacing of heat detectors shall be determined based on guidelines and recommendations in NFPA 72.
- B. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
- C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of the duct. Duct smoke detectors shall be located such that they are accessible for maintenance. Locate detectors according to manufacturer's written recommendations. Duct smoke detectors shall be hard wired to shutdown associated air handling equipment.
- D. Audible Alarm-Indicating Devices: Install per NFPA 72 and manufacturers recommendations.
- E. Visible Alarm-Indicating Devices: Install per NFPA 72 and manufacturers recommendations.
- F. FACP: Surface mount as indicated with tops of cabinets not more than 72 inches (1830 mm) above the finished floor.
1. Install smoke detector above all fire alarm panels, remote panels and NAC panels.

- G. Any fire alarm device utilizing LED's for visual identification must be mounted so they can be viewed and read from the floor. If mounting cannot be viewed from the floor provide a remote indication device.

3.2 WIRING INSTALLATION

- A. Install wiring according to the following:
 - 1. NECA 1.
 - 2. TIA/EIA 568-A.
- B. Wiring Method: Provide wiring in conduit in accordance with Sections 26 0533 and 26 0513, and Manufacturer's instructions.
 - 1. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.
 - 2. Install fire alarm conduit in all concealed locations including above accessible ceilings, and exposed areas such as mechanical rooms, electrical, and loading docks.
 - 3. Install all fire alarm wiring/circuits entering or exiting junction/pull boxes with a minimum of six inches of slack at each end.
- C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, tie wrap, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and a different color-code for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices.
 - 1. Speaker wiring-blue/yellow
 - 2. Strobe wiring-orange/brown
 - 3. SLC wiring-red/black

3.3 IDENTIFICATION

- A. All wiring shall be labeled where accessible in panels, at devices, junction boxes, pull boxes, etc. All smoke and heat detectors shall be permanently labeled with their respective address typewritten on the outside of the unit base. Marking shall be done with gummed paper tags installed on the surfaces that have been steel wool cleaned.
 - 1. Label all notification devices and visible alarm indicating devices with P-touch labeler. Identify circuit number, device number, and end of line.
 - 2. Provide a minimum of ¼ inch high text for all labeling requirements, unless otherwise indicated.
- B. Install instructions frame in a location visible from the FACP.

3.4 GROUNDING

- A. Refer to Specification Section 26 0526 "Grounding and Bonding for Electrical Systems".

- B. Ground the FACP and associated circuits; comply with IEEE 1100. Install a #10 AWG minimum insulated ground wire from main service ground to all FACP.

3.5 TESTING

- A. Demonstrate complete operation of the fire alarm system in accordance with NFPA 72, NFPA 101, the Michigan Building Code, and Manufacturer's instructions. Notify the Owner's Representative 3 working days in advance of the test.
 - 1. The test shall be witnessed by the Authority Having Jurisdiction.
- B. Submit a signed and dated NFPA 72 test report to the Electrical Inspector prior to acceptance of the fire alarm system by the Owner.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
 - 1. Before requesting final approval of the installation, submit a written statement using the form for Record of Completion shown in NFPA 72.
 - 2. Perform each electrical test and visual and mechanical inspection listed in NFPA 72. Certify compliance with test parameters. All tests shall be conducted under the direct supervision of a NICET technician certified under the Fire Alarm Systems program at Level III.
 - a. Include the existing system in tests and inspections.
 - 3. Visual Inspection: Conduct a visual inspection before any testing. Use as-built drawings and system documentation for the inspection. Identify improperly located, damaged, or nonfunctional equipment, and correct before beginning tests.
 - 4. Testing: Follow procedure and record results complying with requirements in NFPA 72.
 - 5. Test and Inspection Records: Prepare according to NFPA 72, including demonstration of sequences of operation by using the matrix-style form in Appendix A in NFPA 70.
- B. Adjusting: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project outside normal occupancy hours for this purpose.
- C. Training: Provide a minimum of 16 hours of factory service engineer training on the operation of the manufacturer's fire alarm system in general and on the system installed.

END OF SECTION 28 4621.11