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Integrated Design Solutions

architecture engineering interiors & technology

# Project Manual

Linden Community Schools
2013 Sinking Fund Projects
Linden, Michigan

IDS Project No. 13101-1000

March 15, 2013
Bids

# Project Manual

## Linden Community Schools
## 2013 Sinking Fund Projects
## Linden, Michigan

**Integrated Design Solutions LLC**
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IDS Project No. 13101-1000

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**SECTION 00100 - ADVERTISEMENT FOR BIDS**

**PROJECT:** Linden Community Schools
2013 Sinking Fund Projects
Linden, MI 48451

**OWNER**: Linden Community Schools
7205 West Silver Lake Road
Linden, MI, 48451-8710

**ARCHITECT:** Integrated Design Solutions, LLC
Architecture, Engineering, Interiors & Technology
1441 W. Long Lake, Suite 200
Troy, MI 48098
(248) 823-2100
(248) 823-2200 fax

**BIDS RECEIVED:** Until 1:30pm local time on April 04, 2013, the Owner will receive sealed Bids for the work as set forth in the Bidding Documents at:

Linden Community Schools
Administration Building
7205 West Silver Lake Road
Linden, MI, 48451-8710
Attention: Mr. Greg Vadasz
Director of Operations

At which time and place all Bids will be publicly opened and read aloud. A bid tabulation summary will be available.

The Bidding Documents will be on file on and after March 15 2013 and may be examined at the following locations during regular business hours, Monday through Friday:

Integrated Design Solutions, LLC, 1441 W. Long Lake, Suite 200, Troy, Michigan 48098, (248) 823-2100.

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

Linden FTP site: www.ids-web.com.

Username: ids-lcs
Password: linden-schools

State of Michigan Bid System: www.Bid4Michigan.com.

Construction Association of Michigan, 43636 Woodward Ave., Bloomfield Hills, Michigan 48302, (248) 972-1000.

Builders Exchange of Lansing & Central Michigan, 1240 E. Saginaw, St., Lansing, Michigan 48906, (517) 372-8930.
Builders Exchange of Grand Rapids, 4461 Cascade Road S. E., Grand Rapids, Michigan 49501, (616) 949-8650.

Plan Room, MHC/ReproMAX Reprographics One (McGraw Hill Construction), 36060 Industrial Drive., Livonia, Michigan, 48150, (734) 464-2959, (734) 464-3104 fax.
Plan Room, MHC/ReproMAX Capital Imaging (McGraw Hill Construction), 2521 E. Michigan Ave., Lansing, Michigan, 48912, (517) 316-0364, (517) 316-0372 fax.
Plan Room, MHC/ReproMAX Kal-Blue (McGraw Hill Construction), 401 Hall Street SW., Grand Rapids, Michigan, 49503, (866) 480-6203, (888) 376-4319 fax.

A pre-bid conference is scheduled for Thursday, March 21, 2013 at 2:45 pm local time. All interested Bidders are invited and strongly encouraged to attend. Bidders shall meet at the Main Office of Linden High School.

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 Linden 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 00450). 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.

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.

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 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.

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 ADVERTISEMENT FOR BIDS**

# SECTION 00200 - INSTRUCTIONS TO BIDDERS

## 1. DEFINITIONS

A. Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement for Bids, 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. Copies of the Bidding Documents are available upon conditions set forth in the Advertisement for Bids.

B. Additional sets of documents may be obtained, at Bidder's expense, from ARC Michigan Troy/Clawson (formerly Dunn Blueprint Company) (248) 288-5600.

B. The Owner or Architect assumes no responsibility for errors or misinterpretations resulting from use of incomplete sets of Bidding Documents.

C. 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. The Bid Form must be completed in its entirety. A bid amount must be entered on the Bid Form for each base bid. Bidders shall enter the words "No Bid" on the base bids that he or she does not wish to bid.

E. Alterations by erasure or interlineations must be initialed by the Bidder.

F. All Alternates must be bid. If no change in the Base Bid is required, enter "No Change".

G. 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 Advertisement for Bids 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, LINDEN COMMUNITY SCHOOLS, 2013 SINKING FUND PROJECTS, 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 publicly opened and read aloud. A bid tabulation summary will be available.

H. 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.
5. Bidders not bidding on materials, equipment and systems required by the Bidding Documents may propose voluntary alternates in space provided on Bid Form. The Owner is under no obligation to accept any voluntary alternate.

## 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. 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 Linden 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.

1. The cost of providing the Performance Bond and Labor and Material Payment Bond shall be included in the Base Bid.

C. 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.

D. 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.

E. 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.

**6. 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.

**7. 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 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 base bids and/or 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.

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

**8. EXECUTION OF AGREEMENT**

A. The successful Bidder will be required to execute AIA Standard Form of Agreement Between Owner and Contractor for a Project of Limited Scope, AIA Document A107-, 2007.

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.

**9. 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.

**10. 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.

**11. 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 seven (7) 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.

**12. 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.

**13. PERMITS AND FEES**

A. All Bids shall include costs for all permits and fees. Contractor shall obtain all applicable permits from the State of Michigan, Department of Licensing and Regulatory Affairs, Bureau of Construction Codes.

B. The High School new offices and barrier free toilet room and Central Elementary window and storefront renovations shall be submitted to the State of Michigan, Department of Licensing and Regulatory Affairs, Bureau of Construction Codes and the Bureau of fire Services for plan review and approval. The Architect will submit Drawings and Specifications for such reviews and approvals, and pay the plan review fees.

**14. TIME OF COMPLETION**

A. The Bidder, if awarded the Contract, agrees to complete the Work in accordance with the schedule stated in the Bid Form.

**15. PREVAILING WAGE LAW**

A. Prevailing wages are not required.

**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 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.

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 unless such a Statement has been submitted as a prerequisite to the issuance of Bidding Documents.

**END OF SECTION 00200**

**SECTION 00410 - BID FORM**

**PROJECT:** Linden Community Schools
2013 Sinking Fund Projects
Linden, Michigan 48451

**ARCHITECT:** Integrated Design Solutions, LLC
Architecture, Engineering, Interiors & Technology
1441 W. Long Lake Road, Suite 200
Troy, Michigan 48098
(248) 823-2100
(248) 823-2200 fax

**NAME OF BIDDER:** _____

**ADDRESS:** _____

_____

**TELEPHONE & FAX:** _____

**BID**

Pursuant to and in compliance with your Advertisement for Bids, 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 Linden Community Schools, Linden Elementary Roof Replacement Project in accordance with the Drawings and Specifications prepared by Integrated Design Solutions, LLC and agrees to accept payment as herein provided.

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

**BASE BID NO. 1: HIGH SCHOOL**

Lump sum bid for all work specified and shown on the Drawings for High School locker replacements, toilet room renovations, new offices, and new barrier free toilet as indicated for base bid:

_____

_____ Dollars ($_____).

**BASE BID NO. 2: CENTRAL ELEMENTARY LOCKER REPLACEMENT**

Lump sum bid for all work specified and shown on the Drawings for Central Elementary locker replacements as indicated for base bid:

_____

_____ Dollars ($_____).

**BASE BID NO. 3: CENTRAL ELEMENTARY WINDOW AND STOREFRONT RENOVATION**

Lump sum bid for all work specified and shown on the Drawings for Central Elementary windows and storefront renovations as indicated for base bid:

_____

_____ Dollars ($_____).

**BASE BID NO. 4: LINDEN ELEMENTARY STORAGE RENOVATION**

Lump sum bid for all work specified and shown on the Drawings for Linden Elementary casework and storage renovations as indicated for base bid:

_____

_____ Dollars ($_____).

**BASE BID NO. 5: COMBINED WORK OF BASE BIDS NO. 1 THRU NO. 4**

Lump sum bid for all work specified and shown on the Drawings for all work at all buildings as indicated for base bid:

_____

_____ Dollars ($_____).

**UNIT PRICES**

The Bidder proposes unit prices in accordance with the following schedule and as specified in Section 01270. Said unit prices shall include all charges for labor, materials and equipment, overhead and profit, general conditions, supervision, insurance, taxes and incidental expenses.

Said unit prices shall be applicable to the pricing of additions to, or deletions from, the work indicated in the Contract Documents, unless otherwise indicated.

Unit Price No. 1:
Sectional Mobile Cubbies. $_____/each installed.

Unit Price No. 2:
25 Tray Mobile Cubbies. $_____/each installed.

Unit Price No.3:
10 Tray Mobile Storage. $_____/each installed.

Unit Price No. 4:
Paper Rack. $_____/each installed.

Unit Price No. 5:
Supply Cabinet. $_____/each installed.

**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 _____

_____

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 Linden 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**

The undersigned agrees to substantially complete the Project by August 16, 2013.

Access to the site for actual construction will not be allowed until June 17, 2013.

**WITHDRAWAL OF BIDS**

The undersigned agrees that his Bid shall not be withdrawn for a period of thirty (30) 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 00450**
**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 Linden Community 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

_____
(Individual, Partnership or Corp.)

By_____
(Authorized Signature of Bidder)

Its_____
(Title)

State of Michigan )
)ss.
County of _____)

This instrument was acknowledged before me on the _____ day of _____, 2013 by

_____

Notary Public, _____
County, Michigan

My commission expires _____

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

# AIA® Document A107™ – 2007

## *Standard Form of Agreement Between Owner and Contractor for a Project of Limited Scope*

**AGREEMENT** made as of the day of in the year
*(In words, indicate day, month and year)*

**BETWEEN** the Owner:
*(Name, address and other information)*

and the Contractor:
*(Name, address and other information)*

for the following Project:
*(Name, location and detailed description)*

00000-00000 Blank Forms

The Architect:
*(Name, address and other information)*

The Owner and Contractor agree as follows.

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

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

TABLE OF ARTICLES



## ARTICLE 1 THE WORK OF THIS CONTRACT

The Contractor shall execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

## ARTICLE 2 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

**§ 2.1** The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.

*(Insert the date of commencement, if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)*

**§ 2.2** The Contract Time shall be measured from the date of commencement.

**§ 2.3** The Contractor shall achieve Substantial Completion of the entire Work not later than ( ) days from the date of commencement, or as follows:
*(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)*

, subject to adjustments of this Contract Time as provided in the Contract Documents.
*(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)*

## ARTICLE 3 CONTRACT SUM

**§ 3.1** The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. The Contract Sum shall be one of the following:
*(Check the appropriate box.)*

[ **X** ] Stipulated Sum, in accordance with Section 3.2 below

[ ] Cost of the Work plus the Contractor's Fee, in accordance with Section 3.3 below

[ ] Cost of the Work plus the Contractor's Fee with a Guaranteed Maximum Price, in accordance with Section 3.4 below

*(Based on the selection above, complete Section 3.2, 3.3 or 3.4 below.)*

**§ 3.2** The Stipulated Sum shall be ($ ), subject to additions and deletions as provided in the Contract Documents.

**§ 3.2.1** The Stipulated Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:
*(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)*

**§ 3.2.2** Unit prices, if any:
*(Identify and state the unit price, and state the quantity limitations, if any, to which the unit price will be applicable.)*

| Item | Units and Limitations | Price Per Unit |
|---|---|---|

**§ 3.2.3** Allowances included in the stipulated sum, if any:
*(Identify allowance and state exclusions, if any, from the allowance price.)*

| Item | Allowance |
|---|---|

### § 3.3 COST OF THE WORK PLUS CONTRACTOR'S FEE

**§ 3.3.1** The Cost of the Work is as defined in Exhibit A, Determination of the Cost of the Work.

**§ 3.3.2** The Contractor's Fee:
*(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee and the method of adjustment to the Fee for changes in the Work.)*

**§ 3.4 COST OF THE WORK PLUS CONTRACTOR'S FEE WITH A GUARANTEED MAXIMUM PRICE**
**§ 3.4.1** The Cost of the Work is as defined in Exhibit A, Determination of the Cost of the Work.

**§ 3.4.2** The Contractor's Fee:
*(State a lump sum, percentage of Cost of the Work or other provision for determining the Contractor's Fee and the method of adjustment to the Fee for changes in the Work.)*

**§ 3.4.3 GUARANTEED MAXIMUM PRICE**
**§ 3.4.3.1** The sum of the Cost of the Work and the Contractor's Fee is guaranteed by the Contractor not to exceed ($ ), subject to additions and deductions by changes in the Work as provided in the Contract Documents. Such maximum sum is referred to in the Contract Documents as the Guaranteed Maximum Price. Costs which would cause the Guaranteed Maximum Price to be exceeded shall be paid by the Contractor without reimbursement by the Owner.
*(Insert specific provisions if the Contractor is to participate in any savings.)*

**§ 3.4.3.2** The Guaranteed Maximum Price is based on the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

**§ 3.4.3.3** Unit Prices, if any:
*(Identify and state the unit price, and state the quantity limitations, if any, to which the unit price will be applicable.)*

| Item | Units and Limitations | Price Per Unit |
|---|---|---|

**§ 3.4.3.4** Allowances included in the Guaranteed Maximum Price, if any:
*(Identify and state the amounts of any allowances, and state whether they include labor, materials, or both.)*

| Item | Allowance |
|---|---|

**§ 3.4.3.5** Assumptions, if any, on which the Guaranteed Maximum Price is based:

**ARTICLE 4 PAYMENTS**
**§ 4.1 PROGRESS PAYMENTS**
**§ 4.1.1** Based upon Applications for Payment submitted to the Architect by the Contractor and Certificates for Payment issued by the Architect, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

**§ 4.1.2** The period covered by each Application for Payment shall be one calendar month ending on the last day of the month, or as follows:

**§ 4.1.3** Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the certified amount to the Contractor not later than the day of the same month. If an Application for Payment is received by the Architect after the date fixed above, payment shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment.
*(Federal, state or local laws may require payment within a certain period of time.)*

**§ 4.1.4** Retainage, if any, shall be withheld as follows:

**§ 4.1.5** Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.
*(Insert rate of interest agreed upon, if any.)*

per annum

**§ 4.2 FINAL PAYMENT**
**§ 4.2.1** Final payment, constituting the entire unpaid balance of the Contract Sum, shall be made by the Owner to the Contractor when

**.1** the Contractor has fully performed the Contract except for the Contractor's responsibility to correct Work as provided in Section 18.2, and to satisfy other requirements, if any, which extend beyond final payment;

**.2** the contractor has submitted a final accounting for the Cost of the Work, where payment is on the basis of the Cost of the Work with or without a guaranteed maximum price; and

**.3** a final Certificate for Payment has been issued by the Architect.

**§ 4.2.2** The Owner's final payment to the Contractor shall be made no later than 30 days after the issuance of the Architect's final Certificate for Payment, or as follows:

## ARTICLE 5 DISPUTE RESOLUTION

**§ 5.1 BINDING DISPUTE RESOLUTION**
For any claim subject to, but not resolved by, mediation pursuant to Section 21.3, the method of binding dispute resolution shall be as follows:
*(Check the appropriate box. If the Owner and Contractor do not select a method of binding dispute resolution below, or do not subsequently agree in writing to a binding dispute resolution method other than litigation, claims will be resolved in a court of competent jurisdiction.)*

[ ] Arbitration pursuant to Section 21.4 of this Agreement

[ ] Litigation in a court of competent jurisdiction

[ ] Other *(Specify)*

## ARTICLE 6 ENUMERATION OF CONTRACT DOCUMENTS

**§ 6.1** The Contract Documents are defined in Article 7 and, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

**§ 6.1.1** The Agreement is this executed AIA Document A107–2007, Standard Form of Agreement Between Owner and Contractor for a Project of Limited Scope.

**§ 6.1.2** The Supplementary and other Conditions of the Contract:

| Document | Title | Date | Pages |
|---|---|---|---|

**§ 6.1.3** The Specifications:
*(Either list the Specifications here or refer to an exhibit attached to this Agreement.)*
Title of Specifications exhibit:
*(Table deleted)*
**§ 6.1.4** The Drawings:
*(Either list the Drawings here or refer to an exhibit attached to this Agreement.)*
Title of Drawings exhibit:
*(Table deleted)*
**§ 6.1.5** The Addenda, if any:

| Number | Date | Pages |
|---|---|---|

Portions of Addenda relating to bidding requirements are not part of the Contract Documents unless the bidding requirements are enumerated in this Article 6.

**§ 6.1.6** Additional documents, if any, forming part of the Contract Documents:

**.1** Exhibit A, Determination of the Cost of the Work, if applicable.

**.2** AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed, or the following:

**.3** Other documents:
*(List here any additional documents that are intended to form part of the Contract Documents.)*

## ARTICLE 7 GENERAL PROVISIONS

### § 7.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in Article 6 and consist of this Agreement (including, if applicable, Supplementary and other Conditions of the Contract), Drawings, Specifications, Addenda issued prior to the execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

### § 7.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind between any persons or entities other than the Owner and the Contractor.

### § 7.3 THE WORK

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

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

### § 7.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE
**§ 7.5.1** The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

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

### § 7.6 TRANSMISSION OF DATA IN DIGITAL FORM
If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmission, unless otherwise provided in the Agreement or in the Contract Documents.

## ARTICLE 8 OWNER
### § 8.1 INFORMATION AND SERVICES REQUIRED OF THE OWNER
**§ 8.1.1** The Owner shall furnish all necessary surveys and a legal description of the site.

**§ 8.1.2** The Contractor shall be entitled to rely on the accuracy of information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

**§ 8.1.3** Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 9.6.1, the Owner shall secure and pay for other necessary approvals, easements, assessments and charges required for the construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

### § 8.2 OWNER'S RIGHT TO STOP THE WORK
If the Contractor fails to correct Work which is not in accordance with the requirements of the Contract Documents, or repeatedly fails to carry out the Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order is eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity.

### § 8.3 OWNER'S RIGHT TO CARRY OUT THE WORK
If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents, and fails within a ten-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner, without prejudice to any other remedy the Owner may have, may correct such deficiencies and may deduct the reasonable cost thereof, including Owner's expenses and compensation for the Architect's services made necessary thereby, from the payment then or thereafter due the Contractor.

## ARTICLE 9 CONTRACTOR

### § 9.1 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

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

**§ 9.1.2** Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 8.1.1, shall take field measurements of any existing conditions related to that portion of the Work and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies, or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional unless otherwise specifically provided in the Contract Documents.

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

### § 9.2 SUPERVISION AND CONSTRUCTION PROCEDURES

**§ 9.2.1** The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences and procedures, and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters.

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

### § 9.3 LABOR AND MATERIALS

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

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

**§ 9.3.3** The Contractor may make a substitution only with the consent of the Owner, after evaluation by the Architect and in accordance with a Modification.

### § 9.4 WARRANTY

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

### § 9.5 TAXES

The Contractor shall pay sales, consumer, use and other similar taxes that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

### § 9.6 PERMITS, FEES, NOTICES, AND COMPLIANCE WITH LAWS

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

**§ 9.6.2** The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work. If the Contractor performs Work knowing it to be contrary to applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities, the Contractor shall assume appropriate responsibility for such Work and shall bear the costs attributable to correction.

### § 9.7 ALLOWANCES

The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. The Owner shall select materials and equipment under allowances with reasonable promptness. Allowance amounts shall include the costs to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts. Allowance amounts shall not include the Contractor's costs for unloading and handling at the site, labor, installation, overhead, and profit.

### § 9.8 CONTRACTOR'S CONSTRUCTION SCHEDULES

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

**§ 9.8.2** The Contractor shall perform the Work in general accordance with the most recent schedule submitted to the Owner and Architect.

### § 9.9 SUBMITTALS

**§ 9.9.1** The Contractor shall review for compliance with the Contract Documents and submit to the Architect 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. The Work shall be in accordance with approved submittals.

**§ 9.9.2** Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents.

### § 9.10 USE OF SITE

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

### § 9.11 CUTTING AND PATCHING

The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly.

### § 9.12 CLEANING UP

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

### § 9.13 ROYALTIES, PATENTS AND COPYRIGHTS

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

### § 9.14 ACCESS TO WORK

The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever located.

### § 9.15 INDEMNIFICATION

**§ 9.15.1** To the fullest extent permitted by law, the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Section 9.15.1.

**§ 9.15.2** In claims against any person or entity indemnified under this Section 9.15 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 9.15.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

## ARTICLE 10 ARCHITECT

**§ 10.1** The Architect will provide administration of the Contract and will be an Owner's representative during construction, until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with other provisions of the Contract.

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

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

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

**§ 10.5** The Architect has authority to reject Work that does not conform to the Contract Documents and to require inspection or testing of the Work.

**§ 10.6** The Architect will review and approve or take other appropriate action upon the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents.

**§ 10.7** The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect will make initial decisions on all claims, disputes and other matters in question between the Owner and Contractor but will not be liable for results of any interpretations or decisions rendered in good faith.

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

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

## ARTICLE 11 SUBCONTRACTORS

**§ 11.1** A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site.

**§ 11.2** Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of the Subcontractors or suppliers for each of the principal portions of the Work. The Contractor shall not contract with any Subcontractor or supplier to whom the Owner or Architect has made reasonable written objection within ten days after receipt of the Contractor's list of Subcontractors and suppliers. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

**§ 11.3** Contracts between the Contractor and Subcontractors shall (1) require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by the terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the Subcontractor's Work, which the Contractor, by the Contract Documents, assumes toward the Owner and Architect, and (2) allow the Subcontractor the benefit of all rights, remedies and redress against the Contractor that the Contractor, by these Contract Documents, has against the Owner.

## ARTICLE 12 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

**§ 12.1** The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under conditions of the contract identical or substantially similar to these, including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such claim as provided in Article 21.

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

**§ 12.3** The Owner shall be reimbursed by the Contractor for costs incurred by the Owner which are payable to a separate contractor because of delays, improperly timed activities or defective construction of the Contractor. The

Owner shall be responsible to the Contractor for costs incurred by the Contractor because of delays, improperly timed activities, damage to the Work or defective construction of a separate contractor.

## ARTICLE 13 CHANGES IN THE WORK

**§ 13.1** By appropriate Modification, changes in the Work may be accomplished after execution of the Contract. The Owner, without invalidating the Contract, may order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, with the Contract Sum and Contract Time being adjusted accordingly. Such changes in the Work shall be authorized by written Change Order signed by the Owner, Contractor and Architect, or by written Construction Change Directive signed by the Owner and Architect.

**§ 13.2** Adjustments in the Contract Sum and Contract Time resulting from a change in the Work shall be determined by mutual agreement of the parties 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, unless the parties agree on another method for determining the cost or credit. Pending final determination of the total cost of a Construction Change Directive, the Contractor may request payment for Work completed pursuant to the Construction Change Directive. The Architect will make an interim determination of the amount of payment due for purposes of certifying the Contractor's monthly Application for Payment. When the Owner and Contractor agree on adjustments to the Contract Sum and Contract Time arising from a Construction Change Directive, the Architect will prepare a Change Order.

**§ 13.3** The Architect will have authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes shall be effected by written order and shall be binding on the Owner and Contractor. The Contractor shall carry out such written orders promptly.

**§ 13.4** If concealed or unknown physical conditions are encountered at the site that differ materially from those indicated in the Contract Documents or from those conditions ordinarily found to exist, the Contract Sum and Contract Time shall be equitably adjusted as mutually agreed between the Owner and Contractor; provided that the Contractor provides notice to the Owner and Architect promptly and before conditions are disturbed.

## ARTICLE 14 TIME

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

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

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

**§ 14.4** The date of Substantial Completion is the date certified by the Architect in accordance with Section 15.4.3.

**§ 14.5** If the Contractor is delayed at any time in the commencement or progress of the Work by changes ordered in the Work, by labor disputes, fire, unusual delay in deliveries, abnormal adverse weather conditions not reasonably anticipatable, unavoidable casualties or any causes beyond the Contractor's control, or by other causes which the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine, subject to the provisions of Article 21.

## ARTICLE 15 PAYMENTS AND COMPLETION

### § 15.1 APPLICATIONS FOR PAYMENT

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

**§ 15.1.2** With each Application for Payment where the Contract Sum is based upon the Cost of the Work, or the Cost of the Work with a Guaranteed Maximum Price, the Contractor shall submit payrolls, petty cash accounts, receipted invoices or invoices with check vouchers attached, and any other evidence required by the Owner to demonstrate that cash disbursements already made by the Contractor on account of the Cost of the Work equal or exceed (1) progress payments already received by the Contractor, less (2) that portion of those payments attributable to the Contractor's Fee; plus (3) payrolls for the period covered by the present Application for Payment.

**§ 15.1.3** Payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment stored, and protected from damage, off the site at a location agreed upon in writing.

**§ 15.1.4** The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or other encumbrances adverse to the Owner's interests.

### § 15.2 CERTIFICATES FOR PAYMENT

**§ 15.2.1** The Architect will, within seven days after receipt of the Contractor's Application for Payment, either issue to the Owner a Certificate for Payment, with a copy to the Contractor, for such amount as the Architect determines is properly due, or notify the Contractor and Owner in writing of the Architect's reasons for withholding certification in whole or in part as provided in Section 15.2.3.

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

**§ 15.2.3** The Architect may withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Architect's opinion the representations to the Owner required by Section 15.2.2 cannot be made. If the Architect is unable to certify payment in the amount of the Application, the Architect will notify the Contractor and Owner as provided in Section 15.2.1. If the Contractor and the Architect cannot agree on a revised amount, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to make such representations to the Owner. The Architect may also withhold a Certificate for Payment or, because of subsequently discovered evidence, may nullify the whole or a part of a Certificate for Payment previously issued, to such extent as may be necessary in the Architect's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 9.2.2, because of

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

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

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

**§ 15.3 PROGRESS PAYMENTS**

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

**§ 15.3.2** Neither the Owner nor Architect shall have an obligation to pay or see to the payment of money to a Subcontractor except as may otherwise be required by law.

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

**§ 15.4 SUBSTANTIAL COMPLETION**

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

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

**§ 15.4.3** Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Work or designated portion thereof is substantially complete. When the Architect determines that the Work or designated portion thereof is substantially complete, the Architect will issue a Certificate of Substantial Completion which shall establish the date of Substantial Completion, establish responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

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

**§ 15.5 FINAL COMPLETION AND FINAL PAYMENT**

**§ 15.5.1** Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions stated in Section 15.5.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

**§ 15.5.2** Final payment shall not become due until the Contractor has delivered to the Owner a complete release of all liens arising out of this Contract or receipts in full covering all labor, materials and equipment for which a lien could be filed, or a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including costs and reasonable attorneys' fees.

**§ 15.5.3** The making of final payment shall constitute a waiver of claims by the Owner except those arising from

.1 liens, claims, security interests or encumbrances arising out of the Contract and unsettled;

.2 failure of the Work to comply with the requirements of the Contract Documents; or

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

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

## ARTICLE 16 PROTECTION OF PERSONS AND PROPERTY

### § 16.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract. The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to

.1 employees on the Work and other persons who may be affected thereby;

.2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and

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

The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons and property and their protection from damage, injury or loss. The Contractor shall promptly remedy damage and loss to property caused in whole or in part by the Contractor, a Subcontractor, a sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 16.1.2 and 16.1.3, except for damage or loss attributable to acts or omissions of the Owner or Architect or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 9.15.

### § 16.2 HAZARDOUS MATERIALS

**§ 16.2.1** The Contractor is responsible for compliance with the requirements of the Contract Documents regarding hazardous materials. If the Contractor encounters a hazardous material or substance not addressed in the Contract Documents, and if reasonable precautions will be inadequate to prevent foreseeable bodily injury or death to persons resulting from a material or substance, including but not limited to asbestos or polychlorinated biphenyl (PCB), encountered on the site by the Contractor, the Contractor shall, upon recognizing the condition, immediately stop Work in the affected area and report the condition to the Owner and Architect in writing. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shutdown, delay and start-up.

**§ 16.2.2** To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area, if in fact, the material or substance presents the risk of bodily injury or death as described in Section 16.2.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

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

## ARTICLE 17 INSURANCE AND BONDS

**§ 17.1** The Contractor shall purchase from, and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, insurance for protection from claims under workers' compensation acts and other employee benefit acts which are applicable, claims for damages because of bodily injury, including death, and claims for damages, other than to the Work itself, to property which may arise out of or result from the Contractor's operations and completed operations under the Contract, whether such operations be by the Contractor or by a Subcontractor or anyone directly or indirectly employed by any of them. This insurance shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater, and shall include contractual liability insurance applicable to the Contractor's obligations under Section 9.15. Certificates of Insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work. Each policy shall contain a provision that the policy will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. The Contractor shall cause the commercial liability coverage required by the Contract Documents to include: (1) the Owner, the Architect and the Architect's Consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

### § 17.2 OWNER'S LIABILITY INSURANCE

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

### § 17.3 PROPERTY INSURANCE

**§ 17.3.1** Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance on an "all-risk" or equivalent policy form, including builder's risk, in the amount of the initial Contract Sum, plus the value of subsequent modifications and cost of materials supplied and installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 15.5 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 17.3.1 to be covered, whichever is later. This insurance shall include interests of the Owner, the Contractor, Subcontractors and sub-subcontractors in the Project.

**§ 17.3.2** The Owner shall file a copy of each policy with the Contractor before an exposure to loss may occur. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

**§ 17.3.3** The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 12, if any, and any of their subcontractors, sub-subcontractors, agents and employees for damages caused by fire or other causes of loss to the extent covered by property insurance obtained pursuant to Section 17.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 12, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

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

### § 17.4 PERFORMANCE BOND AND PAYMENT BOND

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

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

## ARTICLE 18 CORRECTION OF WORK

**§ 18.1** The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense, unless compensable under Section A.2.7.3 in Exhibit A, Determination of the Cost of the Work.

**§ 18.2** In addition to the Contractor's obligations under Section 9.4, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 15.4.3, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty.

**§ 18.3** If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct it in accordance with Section 8.3.

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

**§ 18.5** The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Article 18.

## ARTICLE 19 MISCELLANEOUS PROVISIONS

### § 19.1 ASSIGNMENT OF CONTRACT

Neither party to the Contract shall assign the Contract without written consent of the other, except that the Owner may, without consent of the Contractor, assign the Contract to a lender providing construction financing for the Project if the lender assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

### § 19.2 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located, except, that if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 21.4.

### § 19.3 TESTS AND INSPECTIONS

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

after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating the costs to the Contractor.

### § 19.4 COMMENCEMENT OF STATUTORY LIMITATION PERIOD

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 19.4.

## ARTICLE 20 TERMINATION OF THE CONTRACT

### § 20.1 TERMINATION BY THE CONTRACTOR

If the Architect fails to certify payment as provided in Section 15.2.1 for a period of 30 days through no fault of the Contractor, or if the Owner fails to make payment as provided in Section 4.1.3 for a period of 30 days, the Contractor may, upon seven additional days' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

### § 20.2 TERMINATION BY THE OWNER FOR CAUSE

**§ 20.2.1** The Owner may terminate the Contract if the Contractor

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

**§ 20.2.2** When any of the above reasons exists, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may, without prejudice to any other remedy the Owner may have and after giving the Contractor seven days' written notice, terminate the Contract and take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor and may finish the Work by whatever reasonable method the Owner may deem expedient. Upon request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

**§ 20.2.3** When the Owner terminates the Contract for one of the reasons stated in Section 20.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

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

### § 20.3 TERMINATION BY THE OWNER FOR CONVENIENCE

The Owner may, at any time, terminate the Contract for the Owner's convenience and without cause. The Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

## ARTICLE 21 CLAIMS AND DISPUTES

**§ 21.1** Claims, disputes and other matters in question arising out of or relating to this Contract, including those alleging an error or omission by the Architect but excluding those arising under Section 16.2, shall be referred initially to the Architect for decision. Such matters, except those waived as provided for in Section 21.8 and Sections 15.5.3 and 15.5.4, shall, after initial decision by the Architect or 30 days after submission of the matter to the Architect, be subject to mediation as a condition precedent to binding dispute resolution.

**§ 21.2** If a claim, dispute or other matter in question relates to or is the subject of a mechanic's lien, the party asserting such matter may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

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

**§ 21.4** If the parties have selected arbitration as the method for binding dispute resolution in the Agreement, any claim, subject to, but not resolved by, mediation shall be subject to arbitration which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association, in accordance with the Construction Industry Arbitration Rules in effect on the date of this Agreement. Demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The award rendered by the arbitrator or arbitrators shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

**§ 21.5** Either party, at its sole discretion, may consolidate an arbitration conducted under this Agreement with any other arbitration to which it is a party provided that (1) the arbitration agreement governing the other arbitration permits consolidation; (2) the arbitrations to be consolidated substantially involve common questions of law or fact; and (3) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

**§ 21.6** Any party to an arbitration may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of a Claim not described in the written Consent.

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

**§ 21.8 CLAIMS FOR CONSEQUENTIAL DAMAGES**

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

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

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

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 20. Nothing contained in this Section 21.8 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

This Agreement entered into as of the day and year first written above.

| | |
|---|---|
| **OWNER** *(Signature)* | **CONTRACTOR** *(Signature)* |
| *(Printed name and title)* | *(Printed name and title)* |

**SECTION 00800**

**SUPPLEMENTARY CONDITIONS AND ADDITIONAL CONDITIONS**

**PROJECT:** Linden Community Schools
2013 Sinking Fund Projects
Linden, Michigan 48451

**OWNER:** Linden Community Schools
7205 West Silver Lake Road
Linden, MI, 48451-8710

**ARCHITECT:** Integrated Design Solutions, LLC
1441 W. Long Lake Road, Suite 200
Troy, MI 48098
(248) 823-2100
(248) 823-2200 (Fax)

**THE FOLLOWING SUPPLEMENTS MODIFY AIA DOCUMENT A107-2007, " STANDARD FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR FOR CONSTRUCTION PROJECTS OF LIMITED SCOPE". 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 Add new subparagraph 7.5.3 as follows:

7.5.3 The Contractor will be furnished free of charge five (5) copies of Drawings and Project Manuals for execution of the Work.

22.3 Delete subparagraph 8.1.1 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 subparagraph 10.7.1 as follows:

10.7.1 Interpretations and decisions of the Architect will be consistant 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 faithfull 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 forced, 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 to the end of subparagraph 15.1.1

"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 subparagraph 15.1.2 in its entirety.

22.9 Modifications to subparagraph 17.1.
To the end of this subparagraph add the following:

"17.1.1 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<br>$1,000,000.00 Disease, Policy Limit<br>$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 (Bodily Injury and Property Damage Combined) $1,000,000.00

"17.1.2" 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.

17.1.3 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 17.4.1and add the following in its place.

"17.4.1 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 therto, it shall be paid by the Owner.

"17.4.1 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.

17.4.1.1 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 all existing Subcontracts and purchase orders and enter into no further Subcontracts and purchase orders.

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 00800**

# SECTION 01000 – GENERAL REQUIREMENTS

## 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. Summary of the Work.
2. Work Restrictions.
3. Contract Modification Procedures.
4. Payment Procedures.
5. Project Management and Coordination.
6. Submittal Procedures.
7. Quality Requirements.
8. References.
9. Temporary Facilities and Controls.
10. Product Requirements.
11. Execution Requirements.
12. Cutting and Patching.
13. Closeout Procedures.

### 1.3 SUMMARY OF THE WORK

A. Summary of the Work: Work includes but is not limited to the following:

1. High School: Locker replacement, toilet room upgrades and fixture replacements, new barrier free toilet and office renovations.

a. Demolition of the following:

1) Lockers.
2) Toilet room wall and floor finishes including toilet accessories and floor tile.
3) Toilet fixtures including sinks, urinals, and toilets.
4) Gypsum board walls, masonry walls, and doors and frames.
5) Portions of concrete floor slabs.
6) Cabinetry and visual display boards.
7) All associated mechanical items.
8) All associated electrical work shall be provided by the Owner.

b. New work includes the following:

1) Lockers and resilient base.
2) Toilet room wall and floor finishes including toilet accessories, wall tile, and floor tile.
3) Painting.
4) Toilet fixtures including sinks, urinals, and toilets and associated faucets and valves

5) Gypsum board walls, masonry walls, doors and frames, and door hardware.
6) Portions of concrete floor slabs.
7) Cabinetry.
8) All associated mechanical (HVAC and Plumbing) items.
9) All associated electrical work shall be provided by the Owner.
10) All new floor carpeting and associated resilient base work in Offices 309, 309A, 309B and 309C shall be provided by the Owner.

2. Central Elementary: Replacement of lockers.

a. Demolition of the following:

1) None

b. New work includes the following:

1) Lockers and resilient base

3. Central Elementary: Replacement of windows and storefront entrances.

a. Demolition of the following:

1) Windows and storefront.
2) Selected doors, frames and hardware

b. New work includes the following:

1) Windows and storefront.
2) Doors and hardware.
3) Reinstallation of selected salvaged doors and hardware.
4) Masonry infill including flashings.
5) All new floor carpeting work in Vestibule 106 shall be provided by the Owner.

4. Linden Elementary: Classroom casework and storage renovations.

a. Demolition of the following:

1) Cabinetry.
2) Sink and bubblers.
3) Masonry walls.
4) All associated mechanical items.
5) All associated electrical work shall be provided by the Owner.

b. New work includes the following:

1) Masonry infill.
2) Cabinetry.
3) All associated mechanical (Plumbing) items.
4) All associated electrical work shall be provided by the Owner.

5. Refer to Drawings for additional information and complete scope of work.

B. Ordinances and Fees:

1. All work shall be executed and inspected in accordance with the rules and regulations of the 2009 State of Michigan Building Code.
2. Refer to Section 00200 "Instructions to Bidders"for required permits and fees.

**1.4 WORK RESTRICTIONS**

A. Site Access: Access to the site will be restricted to the following times and days when the building is occupied:

1. Access to site for physical construction will not be available until June 17, 2013.

B. Use of Premises: Limit the use of the premises to work in areas indicated. Do not disturb portions of the site beyond areas in which the Work is indicated. Allow for Owner occupancy.

C. Use of Existing Building: Maintain the existing building in a weather-tight and secure condition throughout the construction period. Repair damage caused by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

1. The Contractor and each Subcontractor will be expected to have visited the site and appraise the existing situation and circumstances of operation.
2. Consult with the Owner as to the availability of space for storage of materials and places of access to the work, etc. Materials and equipment must be placed to avoid interferences with the Owner's operations and shall be moved when so required.
3. Comply with the Owner's requirements with regard to entrance, movement within and exit of all trucks, equipment, and personnel.
4. The Owner reserves the right to perform construction work similar in nature to the work included under this Contract, in the same area concurrently with the Contractor, with his own forces, or with other Contractors, without conflict of any nature.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

E. Utility Tie-Ins: All utility connections, disconnections, tie-ins, shut-downs, and similar work to existing services which would interfere with Owner's operations, must be performed on premium or overtime (Owner's non-standard work hours) basis with all costs included in the proposal lump sum price. All required connections, disconnections, tie-ins and shut-downs of system shall be scheduled in advance, prearranged and approved by the Owner's Representative.

F. No welding, flame cutting or other operations involving the use of flame, arcs or sparking devices will be allowed, unless prior approval is obtained from the Owner's Representative and all precautions are taken, including temporary fire resistant barriers and stand-by fire extinguishers.

G. Damage to Other Work: The Contractor shall repair, replace, or touch-up all finished surfaces in the existing building which may be damaged as a result of his work or operations.

H. Utilities or other services encountered or otherwise found shall be protected from any damage, unless or until they are abandoned. If the utilities or services are not abandoned, immediately repair any damage from work and operations of this Contract. Immediately repair any damage from the Work or operations and restore the utilities and services to an equal or better condition than that which existing prior to the damage or disruption.

I. Enforce strict discipline and good order among the Contractor's employees and subcontractor's.

1. Foul or abusive language or demeanor will not be tolerated.
2. Contractor's employees and subcontractor's shall dress in a neat workmanlike manner.
3. Smoking is prohibited anywhere on school property.
4. Possession, sale or consumption of alcoholic beverages on Owner's property is strictly prohibited.
5. The manufacturing, distribution, dispensing, possession or use of unlawful drugs on Owner's property is strictly prohibited and may result in criminal prosecution.

**1.5 CONTRACT MODIFICATION PROCEDURES**

A. Minor Changes In The Work: Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on AIA Document G710, "Architect's Supplemental Instructions."

B. Bulletins: After award of Contract, the Contractor as required shall quote changes in the work described in Bulletins or otherwise.

1. Except as otherwise specifically mentioned, the general character of the work covered by these Bulletins shall be the same as originally specified for the project and all incidental items required in connection with the work hereinafter described shall be included even though not specifically mentioned. Where an item is mentioned with no additional specifications given, reference is to be made to the original specifications. All applicable parts of the original specifications shall apply.
2. Submit detailed itemized quotations for each item of work described, stating fully the amounts for additions and deductions.
3. Following are sample guidelines for use in preparing detailed cost breakdown for each item in the Bulletin being quoted:

a. Material Cost:

List material giving unit cost
x number of units = cost _____
Add sales tax _____
Add applicable shipping costs _____

Subtotal Material Cost $_____

b. Labor Cost - List for each trade the:
Hourly rate x number of hours =
Labor cost _____

Add Labor Fringes as applicable:
F.I.C.A. _____
M.E.S.C. _____
Pension Contribution _____
Vacation Contribution _____
H.E.W. Insurance _____

Subtotal Labor Cost $_____

c. Equipment (heavy, i.e. cranes, earth moving, hoists, etc.):
Rental Charge or equivalent per day or week (including operating costs except labor) _____

Subtotal Equipment Cost $_____

d. Overhead & Profit

1) Work performed by prime contractor 10% overhead and profit.
2) On work performed by subcontractor, The prime contractor is allowed 5% handling charge unless otherwise stated in Contract Documents.
3) Work performed by subcontractor 5% overhead and profit
Subtotal Overhead & Profit $_____

TOTAL COST ITEM $_____

4. Quotations should be received by the Architect within two (2) weeks of issuance of the Bulletin.

C. Change Order Procedures: On Architect's recommendation and Owner's approval of a Bulletin quotation, Architect will issue a Change Order for signatures of Owner and Contractor on AIA Document G701.

D. Construction Change Directive: Architect may issue a Construction Change Directive on AIA Document G714. Construction Change Directive instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Construction Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

2. Documentation: Maintain detailed records on a time and material basis of work required by the Construction Change Directive.

    a. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

**1.6 PAYMENT PROCEDURES**

A. Schedule of Values: Submit the Schedule of Values as a preliminary Application for Payment to the Architect at least 7 days before submittal of the initial Application for Payment.

1. Format and Content: Use AIA Documents G702 and G703. Use the Project Manual Table of Contents as a guide to establish the format for the Schedule of Values.

    a. Provide a breakdown of the Contract Sum in sufficient detail to facilitate continued evaluation of Applications for Payment and progress reports. Break principal subcontract amounts down into several line items.
    b. Round amounts off to the nearest whole dollar; the total shall equal the Contract Sum.
    c. Where an Application for Payment may include materials or equipment, purchased or fabricated and stored, but not yet installed, provide separate line items on the Schedule of Values for initial cost of the materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
    d. Margins of Cost: Show line items for indirect costs, and margins on actual costs, only to the extent that such items will be listed individually in Applications for Payment. Each item in the Schedule of Values and Applications for Payment shall be complete including its total cost and proportionate share of general overhead and profit margin.

        1) At the Contractor's option, temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown as separate line items in the Schedule of Values or distributed as general overhead expense.

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

1. The Application for Payment at time of Substantial Completion and the final Application for Payment involve additional requirements.

C. Application Preparation: Complete every entry on the form, including notarization and execution by person authorized to sign legal documents on behalf of the Contractor. Incomplete applications will be returned without action.

1. Include amounts of Change Orders and Construction Change Directives issued prior to the last day of the construction period covered by the application.

D. Transmittal: Submit 3 executed copies of each Application for Payment to the Architect. One copy shall be complete, including waivers of lien and similar attachments, when required.

1. Transmit each copy with a transmittal form listing attachments, and recording appropriate information related to the application in a manner acceptable to the Architect.

E. Waivers of Mechanics Lien: With each Application for Payment, submit waivers of mechanics lien from every entity who may lawfully be entitled to file a mechanics lien arising out of the Contract, and related to the Work covered by the payment.

1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
2. Where an application shows completion of an item, submit final or full waivers.
3. Owner reserves the right to designate which entities involved in the Work must submit waivers.

F. Application for Payment at Substantial Completion: Actions and submittals that shall proceed or coincide with this application include:

Final cleaning.
Application for reduction of retainage, and consent of surety.
Punch list of incomplete Work, recognized as exceptions to Architect's Certificate of Substantial Completion.

G. Final Payment Application: Actions and submittals that shall precede or coincide with this application include:

Completion of Project closeout requirements.
Completion of items specified for completion after Substantial Completion.
Transmittal of required Project construction records to Owner.
Proof that taxes, fees and similar obligations have been paid.
Removal of temporary facilities and services.
Removal of surplus materials, rubbish and similar elements.

**1.7 PROJECT MANAGEMENT AND COORDINATION**

A. Coordination: Coordinate construction operations 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.

B. Pre-Construction Conference:

1. Architect will schedule a pre-construction conference at the Project site after execution of the Agreement and prior to commencement of construction to review responsibilities and personnel assignments.
2. Attendees: The Owner, Architect, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference.
3. Agenda: Discuss items of significance that could affect progress including such topics as:

Designation of responsible personnel.
Distribution of Contract Documents.
Construction schedule.
Critical Work sequencing.
Procedures for processing field decisions and Change Orders.
Procedures for processing Applications for Payment.
Submittal of Shop Drawings, Product Data and Samples.
Preparation of record documents.
Use of the premises.

Office, Work and storage areas.
Equipment deliveries and priorities.
Safety procedures.
First aid.
Security.
Housekeeping.
Working hours.

C. Progress Meeting:

1. Architect and Owner will conduct progress meetings, with the representatives of the various trades and the Contractor in attendance at periodic intervals as directed. The Minutes of these meetings will be recorded by the Architect and copies sent to all interested parties. The dates of progress will be coordinated with preparation of payment request.
2. Agenda: Review and correct or approve minutes of the previous progress meeting. Include topics for discussion as appropriate to the current status of the Project.

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

      Interface requirements.
      Time.
      Sequences.
      Deliveries.
      Off-site fabrication problems.
      Access.
      Site utilization.
      Temporary facilities and services.
      Hours of Work.
      Hazards and risks.
      Housekeeping.
      Quality and Work standards.
      Change Orders.
      Documentation of information for payment requests.

**1.8 CONSTRUCTION PROGRESS DOCUMENTATION**

A. Construction Schedule: Submit a comprehensive, fully developed, horizontal bar chart, construction schedule.

1. Submit schedule within two (2) weeks after award of Contract. Base schedule on the Times of Completion specified for the Project.
2. Update construction schedule monthly after construction progress meetings, to reflect actual construction progress and activities.
3. Indicate each significant construction activity separately.
4. Time Frame: Extend schedule from date established for commencement of the Work to date of final completion.

5. Activities: Comply with the following:

    a. Procurement Activities: Include procurement activities for long lead items. Procurement activities include, but are not limited to, submittals, approvals, purchasing, fabrication and delivery.
    b. Substantial Completion: Indicate completion in advance of date of substantial completion, allow time for Architect's inspection and punch list.

6. Milestones: Include milestones such as Notice to Proceed, Substantial Completion and Final Completion.

**1.9 SUBMITTAL PROCEDURES**

A. General: Electronic copies of CAD Drawings of the Contract Drawings will be provided by Architect for Contractor's use in preparing submittals under the following conditions:

1. Contractor's application and signature on IDS CAD Release Form at the end of this Section.
2. Payment of a non-refundable service fee of $40.00 per Drawing.

B. Shop Drawings, Product Data and Samples: Submit Shop Drawings, Product Data and Samples to the Architect for review. Architect will provide to the Contractor the submittal forms that must be filled out and accompany each submittal.

1. Coordinate the preparation and processing of submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities such as testing, purchasing, fabrication, delivery and similar activities and require sequential activity.

    a. Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the Architect's need to review a related submittal. The Architect reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

2. Allow sufficient time so that the installation will not be delayed as a result of the time required to properly process submittals, including time for resubmittal, if necessary.

    a. Allow ten (10) working days for the Architect's review of each submittal. Allow a longer time period where processing must be delayed for coordination with subsequent submittals. The Architect will advise the Contractor promptly when it is determined that a submittal being processed must be delayed for coordination.
    b. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect/Engineer sufficiently in advance of the work.

3. The Contractor shall review Shop Drawings, product Data and Samples prior to submission. Notify the Architect in writing of any deviations in the submittals from requirements of the Contract Documents.

    a. Information required on shop drawings includes, dimensions, identification of specific products and materials which are included in the work, compliance with specified standards and notations of coordination requirements with other work. Provide special notation of dimensions that have been established by field measurement. Highlight, encircle or otherwise indicate deviations from the contract documents on the shop drawings.
    b. Submit samples for the Architect's visual review of general generic kind, color, pattern, and texture, and for a final check of the coordination of these characteristics with other related elements of the work. Samples are also submitted for quality control comparison of these characteristics between the final sample submittal and the actual work as it is delivered and installed.

4. Architect's acceptance shall not relieve the Contractor from responsibility for errors in submittals.
5. Do not use Shop Drawings, Product Data or Samples without an appropriate stamp indicating Architect/Engineer's action taken.
6. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, 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.

7. Informational Submittals: Architect will review each submittal and will not return it, or will reject and return it if it does not comply with requirements. Construction Manager will forward each submittal to appropriate party.
8. Action Not Required: Submittals not required by the Contract Documents will not be reviewed and will be returned with notation “Action Not Required.”
9. Submit the following:

    a. Shop Drawings: One reproducible sepia print and five blue or black line prints.
    b. Product Data: Submit six (6) copies.
    c. Samples: Submit three (3) sets of samples.

10. Fire Performance Affidavits: Submit in triplicate, notarized affidavits for the products required as specified in the various technical sections of the specifications. Affidavit shall be signed and notarized, and in the following format:

AFFIDAVIT

This is to certify that, (Name of Product) which was or will be furnished to (Company making Application of Product) for (Job or Project Name and Address) is the same in all respects in content, and specifications for mixing and/or application as the specimen tested by (Name of Laboratory) or their project or test number (Test Number) dated (Date of Test).

Flame Spread _____
Fuel Contributed _____
Smoke Developed _____

C. Electronic Submittal Procedure: At Contractor's option submittals (Shop Drawings, Product Data and Samples) may be submitted electronically to the Architect for review. If Contractor elects to use electronic submittals, all submittals (except samples) must be electronic. The following instructions must be followed to minimize the risk of submittals being lost and to help expedite the review.

1. At Construction kick-off meeting the Architect will transmit to the contractor in both Word and PDF format the submittal form that must be used.
2. Contractor prior to e-mailing to the Architect must fill out the following information on the submittal form.

    a. Item (1) – From/Return to:
    b. Item (2) – Project Title/Location:
    c. Item (3) - IDS Project No.:
    d. Item (4) – Submittal Date:
    e. Item (8) – Project Manual Section No.:
    f. Item (9) – Product Manufacturer:
    g. Item (10) - Item Description (specific information, not just "drawings", i.e. Curtainwall Shop Drawings.
    h. Item (11) – Print/Sepia/Catalog/Sample/Other (Quantity)
    i. Item (12) – Contractor's/Construction Manager's Remarks & Deviations (if any).
    j. Item (13) – Addendum or Bulletin (if any).
    k. Item (14) – Substitution (if any).

3. Contractor shall e-mail the submittal to shopdrawings@ids-troy.com and the IDS Construction Administration individual. (Note: Not all submittals will be able to be received in the Construction Administration individuals e-mail due to e-mail limiting). The e-mail submittals should be formatted as follows:

    a. Subject of e-mail should indicate the project name and specification section number and IDS project number.
    b. Only one (1) specification section should be included in each e-mail. This aids in processing and future retrieval.
    c. IDS submittal form must be completed and included at the beginning of and in the same PDF as the submittal (if the contractor chooses to use the Word format document to aid in filling in the information then they will need to convert it to a PDF and bind it into the actual submittal).

**1.10 QUALITY REQUIREMENTS**

A. The Owner may employ the services of a testing agency. This will be for the Owner's purpose. Any information or assistance furnished by this agency will not relieve the Contractor of his responsibility for the work and the removal and replacement of any faulty work done which is not in accordance with plans and specifications without additional cost to the Owner.

**1.11 REFERENCES**

A. Specifications & Drawings To be Cooperative:

1. These Specifications and accompanying Drawings are intended to describe and provide for finished work. They are intended to be cooperative and what is called for by either shall be as binding as if called for by both. The Drawings accompanying the Specifications are intended to show the general design and arrangement of the installation and in some cases are more or less diagrammatic. They are not intended to serve as shop drawings nor are they to be scaled for dimensions or exact locations of equipment.
2. It is the intent of the Drawings and Specifications to provide for a complete and satisfactory installation. The Contractor shall furnish Labor and/or materials neither shown nor specified but obviously necessary for the completion of the proper functioning of the systems.

B. Specification Format and Content Explanation:

1. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's 16-Division format and MASTER FORMAT numbering system.
2. Words, which have well known technical or construction industry meanings are used in the Contract Documents in accordance with such, recognized meanings.
3. Abbreviated Language: In the interest of brevity, the Contract Documents frequently omit modifying words such as “all” and “any” and articles such as “the” and “an” but the fact that a modifier or an article is absent from a statement and appears in another is not intended to affect the interpretation of either statement.
4. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespersons of the corresponding generic name.

C. Definitions:

1. Indicated: Refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in Specifications, and similar requirements in Contract Documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used, it is to help locate the reference; no limitation on location is intended except as specifically noted.
2. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by the Architect", "requested by the Architect", and similar phrases. However, no implied meaning shall be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.

3. Approve: The term "approved", where used in conjunction with the Architect's action on the contractor's applications and requests, is limited to the duties and responsibilities of the Architect as stated in General and Supplementary Conditions. Such approval shall not release the Contractor from responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.
4. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the construction industry that control performance of the Work, whether lawfully imposed by authorities having jurisdiction or not.
5. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."
6. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."
7. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."
8. Installer: An "Installer" is the Contractor engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
9. Project Site: Is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other construction activities as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land upon which the Project is to be built.
10. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

D. Standards of Industry: Reference to standards, codes, and recommendations shall be the latest edition of such publications adopted and published at date of bids. Work shall be installed according to the following industry standards when applicable:

1. UL - Underwriter's Laboratories, Inc.
2. ASA - American Standard Association
3. ASHRAE - American Society of Heating, Refrigeration and Air Conditioning Engineers
4. ASME - American Society of Mechanical Engineers
5. ASTM - American Society for Testing and Materials
6. Any local state or national plumbing and building codes having jurisdiction.

## 1.12 TEMPORARY FACILITIES AND CONTROLS

A. Temporary Water, Power and Lighting:

1. The Owner will furnish at no cost to the Contractor water and electricity for construction purposes. All such water and electricity shall be obtained from existing outlets designated by the Owner's Representative. If the Contractor's requirements exceed the characteristics at the designated outlets, the Contractor shall provide and pay for additional facilities as he may require.

    a. Water shall not be taken from Fire Protection System.

2. The Contractor shall provide temporary distribution systems, transformers, pumps, outlets, lighting fixtures and other accessories as may require for construction operations. At completion, or when so directed by the Owner's Representative, remove all temporary facilities.
3. All connections and distribution systems shall be furnished and installed by the Contractor at his own expense.

B. Compressed Air: Each trade shall provide compressed air as required for the successful performance of their work.

C. Temporary Toilets:

1. The Owner's will allow the use of designated toilet facilities for use by all workers employed on the project. Keep the facilities clean and in sanitary condition at all times.

D. Temporary Parking: Park in designated spaces only.

1. Do not park vehicles on sidewalks or lawn areas surrounding the building unless written approval is received from the Owner.

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

1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.

F. Temporary Partitions: Construct temporary dust-proof partitions to separate areas of construction for occupied or used areas.

1. Provide walk-off dust mats each side of doors in temporary partitions.
2. Temporary partitions to separate areas of construction from non-occupied or not used areas shall be constructed of layer of fire-retardant polyethylene film on one side of 2 x 4 wood or metal studs.

G. Temporary Storage: Storage space within the building is limited. Each trade shall arrange for storage trailers on site for storage of materials, equipment, supplies and tools as required. The Owner accepts no responsibility for security of such storage trailers.

1. Storage of materials will not be allowed on roofs.

H. Project Identification and Temporary Signs:

1. No advertising, contractor's sign or project sign will be permitted on the site.

I. Waste Material Removal and Cleaning: Remove and properly dispose of, on a daily basis all waste materials and debris resulting from the Work. The Project and adjacent grounds shall be kept free of accumulations of rubbish.

1. Construction debris shall not be stored overnight, nor shall it be left in common corridors. Keep debris confined to work areas only until such time as it is being removed.
2. No burning of waste materials will be permitted on the premises.

3. Contractors shall provide dumpsters as necessary for all waste material generated by their work.

**1.13 PRODUCT REQUIREMENTS**

A. Product Substitutions: Contractor's request for substitution will be received and considered when extensive revisions to the Contract Documents are not required, when the proposed changes are in keeping with the general intent of the contract documents, when the request are timely, fully documented and properly submitted, and when one or more of the following conditions is satisfied, all as judged by the Architect; otherwise the request will be returned without action except to record non-compliance with these requirements.

B. The Architect will consider a request for substitution for the following reasons only:

1. Where the request is directly related to an "or equal" clause in the contract documents.
2. Where the specified product cannot be provided within the Contract Time. However, the request will not be considered if the product cannot be provided as a result of the Contractor's failure to pursue the work promptly or to coordinate the various activities properly.
3. Where the specified product cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
4. Where a substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit, after deducting offsetting responsibilities the Owner may be required to bear. These additional responsibilities may include such considerations as additional compensation to the Architect for redesign and evaluation services, the increased cost of other work by the Owner or separate contractors, and similar considerations.
5. When the specified product cannot be provided in a manner which is compatible with other materials of the work, and where the Contractor certifies that the substitution will overcome the incompatibility.
6. When the specified product cannot be properly coordinated with other materials in the work, and where the Contractor certifies that the proposed substitution can be properly coordinated.
7. When the specified product cannot receive a warranty as required by the contract documents and where the contractor certifies that the proposed substitution receive the required warranty.

C. Substitution Requests:

1. Requests for Substitutions: Do <u>not</u> submit substitution request as a shop drawing submittal. Submit a separate request for each request for substitution. In each request identify the product to be replaced by the substitution, include related specification section and drawing numbers, and complete documentation showing compliance with the requirements for substitutions. Include the following information, as appropriate, with each request:

   a. Provide complete product data, drawings and descriptions of products, and fabrication and installation procedures.
   b. Provide samples if requested.
   c. Provide a detailed comparison of the significant qualities of the proposed substitution with those of the work originally specified. Significant qualities include elements such as size, weight, durability, performance and visual effect.

d. Provide complete coordination information. Include all changes required in other elements of the work to accommodate the substitution.
e. Provide a statement indicating the effect the substitution will have on the work schedule in comparison to the schedule without approval of the proposed substitution. Include information regarding the effect of the proposed substitution on the Contract Time.
f. Provide complete cost information, including a proposal of the net change in the Contract Sum.
g. Include in this certification, the Contractor's waiver of rights to additional payment or time, which may subsequently be necessary because of the failure of the substitution to perform adequately.

D. Sample Substitution Request Form: Use CSI Form 13.1A provided at end of Section

**1.14 EXECUTION REQUIREMENT**

A. Establish benchmarks and markers to set lines and levels as needed to properly locate each element of the Work. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions.

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

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

D. Clean Project site and work areas daily, including common areas. Dispose of materials lawfully.

1. Site: Maintain Project site free of waste materials and debris.
2. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
3. Clean completed construction as frequently as necessary through the remainder of the construction period.

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

**1.15 CUTTING AND PATCHING**

A. Cutting of holes and openings through existing slabs, walls, ceilings, partitions, etc., of existing building required for the installation of new piping conduits, ducts, etc., (including patching and repairing) shall be performed by the trade requiring such openings without additional cost to the Owner.

B. The cutting of holes through the existing building construction shall only be done by the use of abrasive saw 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 work. Where existing piping, etc., is removed, the unused openings shall be grouted in.

C. The drilling or punching of structural members, such as holes through beams or column, shall not be done without the specific permission of the Architect.

D. Do not cut and patch work exposed in the building's exterior or in its occupied spaces in a manner that would, in the Architect's opinion, result in lessening the building's aesthetic qualities. Do not cut and patch in a manner that would result in substantial visual evidence of cut and patch work. Remove and replace work judged by Architect to be cut and patched in a visually unsatisfactory manner.

E. Restore exposed finishes of patched areas and extend finish restoration into retained adjacent construction in a manner that will eliminate evidence of patching and refinishing.

F. Where removal of walls extends one finished area into another, patch and repair floor, wall and ceiling surfaces, to provide an even surface of uniform color and appearance.

G. Where patching occurs in a painted surface, extend final paint coat over entire unbroken surface containing the patch.

**1.16 CLOSEOUT PROCEDURES**

A. At time of substantial completion, submit record drawings, maintenance manuals and warranties.

B. Record Drawings: Maintain a clean, undamaged set of blue line prints of Contract Drawings. Mark the set to show the actual installation where the installation varies substantially with the Work as originally shown. Give particular attention to concealed elements that would be difficult to locate at a later date. Mark record sets with red erasable pencil.

C. Record Shop Drawings and Product Data: Maintain one copy of shop drawings and product data. Mark these documents to show significant variations in actual Work performed.

D. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind properly indexed data in heavy-duty, 2-inch, 3-ring loose-leaf binders with pocket folders for folded sheet information. Include the following types of information:

Emergency instructions.
Spare parts list.
Copies of warranties.
Inspection procedures.
Shop drawings and product data.
Fan and pump curves.
Lubrication chart and schedule.
Fixture lamping schedule.

E. Guarantee: Furnish the Owner with a written guarantee to remedy any defects due to faulty materials or workmanship which appear in the work within one year from date of final acceptance by the Owner.

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION (Not Used)**

**END OF SECTION 01000**

A Request for **Integrated Design Solutions, LLC (ids)** from Contractor
For Transfer of Computer-Aided Drafting (CAD) Files on Electronic Media

Project Administrator: _____ Contractor: _____

**ids** Project Number: _____ _____

Project Name: _____ _____

Location: _____ _____

Bid Package Number _____ Date: _____

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

| Drawing No. | Drawing Title | Issue Date of Drawing |
|---|---|---|
| | | |
| | | |
| | | |

Drawings were prepared on the following:

Software: MicroStation "J", 7.0 Operating System: Windows NT, 4.0

Check appropriate format for translation if other than MicroStation:

AutoCAD _____ DXF _____ IGES _____

Contractor shall pay **ids** a service fee of _____ $(_____)
(Fee equals $40 per drawing)

**TERMS AND CONDITIONS**

1. **ids** makes no representation as to the compatibility of the CAD files with any hardware or software.
2. Since the information set forth on the CAD 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.
3. Contractor will use figured dimensions only and will not "pull" dimensions from the CAD files.
4. All information on the CAD 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 files shall remain the property of **ids**, and in no case shall the transfer of these files be considered a sale.
5. **ids** makes no representation regarding the accuracy, completeness, or permanence of CAD files, nor for their merchantability or fitness for a particular purpose. Addenda information or revisions made after the date indicated on the CAD files may not have

been incorporated. In the event of a conflict between **ids**' sealed contract drawings and CAD files, the sealed contract drawings shall govern. It is the Contractor's responsibility to determine if any conflict exists. The CAD files shall not be considered to be Contract Documents as defined by the General Conditions of the Contract for Construction.

6. The use of CAD 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.

7. The Contractor 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 files by the Contractor, or by third party recipients of the CAD 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 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. Payment of the service fee is due upon receipt of this request for CAD files.

11. This agreement shall be governed by the laws of the State of Michigan.

**AUTHORIZED ACCEPTANCE**

| by **Integrated Design Solutions, LLC** | by Contractor |
|---|---|
| _____ | _____ |
| Signature | Signature |
| _____ | _____ |
| Print Name and Title | Print Name and Title |
| _____ | _____ |
| Date | Date |

# SUBMITTAL FORM

**Integrated** Design Solutions
Architecture, Engineering, Interiors & Technology
1441 W. Long Lake, Suite 200, Troy, MI 48098
(248) 823-2100 ✹ (248) 823-2200 (Fax)

**(Project Title/Location 3 lines MAXIMUM)**

| From/Return To: (1) | Project Title/Location: (2) | | Submittal No.: (5) | |
|---|---|---|---|---|
| | **ids** Project No.: (3) | | Partial Submittal No.: (6) | |
| | Submittal Date: (4) | | Resubmittal No.: (7) | |

| Proj. Manual Section No. (8) | Product Manufacturer (9) | Item Description (10) | Print (11) | Sepia | Catalog | Sample | Other | ☐ A | ☐ M | ☐ E | ☐ EN | ☐ S | ☐ C | ☐ DN | ☐ FS | ☐ IN | ☐ TE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Contractor's/Construction Manager's Remarks & Deviations: (12) | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Addendum or Bulletin: (13) | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| Substitution: (14) | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

IDS Remarks:

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.

Contractor/Construction Manager: _____

Signature: _____

**ids** Received Stamp

Distribution: Contractor/Construction Manager
Architect/Engineer
Owner

IDS Construction Administration Approval:

_____

Date: _____

**ACTION CODE:**

1. NO EXCEPTIONS TAKEN
2. EXCEPTIONS AS NOTED
3. REJECTED
4. ACTION NOT REQUIRED

# 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) Contractor's/Construction Manager's name and address to whom submittal is to be returned.

(2) Project Title and Location. (Refer to Title Page of specifications. Include Bid Package number, if applicable.)

(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, use "1" in the space for the first partial submittal, "2" for the second partial submittal, etc. If this is a complete submittal, leave space blank.

(7) If this is a resubmittal (revision to a previous submittal), use the original submittal number and place the letter "A" in the resubmittal space for the first resubmittal, "B" for the second resubmittal, etc. If this is a new submittal, leave space blank.

(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.

Advancement of Construction Technology

# SUBSTITUTION REQUEST

**(After the Bidding Phase)**

Project: _____ Substitution Request Number: _____

_____ From: _____

To: _____ Date: _____

_____ A/E Project Number: _____

Re: _____ Contract For: _____

Specification Title: _____ Description: _____

Section: _____ Page: _____ Article/Paragraph: _____

Proposed Substitution: _____

Manufacturer: _____ Address: _____ Phone: _____

Trade Name: _____ Model No.: _____

Installer: _____ Address: _____ Phone: _____

History: ☐ New product ☐ 2-5 years old ☐ 5-10 yrs old ☐ More than 10 years old

Differences between proposed substitution and specified product: _____

_____

_____

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

Reason for not providing specified item: _____

_____

Similar Installation:

Project: _____ Architect: _____

Address: _____ Owner: _____

_____ Date Installed: _____

Proposed substitution affects other parts of Work: ☐ No ☐ Yes; explain _____

_____

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

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

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

# SUBSTITUTION REQUEST
**(Continued)**

The Undersigned certifies:

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

Submitted by: _____

Signed by: _____

Firm: _____

Address: _____

_____

Telephone: _____

Attachments: _____

_____

_____

_____

A/E's REVIEW AND ACTION

☐ Substitution approved - Make submittals in accordance with Specification Section 01330.
☐ Substitution approved as noted - Make submittals in accordance with Specification Section 01330.
☐ Substitution rejected - Use specified materials.
☐ Substitution Request received too late - Use specified materials.

Signed by: Date:

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

_____

_____

_____

_____

_____

_____

_____

# SECTION 01270 - UNIT PRICES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes administrative and procedural requirements for unit prices.

### 1.3 DEFINITIONS

A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

### 1.4 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.

C. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 LIST OF UNIT PRICES

A. Unit Price No. 1 - Sectional Mobile Cubbies:

1. Description: Provide Jonticraft Sectional Mobile Cubbie – Model No. 04160JC with clear trays. Holds fifteen trays and has sixteen removable, finished partitions. 48" wide x 15" deep x 35-1/2" high. Back Options: As selected by Architect.

    a. Unit of Measurement: Per unit/Each.

B. Unit Price No. 2 - 25 Tray Mobile Cubbies:

1. Description: Provide Jonticraft 25 Tray Mobile Cubbies – Model No. 04260JC with clear trays. Contains twenty-five cubbie-trays. 48" wide x 15" deep x 35½" high. Back Options: As selected by Architect.

a. Unit of Measurement: Per unit/Each.

C. Unit Price No. 3 - 10 Tray Mobile Storage:

1. Description: Provide Jonticraft 10 Tray Mobile Storage – Model No. 06110JC with clear trays. 20" wide x 15" deep x 35½" high. Back Options: As selected by Architect.

a. Unit of Measurement: Per unit/Each.

D. Unit Price No. 4 - Paper Rack:

1. Description: Provide Jonticraft Paper Rack – Model No. 0386JC. Fourteen shelves store reams of paper, up to 19" x 24" size, and can double as a drying rack for individual art projects. Maple construction. 29" wide x 28" deep x 49" high.

a. Unit of Measurement: Per unit/Each.

E. Unit Price No. 5 - Supply Cabinet:

1. Description: Provide Jonticraft Supply Cabinet – Model No. 9510JC. Locking cabinet to store various supplies or personal effects. Include cabinet lock and key. Two drawers and three adjustable shelves. Extra heavy duty locking casters. 36" wide x 24" deep x 46" high.

a. Unit of Measurement: Per unit/Each.

**END OF SECTION 01270**

# SECTION 02222 - 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 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of building or structure.
2. Patching and repairs to adjacent construction caused by demolition operations and installation of new work.

B. Related Sections include the following:

1. Section 04810 "Unit Masonry Assemblies" for salvaging face brick.
2. Division 15 Sections for demolishing, cutting, patching, or relocating mechanical items.
3. Division 16 Sections for demolishing, cutting, patching, or relocating electrical items.

### 1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

### 1.4 MATERIALS OWNERSHIP

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

### 1.5 SUBMITTALS

A. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.

B. Predemolition Photographs or Videotapes: It shall be the Contractor's responsibility to document and show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations.

C. Warranties: Documentation indicated that existing warranties are still in effect after completion of selective demolition.

**1.6 QUALITY ASSURANCE**

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Standards: Comply with ANSI A10.6 and NFPA 241.

**1.7 PROJECT CONDITIONS**

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Construction Manager, Architect and Owner.

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.

**1.8 WARRANTY**

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

**PART 2 - PRODUCTS (Not Used)**

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Verify that utilities have been disconnected and capped.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs or videotapes.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

**3.2 PREPARATION**

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner.
2. Protect existing site improvements, appurtenances, and landscaping to remain.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather and security protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage, unauthorized entry and damage to structure and interior areas.

    a. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

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.

C. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate occupied areas from construction areas.

1. 1 Hour Rated Dustproof Partitions: Construct partitions to separate areas of construction from occupied areas or means of egress of not less than nominal 4-inch wood or metal studs, 5/8-inch gypsum wallboard with joints taped on occupied side, and 5/8-inch gypsum wallboard on the demolition side.
2. Non-rated Dustproof Partitions: Construct partitions to separate areas of construction from non-occupied areas of not less than nominal 4-inch wood or metal studs and fire-retardant polyethylene sheeting.
3. Provide walk-off dust mats each side of doors in temporary dustproof partitions.
4. Insulate partition to provide noise protection to occupied areas.
5. Seal joints and perimeter. Equip partitions with dustproof doors and security locks.
6. Protect air-handling equipment.
7. Weatherstrip openings.

## 3.3 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
7. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area on-site.
5. Protect items from damage during transport and storage.

C. 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.

D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

## 3.4 POLLUTION CONTROLS

A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.

2. Wet mop floors to eliminate trackable dirt and wipe down walls and doors of demolition enclosure. Vacuum carpeted areas.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.

**3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS**

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals, using power-driven saw, then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

D. Remove all miscellaneous fasteners, anchors, brackets, not required for the structural integrity of the wall or ceiling surfaces.

E. Remove all existing joint sealants remaining after removal door frames, window frames or storefront framing.

F. Remove all existing mortar remaining on existing masonry walls after removal of an intersecting masonry wall.

**3.6 PATCHING AND REPAIRS**

A. General: Promptly repair damage to adjacent construction caused by demolition operations.

B. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

1. Completely fill holes and depressions in existing masonry walls that are to remain with an approved masonry patching material applied according to manufacturer's written recommendations.

C. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

D. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

## 3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

## 3.8 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 02222**

# SECTION 03300 - CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section specifies cast-in place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Infilling existing slabs-on-grade.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.

D. Field quality-control test reports.

### 1.4 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94 requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

E. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5. **"**
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
3. ACI 211, "Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete."
4. ACI 302.1R, "Guide for Concrete Floor and Slab Construction".
5. ACI 304R, "Guide for Measuring, Mixing, Transporting and Placing Concrete".
6. ACI 305R, Hot Weather Concreting".
7. ACI 306.1, "Standard Specification for Cold Weather Concreting".
8. ACI 308, "Standard Practice for Curing Concrete".
9. ACI 309R, "Guide for Consolidation of Concrete".
10. ACI 315, "Details and Detailing of Concrete Reinforcement."
11. ACI 318, "Building Code Requirements for Reinforced Concrete."
12. Concrete Reinforcing Steel Institute (CRSI) "Manual of Standard Practice."

F. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

**1.5 DELIVERY, STORAGE, AND HANDLING**

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

**1.6 PROJECT CONDITIONS**

A. Concrete cutting, grinding, drilling and hydro-demolition:

1. Discharge of water, dust, or debris from concrete work to storm or sanitary system is prohibited.
2. Storm drains must be protected from dust and debris.
3. Any water used during concrete work, including sweeping and saw cutting) must be contained and collected for proper disposal. Suggested controls include wet vacuum or absorbents.
4. Good housekeeping practices must be employed at the jobsite. Minimize dust.

**PART 2 - PRODUCTS**

**2.1 STEEL REINFORCEMENT**

A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.

B. Plain-Steel Wire: ASTM A 82, as drawn.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

## 2.2 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

## 2.3 CONCRETE MATERIALS

A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:

1. Portland Cement: ASTM C 150, Type I or III, gray.

B. Fly Ash: ASTM C 618, Class C or F.

C. Normal-Weight Aggregate: ASTM C 33, selected and uniformly graded and as follows:

1. Class: Severe weathering region, but not less than 4S for flatwork.
2. Nominal Aggregate Size: In accordance with ACI 318.

a. Maximum Coarse-Aggregate Size: 3/4 inches nominal.

D. Water: ASTM C 94 and potable.

## 2.4 ADMIXTURES

A. Air-Entraining Admixture: ASTM C 260.

B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494, Type A.
2. Retarding Admixture: ASTM C 494, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017, Type II.

C. Synthetic Fiber: Monofilament polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III, 1/2 to 1-1/2 inches long, at manufacturer's recommended dosage.

1. Available Products:

a. Euclid Chemical Company (The); Fiberstrand F.
b. FORTA Corporation; Eco-Net.
c. Grace, W. R. & Co.--Conn.; Grace Fibers.

**2.5 CURING MATERIALS**

A. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

B. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

1. Products:

a. Conspec Marketing & Manufacturing Co., Inc., a Dayton Superior Company; Sealcure 1315 WB.
b. Euclid Chemical Company (The); Super Diamond Clear VOX.
c. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
d. Meadows, W. R., Inc.; Vocomp-30.
e. Tamms Industries, Inc.; LusterSeal WB 300.

**2.6 RELATED MATERIALS**

A. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

**2.7 CONCRETE MIXTURES, GENERAL**

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.

1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash: 25 percent.

C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.

D. Admixtures: Use admixtures according to manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.

**2.8 CONCRETE MIXTURES FOR BUILDING ELEMENTS**

A. Infill at Interior Slabs-On-Grade: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: 4000 psi at 28 days.
2. Minimum Cementitious Materials Content: 540 lb/cu. yd..
3. Slump Limit: 4 inches, plus or minus 1 inch.
4. Air Content: Do not allow air content of troweled finished toppings to exceed 3 percent.
5. Fly Ash: Maximum 25 percent by weight of cementitious material.
6. Synthetic Fiber (At Contractor's Option): Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 1.0 lb/cu. yd.

**2.9 FABRICATING REINFORCEMENT**

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

**2.10 CONCRETE MIXING**

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
2. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

**PART 3 - EXECUTION**

**3.1 EMBEDDED ITEMS**

A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

## 3.2 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

## 3.3 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened concrete surfaces.

## 3.4 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement.

C. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

D. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

E. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.

## 3.5 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces exposed to view or to be covered with traffic coating, resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:

a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.

## 3.6 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Floor and Slab Surfaces: Begin curing immediately after finishing concrete.

1. Cure concrete surfaces to receive floor coverings with moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.

C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
2. Curing and Sealing Compound: Apply uniformly to floors and slabs in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.
3. All exposed concrete shall use a curing and sealing compound.

**3.7 CONCRETE SURFACE REPAIRS**

A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Floor and Slab Surfaces: Test floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete.
4. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
5. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

D. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

E. Repair materials and installation not specified above may be used, subject to Architect's approval.

**3.8 FIELD QUALITY CONTROL**

A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

    a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C 143; one test at point of placement for each truckload. Perform additional tests when concrete consistency appears to change.
3. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
4. Concrete Temperature: ASTM C 1064; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
5. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
6. Compression Test Specimens: ASTM C 31.

    a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.

7. Compressive-Strength Tests: ASTM C 39; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.

    a. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

8. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
9. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
10. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

11. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42 or by other methods as directed by Architect.
12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate dos not comply with the Contract Documents.

**END OF SECTION 03300**

# SECTION 04720 - CAST STONE

## 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. Cast stone trim including the following:

a. Window sills.

B. Related Sections include the following:

1. Section 04810 "Unit Masonry Assemblies" for installing cast stone units in unit masonry.
2. Section 07920 "Joint Sealants" for sealant used in pointing joints in cast stone.

### 1.3 DEFINITIONS

A. Cast Stone: Architectural precast concrete building units intended to simulate natural cut stone.

### 1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for cast stone units.

B. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.

1. Include building elevations showing layout of units and locations of joints and anchors.

C. Samples for Verification:

1. For each color and texture of cast stone required, 10 inches square in size.

D. Quality-Control Plan: Manufacturer's written quality-control plan that includes all elements of the Cast Stone Institute's "Quality Control Procedures Required for Plant Inspection."

1. Provide copies of documentation showing compliance with quality-control plan as requested by Architect.

E. Material Test Reports: For each mix required to produce cast stone, based on testing according to ASTM C 1364, including test for resistance to freezing and thawing.

1. Provide test reports based on testing within previous two years.

**1.5 QUALITY ASSURANCE**

A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, with sufficient production capacity to manufacture required units.

1. Manufacturer is a producing member of the Cast Stone Institute or has on file and follows a written quality-control plan approved by Architect that includes all elements of the Cast Stone Institute's "Quality Control Procedures Required for Plant Inspection."

B. Testing Agency Qualifications: An independent testing agency qualified according to ASTM E 329 for testing indicated, as documented according to ASTM E 548.

C. Source Limitations for Cast Stone: Obtain cast stone units through one source from a single manufacturer.

**1.6 DELIVERY, STORAGE, AND HANDLING**

A. Coordinate delivery of cast stone with unit masonry work to minimize the need for on-site storage and to avoid delaying the Work.

B. Pack, handle, and ship cast stone units in suitable packs or pallets.

1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.

**PART 2 - PRODUCTS**

**2.1 CAST STONE MATERIALS**

A. General: Comply with ASTM C 1364 and the following:

B. Portland Cement: ASTM C 150, Type I, containing not more than 0.60 percent total alkali when tested according to ASTM C 114.

C. Coarse Aggregates: Granite, quartz, or limestone complying with ASTM C 33; gradation as needed to produce required textures and colors as needed to produce required cast stone colors.

D. Fine Aggregates: Natural sand or crushed stone complying with ASTM C 33, gradation as needed to produce required textures and colors as needed to produce required cast stone colors.

E. Color Pigment: ASTM C 979, synthetic mineral-oxide pigments or colored water-reducing admixtures; color stable, nonfading, and resistant to lime and other alkalis.

F. Admixtures: Do not use admixtures unless specified or approved in writing by Architect.

1. Do not use admixtures that contain more than 0.1 percent water-soluble chloride ions by mass of cementitious materials. Do not use admixtures containing calcium chloride.
2. Use only admixtures that are certified by manufacturer to be compatible with cement and other admixtures used.
3. Air-Entraining Admixture: ASTM C 260. Add to mixes for units exposed to the exterior at manufacturer's prescribed rate to result in an air content of 4 to 6 percent, except do not add to zero-slump concrete mixes.
4. Water-Reducing Admixture: ASTM C 494, Type A.
5. Water-Reducing, Retarding Admixture: ASTM C 494, Type D.
6. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E.
7. Waterproofing Admixture: Non-chloride integral waterproofing admixture, certified by manufacturer to be compatible with other required admixtures.

a. Products:

1) Anti-Hydro-NC Integral Waterproofing Admixture; Anti-Hydro International, Inc.

G. Reinforcement: Deformed steel bars complying with ASTM A 615. Use galvanized or epoxy-coated reinforcement when covered with less than 1-1/2 inches of cast stone material.

1. Epoxy Coating: ASTM A 775.
2. Galvanized Coating: ASTM A 767.

H. Embedded Anchors and Other Inserts: Fabricated from stainless steel complying with ASTM A 240, ASTM A 276, or ASTM A 666, Type 304.

## 2.2 CAST STONE UNITS

A. Manufacturers:

1. Continental Cast Stone Manufacturing, Inc.
2. Custom Cast Stone, Inc.
3. Custom Stone Works Inc.
4. Edwards Cast Stone Company.
5. RockCast; Div. of Reading Rock, Inc.
6. Royal Stone.

B. Provide cast stone units complying with ASTM C 1364 using the vibrant dry tamp method.

1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666, Procedure A, as modified by ASTM C 1364.
2. Provide cast stone units with integral water repellants of type specified or established by cast stone manufacturer as suitable for use in cast stone by proven field performance or through laboratory testing.

C. Fabricate units with sharp arris and details accurately reproduced with indicated texture on all exposed surfaces, unless otherwise indicated.

1. Slope exposed horizontal surfaces 1:12, unless otherwise indicated.
2. Provide drips on projecting elements.

D. Fabrication Tolerances:

1. Variation in Cross Section: Do not vary from indicated dimensions by more than 1/8 inch.
2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or 1/8 inch, whichever is greater, but in no case by more than 1/4 inch.
3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or 1/8 inch, whichever is greater.
4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than 1/8 inch on formed surfaces of units and 3/8 inch on unformed surfaces.

E. Cure units by one of the following methods:

1. Cure units with steam in enclosed curing room at temperature of 105 deg F or above and 95 to 100 percent relative humidity for 6 hours.
2. Cure units with dense fog and water spray in enclosed warm curing room at 95 to 100 percent relative humidity for 24 hours.
3. Cure units to comply with one of the following:

a. Not less than 5 days at mean daily temperature of 70 deg F or above.
b. Not less than 6 days at mean daily temperature of 60 deg F or above.
c. Not less than 7 days at mean daily temperature of 50 deg F or above.
d. Not less than 8 days at mean daily temperature of 45 deg F or above.

F. Acid etch units after curing to remove cement film from surfaces to be exposed to view.

G. Color and Texture: As selected by Architect from manufacturer's full range.

**2.3 MORTAR MATERIALS**

A. Provide mortar materials that comply with Division 4 Section "Unit Masonry Assemblies."

**2.4 ACCESSORIES**

A. Anchors: Type and size indicated, fabricated from stainless steel complying with ASTM A 240, ASTM A 276, or ASTM A 666, Type 304.

B. Dowels: Round stainless-steel bars complying with ASTM A 276, Type 304, and 1/2-inch diameter.

C. Setting Buttons: Lead or resilient plastic buttons, nonstaining to cast stone, sized to suit joint thicknesses and bed depths of cast stone units without intruding into required depths of joint sealants or causing third-side adhesion between sealant and setting button.

D. Proprietary Cleaner: Refer to Section 04810 “Unit Masonry Assemblies” for proprietary cleaner.

**2.5 MORTAR MIXES**

A. Comply with requirements in Section 04810 "Unit Masonry Assemblies" for mortar mixes.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of cast stone.

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

**3.2 SETTING CAST STONE IN MORTAR**

A. Install cast stone units to comply with requirements in Section 04810 "Unit Masonry Assemblies."

B. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.

C. Wet joint surfaces thoroughly before applying mortar or setting in mortar.

D. Set units in full bed of mortar with full head joints, unless otherwise indicated.

1. Use setting buttons of adequate size, in sufficient quantity, and of thickness required to maintain uniform joint width and to prevent mortar from extruding. Hold buttons back from face of cast stone a distance at least equal to width of joint.

a. Set units with joints 3/8 inch wide.

2. Build anchors and ties into mortar joints as units are set.
3. Fill dowel holes and anchor slots with mortar.
4. Build concealed flashing into mortar joints as units are set.
5. Keep head joints in coping and other units with exposed horizontal surfaces open to receive sealant.

E. Rake out joints for pointing with sealant to depths of not less than 1 inch. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.

1. Point with sealant all head joints in cast stone sills.

a. Comply with applicable requirements in Section 07920 "Joint Sealants."
b. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant, unless otherwise indicated.

F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness at all locations where sealant joint pointing is not required.

**3.3 INSTALLATION TOLERANCES**

A. Variation from Plumb: Do not exceed 1/8 inch in 10 feet.

B. Variation from Level: Do not exceed 1/8 inch in 10 feet.

C. Variation in Joint Width: Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less.

D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than 1/16 inch, except due to warpage of units within tolerances specified.

**3.4 ADJUSTING AND CLEANING**

A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.

B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.

C. In-Progress Cleaning: Clean cast stone as work progresses.

1. Remove mortar fins and smears before tooling joints.
2. Remove excess sealant immediately, including spills, smears, and spatter.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
5. Clean cast stone with proprietary cleaner applied according to Section 04810 "Unit Masonry Assemblies".

**END OF SECTION 04720**

# SECTION 04810 - UNIT MASONRY ASSEMBLIES

## 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 unit masonry assemblies consisting of the following:

1. Salvage, clean and reuse existing face brick.
2. Concrete masonry units (CMUs).
3. Ground face (burnished) concrete masonry units (CMUs).
4. Structural-clay facing tile (SGFT).
5. Mortar and grout.
6. Reinforcing steel.
7. Masonry joint reinforcement.
8. Ties and anchors.
9. Embedded flashing.
10. Miscellaneous masonry accessories.
11. Cavity-wall insulation.

B. Related Sections include the following:

1. Section 07841 "Through-Penetration Firestop Systems" for firestopping at openings in masonry walls.

C. Products installed, but not furnished, under this Section include the following:

1. Cast-stone trim, furnished under Section 04720 "Cast Stone."
2. Steel lintels for unit masonry, furnished under Section 05500 "Metal Fabrications."

### 1.3 DEFINITIONS

A. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

### 1.4 PERFORMANCE REQUIREMENTS

A. Provide unit masonry that develops indicated net-area compressive strengths ($f'_m$) at 28 days.

### 1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For the following:

1. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement.
2. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

C. Samples for Initial Selection: For the following:

1. Colored mortar.
2. Weep holes/vents.

D. Samples for Verification: For each type and color of the following:

1. Ground face concrete masonry units.
2. Structural-clay facing tile.
3. Pigmented mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicate types and amounts of pigments used.
4. Weep holes/vents.
5. Accessories embedded in masonry.

E. Material Certificates: Include statements of material properties indicating compliance with requirements including compliance with standards and type designations within standards. Provide for each type and size of the following:

1. Masonry units.

a. Include material test reports substantiating compliance with requirements.

2. Cementitious materials. Include brand, type, and name of manufacturer.
3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
4. Grout mixes. Include description of type and proportions of ingredients.
5. Reinforcing bars.
6. Joint reinforcement.
7. Anchors, ties, and metal accessories.

F. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports, per ASTM C 780, for mortar mixes required to comply with property specification.
2. Include test reports, per ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

**1.6 QUALITY ASSURANCE**

A. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1093 for testing indicated, as documented according to ASTM E 548.

B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, through one source from a single manufacturer for each product required.

C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from a single manufacturer for each cementitious component and from one source or producer for each aggregate.

D. Fire-Resistance Ratings: Where indicated, provide materials and construction with fire-resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

E. 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 mockups for two typical exterior wall areas in sizes approximately 48 inches long by 24 inches high by full thickness, including face and backup wythes and accessories.

   a. Mockup shall include cast stone sill of Section 04720 "Cast Stone."
   b. Include full height sealant-filled joint in mockup.
   c. Include through-wall flashing and weep holes installed for a full length of exterior wall mockup.
   d. Mockup shall be one window area and one storefront area as selected by the architect.

2. Clean exposed faces of mockups with masonry cleaner as indicated.
3. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.

   a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
   b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.

4. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

**1.7 DELIVERY, STORAGE, AND HANDLING**

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for lifting and emptying into dispensing silo. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

**1.8 PROJECT CONDITIONS**

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides and hold cover securely in place.
2. Where 1 wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of 24 inches down face next to unconstructed wythe and hold cover in place.

B. Repoint mortar joints and repair masonry only when air temperature is between and 40 and 90 deg F and is predicted to remain so for at least 7 days after completion of work.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen subgrade or setting beds. Remove and replace unit masonry damaged by frost or freezing conditions. Comply with the following requirements:

1. Preparation:

a. Remove any ice or snow formed on masonry bed by carefully applying heat until top surface is dry to the touch.
b. Do not lay masonry units having a temperature below 20 degrees F.
c. For brick units with initial rates of absorption (suction) which require them to be wetted before laying, comply with the following requirements.

1) For units with surface temperatures above 32 degrees F, wet with water heated to above 70 degrees F.
2) For units with surface temperatures below 32 degrees F, wet with water heated to above 130 degrees F.

2. Cold-Weather Construction: When the ambient temperature is within the limits indicated, use the following procedures. Temperature ranges indicated below apply to air temperatures existing at time of installation except for grout. For grout, temperature ranges apply to anticipated minimum night temperatures. In heating mortar and grout materials, maintain mixing temperature selected within 10 degrees F.

a. 40 to 32 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Follow normal masonry procedures for grout.

b. 32 to 25 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry.
c. 25 to 20 deg F: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F if grouting. Use heat on both sides of walls under construction.
d. 20 deg F and Below: Heat mixing water and sand to produce mortar temperatures between 40 and 120 deg F. Heat grout materials to produce grout temperatures between 40 and 120 deg F. Maintain mortar and grout above freezing until used in masonry. Heat masonry units to 40 deg F. Provide enclosures and use heat on both sides of walls under construction to maintain temperatures above 32 deg F within the enclosures for at least 24 hours after laying units..

3. Cold-Weather Protection: When the mean daily temperature is within the limits indicated, provide the following protection. Temperature ranges indicated apply to mean daily air temperatures, except for grouted masonry. For grouted masonry, temperature ranges apply to anticipated minimum night temperatures.

a. 40 to 25 deg F: Cover masonry with a weather-resistant membrane for 48 hours after construction.
b. 25 to 20 deg F: Use heat source on both sides of masonry under construction. Cover masonry with insulating blankets or provide enclosure and heat for 48 hours after construction to prevent freezing. Install wind breaks when wind velocity exceeds 15 mi./h.
c. 20 deg F and Below: Provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for 48 hours after construction.

4. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and above and will remain so until masonry has dried out, but not less than 7 days after completion of cleaning.

E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

1. When ambient temperature exceeds 100 deg F, or 90 deg F with a wind velocity greater than 8 mph, do not spread mortar beds more than 48 inches ahead of masonry. Set masonry units within one minute of spreading mortar.

**PART 2 - PRODUCTS**

**2.1 MASONRY UNITS, GENERAL**

A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to exceed tolerances and to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not uses units where such defects, including dimensions that vary from specified dimensions by more than stated tolerances, will be exposed in the completed Work or will impair the quality of completed masonry.

## 2.2 CONCRETE MASONRY UNITS (CMUs)

A. Shapes: Provide shapes indicated and as follows:

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide bullnose units for outside corners, unless otherwise indicated.

    a. Field grinding of bullnose corners is not acceptable.

B. Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Weight Classification: Medium weight.
3. Size (Width): Manufactured to the following dimensions:

    a. Nominal face dimension of 16 inches long x 8 inches high (15-5/8 inches x 7-5/8 inches actual) x 3/8 inch less than nominal widths indicated on Drawings.
    b. Provide soaps in dimensions indicated on Drawings.

C. Ground Face (Burnished) Concrete Masonry Units: ASTM C 90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
2. Weight Classification: Medium weight.
3. Size (Width): Manufactured to the following dimensions:

    a. Nominal face dimension of 16 inches long x 8 inches high (15-5/8 inches x 7-5/8 inches actual) x 3/8 inch less than nominal widths indicated on Drawings.

4. Pattern and Texture:

    a. Standard pattern, ground finish.

5. Special Aggregate: Provide units made with aggregate matching aggregate in Architect's sample.
6. Integral Water Repellent: Provide ground face units made with integral water repellent.

    a. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested according to ASTM E 514 as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, shall show no visible water or leaks on the back of test specimen.
    b. Products:

        1) Acme-Hardesty Company; Acme Ultra or Acme Shield.
        2) Addiment Incorporated; Block Plus W-10.
        3) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block.
        4) Krete Industries, Inc.; Krete H. Q. (S) Plus.
        5) BASF.; Rheopel or Color Cure XD.

7. Acrylic Sealer for Ground Face Concrete Masonry Units: Factory apply one coat of non-yellowing water-based acrylic sealer which provides wet-look finish on ground face concrete masonry units as recommended by manufacturer of ground face concrete masonry units. Field apply second coat of water-based sealer after ground face units have been cleaned.
8. Products: Provide the following:

    a. Grand Blanc Cement Products Inc.

        1) Colors: Desert Blend

## 2.3 CONCRETE AND MASONRY LINTELS

A. Masonry Lintels: For concrete masonry unit walls where lintel is exposed to view, use prefabricated or built-in-place masonry lintels made from bond beam concrete masonry units with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

| Lintel Section | Clear Span | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 3'-4" | 4'-0" | 4'-8" | 5'-4" | 6'-0" | 6'-8" | 7'-4" | 8'-8" |
| 6" x 8" | 1-#4 | 1-#4 | 1-#4 | 2-#4 | 2-#5 | | | |
| 8" x 8" | 1-#4 | 2-#4 | 2-#4 | 2-#4 | 2-#4 | 2-#5 | 2-#6 | 2-#6 (B)<br>2-#5 (T) |

B. Concrete Lintels: At Contractor's option, for concrete masonry unit walls where lintel is not exposed to view, use precast units made from concrete matching concrete masonry units in color, texture, and compressive strength and with reinforcing bars indicated or required to support loads indicated. Cure precast lintels by same method used for concrete masonry units.

## 2.4 STRUCTURAL-CLAY FACING TILE (SGFT)

A. General:

1. Provide solid, multicored, or hollow units, with shape and direction of cores optional.
2. Provide special shapes where required for corners, jambs, coved bases, sills, and other special conditions indicated, including applications that cannot be produced by sawing standard units.

    a. Provide bullnose units for outside corners, unless otherwise indicated.
    b. Provide coved internal corners.
    c. Provide straight base units.

B. Glazed Structural-Clay Facing Tile: ASTM C 126, Grade S (Select).

1. Sizes: 6T Series with actual face dimensions of 5-1/6 inches high by 11-3/4 inches long by widths indicated.
2. Provide Type I (single-faced units) where only one finished face is exposed when units are installed.

3. Manufacturer:

   a. Elgin Butler Company

4. Colors and Patterns:

   a. Base: Glossy Black 1055.
   b. Course above Base: Stonewear 4159.

**2.5 BRICK**

A. Salvaged Face Brick: Salvage and reuse existing face brick where indicated on Drawings.

**2.6 MORTAR AND GROUT MATERIALS**

A. Portland Cement: ASTM C 150, Type I, except Type III may be used for cold-weather construction. Provide natural color cement as required to produce mortar color indicated.

B. Hydrated Lime: ASTM C 207, Type S.

C. Masonry Cement: The use of masonry cement, ASTM C 91 or premixed mortars containing masonry cement is not allowed.

D. Mortar Cement: The use of mortar cement, ASTM C 1329 or premixed mortars containing mortar cement is not allowed.

E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortar.

1. Products:

   a. Bayer Corporation, Industrial Chemicals Div.; Bayferrox Iron Oxide Pigments.
   b. Davis Colors; True Tone Mortar Colors.
   c. Solomon Grind-Chem Services, Inc.; SGS Mortar Colors.

F. Aggregate for Mortar: ASTM C 144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

G. Aggregate for Grout: ASTM C 404.

H. Preblended Mortar Mix: At Contractor's option provide mortar and grout consisting of preblended mixture of portland cement, lime, aggregate and pigments requiring the addition of water only at the project site. Preblended mortar shall be delivered to the project site in 3,000 lb. waterproof bags and shall use manufacturer's silos for dispensing mortar and grout.

1. Products:

   a. "Spec/Mix"; Distributed by Quikrete of Michigan, Detroit, Michigan (800) 442-7258.

I. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with concrete masonry units, containing integral water repellent by same manufacturer.

1. Products:

a. Acme-Hardesty Company; Acme Shield.
b. Addiment Incorporated; Mortar Tite.
c. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
d. Krete Industries, Inc.; Krete Gard Mortar Mix;.
e. BASF; Color Cure XD Mortar Admix or Rheomix Rheopel.

J. Water: Potable.

**2.7 REINFORCEMENT**

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

1. Joint Reinforcement, Ties, and Anchors:

a. Dur-O-Wal, Inc.
b. Heckman Building Products, Inc.
c. Hohmann & Barnard, Inc.
d. Wire-Bond

B. Uncoated Steel Reinforcing Bars: ASTM A 615 or ASTM A 996, Grade 60.

C. Masonry Joint Reinforcement, General: ASTM A 951.

1. Interior Walls: Hot-dip galvanized, carbon steel.
2. Exterior Walls: Hot-dip galvanized, carbon steel.
3. Wire Size for Side and Cross Rods: W1.7 or 0.148-inch (9gage) diameter.
4. Wire Size for Veneer Ties: W1.7 or 0.148-inch (9gage) diameter.
5. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
6. Provide in lengths of not less than 10 feet, with prefabricated corner and tee units.

D. Masonry Joint Reinforcement for Single-Wythe Masonry: Ladder type with single pair of side rods.

1. Available Products:

a. Hohmann & Barnard, Inc. No. 220.

E. Masonry Joint Reinforcement for Composite Masonry: Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least 5/8-inch cover on outside face.

1. Available Products:

a. Hohmann & Barnard, Inc. No. 250.

## 2.8 TIES AND ANCHORS

A. Materials: Provide ties and anchors specified in subsequent paragraphs that are made from materials that comply with eight subparagraphs below, unless otherwise indicated.

1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
2. Galvanized Steel Sheet: ASTM A 653, Commercial Steel, G60 zinc coating.
3. Steel Sheet, Galvanized after Fabrication: ASTM A 1008, Commercial Steel, hot-dip galvanized after fabrication to comply with ASTM A 153.

B. Wire Ties, General: Unless otherwise indicated, size wire ties to extend at least halfway through veneer but with at least 5/8-inch cover on outside face. Outer ends of wires are bent 90 degrees and extend 2 inches parallel to face of veneer.

C. Anchors for cast stone: Refer to Section 04720 "Cast Stone."

D. Corrugated Metal Veneer Ties: Metal strips not less than 1 inch wide by length required with 1-1/2" minimum vertical bend with fastener hole for anchoring to substrate/back-up; made from stainless-steel sheet not less than 0.0625 inch (16 gage) thick. Corrugations shall have a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch.

1. Available Products:

    a. Hohmann & Barnard, Inc. No. 345

E. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches.

1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153.
2. Available Products:

    a. Hohmann & Barnard, Inc. No. 344.

## 2.9 MISCELLANEOUS ANCHORS

A. Anchor Bolts: Headed or L-shaped steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153, Class C; of dimensions indicated.

B. Postinstalled Anchors: Provide chemical or torque-controlled expansion anchors, with capability to sustain, without failure, a load equal to six times the load imposed when installed in solid or grouted unit masonry and equal to four times the load imposed when installed in concrete, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

1. Corrosion Protection: Stainless-steel components complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2 for bolts and nuts; ASTM A 666 or ASTM A 276, Type 304 or 316, for anchors.

## 2.10 EMBEDDED FLASHING MATERIALS

A. Metal Flashing: Provide metal flashing, where flashing is exposed or partly exposed and where indicated, complying with SMACNA's "Architectural Sheet Metal Manual and as follows:

1. Stainless Steel: ASTM A 240/A 240M, Type 304, 0.016 inch thick.
2. Fabricate continuous flashings in sections 96 inches long minimum, but not exceeding 12 feet. Provide splice plates at joints of formed, smooth metal flashing.
3. Fabricate through-wall metal flashing embedded in masonry from stainless steel, with ribs at 3-inch intervals along length of flashing to provide an integral mortar bond.
4. Metal Drip Edges: Fabricate from stainless steel. Extend through cavity and 1/2 inch out from wall, with outer edge bent down 30 degrees and hemmed.

B. Flexible Flashing: For flashing not exposed to the exterior, use the following:

1. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive rubberized-asphalt compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch.

    a. Products:

        1) Advanced Building Products Inc.; Peel-N-Seal.
        2) Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
        3) Dayton Superior Corporation, Dur-O-Wal Division; Dur-O-Barrier-44.
        4) Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Perm-A-Barrier Wall Flashing.
        5) Heckmann Building Products Inc.; No. 82 Rubberized-Asphalt Thru-Wall Flashing.
        6) Hohmann & Barnard, Inc.; Textroflash.
        7) Polyguard Products, Inc.; Polyguard 400.
        8) Polytite Manufacturing Corp.; Poly-Barrier Self-Adhering Wall Flashing.
        9) Williams Products, Inc.; Everlastic MF-40.
        10) W. R. Meadows, Inc.; Seal-Tight Air-Shield.

2. Flashing Surface Conditioner/Primer: Rubberized asphalt flashing manufacturer's water-based latex liquid for substrate preparation.
3. Adhesives, Mastics and Sealants for Rubberized Asphalt Flashings: Rubberized asphalt flashing manufacturer's recommended products.
4. Metal Termination Bars for Rubberized Asphalt Flashing: Manufacturer's standard predrilled stainless-steel or aluminum bars, approximately 1 by 1/8 inch thick; with anchors.

C. Sealants for Sheet Metal Flashings:

1. Elastomeric Sealant: ASTM C 920, chemically curing silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

## 2.11 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene.

1. Products:

a. Hohmann & Barnard, Inc.; No. NS, Closed Cell Neoprene Sponge.
b. Williams Products, Inc.; Everlastic Neoprene Type NN 1, 1040 Series.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).

D. Weep/Vent Products: Use the following:

1. Cellular Plastic Weep/Vent: One-piece, flexible extrusion made from UV-resistant polypropylene copolymer, full height and width of head joint and depth 1/8 inch less than depth of outer wythe, in color selected from manufacturer's standard.

a. Products:

1) Advanced Building Products Inc.; Mortar Maze weep vent.
2) Dayton Superior Corporation, Dur-O-Wal Division; Cell Vents.
3) Heckmann Building Products Inc.; No. 85 Cell Vent.
4) Hohmann & Barnard, Inc.; Quadro-Vent.
5) Wire-Bond; Cell Vent.

E. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells with loops for holding reinforcing bars in center of cells. Units are formed from 0.142-inch steel wire, hot-dip galvanized after fabrication. Provide units with either two loops or four loops as needed for number of bars indicated.

1. Products:

a. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

## 2.12 CAVITY-WALL INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, Type X, closed-cell product extruded with an integral skin.

1. Thickness: 2 inches unless otherwise indicated on Drawings.

2. Products:

a. Dow Chemical Co.; "Styrofoam CavityMate."
b. Owens Corning; "Foamular CW15."

B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

C. Insulation Joint/Crack Sealer: Type recommended by insulation board manufacturer for application indicated.

1. Products:

a. FROTH-PAK Foam Sealant; Dow Chemical Co.
b. As recommended by Owens Corning.

## 2.13 MASONRY CLEANERS

A. Proprietary Brick Cleaner: Manufacturer's standard-strength brick cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging brick surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.

1. Products:

a. 202V Vana-Stop; Diedrich Technologies, Inc.
b. Sure Klean Vana Trol; ProSoCo, Inc.

B. Proprietary Ground Face Concrete Masonry and Cast Stone Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging ground face concrete masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of ground face concrete masonry units and cast stone being cleaned.

1. Products:

a. Diedrich 222 Cultured Stone & Burnished Masonry Cleaner; Diedrich Technologies, Inc.
b. Burnished Custom Masonry Cleaner; ProSoCo, Inc.

## 2.14 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, antifreeze compounds, or other admixtures, unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Limit cementitious materials in mortar to portland cement and lime.

a. Do not use mortar cement in mortar or preblended mortars containing mortar cement.
b. Do not use masonry cement in mortar or preblended mortars containing masonry cement.

3. Add waterproofing admixture for mortar for ground face (burnished) concrete masonry units containing integral waterproofing.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar: Comply with ASTM C 270, Proportion Specification. The proportions shall be measured by means of a box or other container of predetermined capacity.

1. Minimum Compressive Strength: 1800psi
2. Provide the following types of mortar for applications stated unless another type is indicated.:

a. For masonry below grade or in contact with earth, use Type M.
b. For reinforced masonry, use Type S.
c. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; use Type N.
d. For interior non-load-bearing partitions, use Type N.

D. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.

1. Pigments shall not exceed 10 percent of portland cement by weight.
2. Mix to match existing mortar color.

E. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
2. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143.
3. Minimum Compressive Strength (28 days): 3000psi

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine conditions for compliance with requirements for installation tolerances and other conditions affecting performance of work.

1. Verify that foundations are within tolerances specified.
2. Verify that reinforcing dowels are properly placed.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.

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

**3.2 BRICK REMOVAL AND SALVAGE**

A. Where indicated, remove and salvage existing brick.

B. Carefully remove brick by hand, at locations indicated. Cut out full units from joint to joint.

C. Salvage as many whole, undamaged bricks as needed for new construction. Salvage damaged brick that may be cut and used where cut units are required.

D. Remove mortar, loose particles and soil from salvaged brick by cleaning with brushes and water. Store brick for reuse.

E. Clean remaining masonry at edges of removal areas by removing mortar, dust, and loose debris in preparation for rebuilding.

F. Take care not to chip, crack or otherwise damage existing brick units during removal, cleaning and handling.

**3.3 INSTALLATION, GENERAL**

A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.

B. Build chases and recesses to accommodate items specified in this and other Sections.

C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.

1. Mix units from several pallets or cubes as they are placed.

F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.

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

H. Comply with construction tolerances in ACI 530.1/ASCE 6/TMS 602 and with the following:

1. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
2. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2 inch maximum.
3. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2 inch maximum.
4. For exposed bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch. Do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.

5. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch. Do not vary from adjacent bed-joint and head-joint thicknesses by more than 1/8 inch.
6. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch except due to warpage of masonry units within tolerances specified for warpage of units.
7. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than 1/16 inch from one masonry unit to the next.

**3.4 LAYING MASONRY WALLS**

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern Masonry: Unless otherwise indicated, lay masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.

1. High School brick pattern is 1/3 running bond.
2. Central Elementary is as indicated on Drawings.
3. At existing masonry, match existing bond pattern and coursing unless otherwise indicated.

C. Stopping and Resuming Work: Clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

D. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

E. Fill space between steel frames and masonry solidly with mortar, unless otherwise indicated.

F. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.

G. Fill cores in hollow concrete masonry units with grout 24 inches under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

H. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above, unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c., unless otherwise indicated.
3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07841 "Firestop Systems."

## 3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow concrete masonry units as follows:

1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.

B. Lay brick masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

1. At cavity walls, bevel beds away from cavity, to minimize mortar protrusions into cavity. As work progresses, trowel mortar fins protruding into cavity flat against the cavity face of the brick.

C. Refer to Section 04720 "Cast Stone" for laying cast stone veneer and trim.

D. Lay structural-clay tile as follows:

1. Lay vertical-cell units with full head joints, unless otherwise indicated. Provide bed joints with full mortar coverage on face shells and webs.
2. Lay horizontal-cell units with full bed joints, unless otherwise indicated. Keep drainage channels, if any, free of mortar. Form head joints with sufficient mortar so excess will be squeezed out as units are placed in position. Butter both sides of units to be placed, or butter one side of unit already in place and one side of unit to be placed.
3. Maintain joint thicknesses indicated except for minor variations required to maintain bond alignment. If not indicated, lay walls with 1/4- to 3/8-inch- thick joints.
4. Where epoxy-mortar pointed joints are indicated, rake out setting mortar to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

E. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness.

## 3.6 COMPOSITE MASONRY

A. Bond wythes of composite masonry together using one of the following methods:

1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.

a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
b. Where bed joints of wythes do not align, use corrugated metal veneer ties to secure veneer masonry to back-up masonry.

B. Corners: Provide interlocking masonry unit bond in each wythe and course at corners, unless otherwise indicated.

1. Provide continuity with masonry joint reinforcement at corners by using prefabricated L-shaped units as well as masonry bonding.

C. Intersecting and Abutting Walls: Unless vertical expansion or control joints are shown at juncture, bond walls together as follows:

1. Provide continuity with masonry joint reinforcement by using prefabricated T-shaped units.
2. Provide rigid metal anchors not more than 24 inches o.c. If used with hollow masonry units, embed ends in mortar-filled cores.

**3.7 CAVITY WALLS**

A. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.

B. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately 12 inches o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with insulation joint/crack sealer compatible with insulation and masonry.

**3.8 MASONRY JOINT REINFORCEMENT**

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings.

a. Reinforcement above is in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

E. Cut and bend reinforcing units as directed by manufacturer for continuity at offsets and other special conditions where prefabricated L-shaped or T-shaped units will not work.

**3.9 CONTROL AND EXPANSION JOINTS**

A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of concrete masonry units on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.

C. Provide horizontal, pressure-relieving joints by inserting a compressible filler of width required for installing sealant and backer rod specified in Section 07920 "Joint Sealants," but not less than 3/8 inch.

**3.10 LINTELS**

A. Install steel lintels where indicated.

B. Provide masonry or concrete lintels where shown and where openings of more than 24 inches for block-size units are shown without structural steel or other supporting lintels.

C. Provide minimum bearing of 8 inches at each jamb, unless otherwise indicated.

**3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS**

A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated. .

B. Install metal flashing and rubberized asphalt flashing as follows:

1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Remove all deleterious material from surfaces to be flashed including dust, dirt and mortar droppings.
2. Apply surface conditioner to face of inner wythe by spray, brush, or roller at the rate recommended by manufacturer, prior to flashing installation. Allow surface conditioner to dry completely before flashing application.
3. At multiwythe masonry walls, including cavity walls and masonry veneer walls, install stainless steel flashing to span across cavity. Overlap adjacent pieces of stainless steel 4 inches and turn stainless steel flashing up cavity wall back-up minimum of 1/2 inch..

    a. At Drips: Install metal drip edges beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal drip edge.

    b. At Non-Drips: Install metal flashing termination beneath flexible flashing at exterior face of wall. Stop flexible flashing 1/2 inch back from outside face of wall and adhere flexible flashing to top of metal flashing termination.

4. Precut pieces of rubberized asphalt flashing to easily handled lengths at each location.

5. Remove release paper and position flashing carefully before placing it against the surface.
6. At composite walls extend flashing through veneer and up face of inner wythe at least 8 inches unless otherwise indicated on Drawings.
7. At lintels, shelf angles and step flashing, extend flashing a minimum of 6 inches into masonry at each end. At heads and sills, extend flashing 6 inches at ends and turn up not less than 2 inches and make careful folds to form an end dam, with the seams sealed.
8. Place flashing against surface and press firmly into place with a steel hand roller fully adhering flashing to substrate to prevent water from migrating under the flashing. Form end dams at flashing terminations to prevent water entry.
9. Overlap adjacent pieces 4 inches and roll overlaps with a steel hand roller.
10. Anchor tops of flashing to wall with continuous termination bars. Apply a bead or trowel coat of mastic along top edges, seams and cuts paying close attention to reinforcing penetrations.
11. Lay or trim edges of rubberized asphalt flashing 1/2 inch back from exposed face of building.

C. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:

1. Use specified weep/vent products to form weep holes.
2. Space weep holes 32 inches o.c..

**3.12 REINFORCED UNIT MASONRY INSTALLATION**

A. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.

B. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches.

**3.13 FIELD QUALITY CONTROL**

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections indicated below and prepare test reports:

1. Retesting of materials failing to comply with specified requirements shall be done at Contractor's expense.

B. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

C. Mortar Test (Property Specification): For each mix provided, per ASTM C 780. Test mortar for mortar air content and compressive strength.

D. Grout Test (Compressive Strength): For each mix provided, per ASTM C 1019.

## 3.14 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.
6. Refer to Section 04720 “Cast Stone” for cleaning cast stone.
7. Ground Face (Burnished) Concrete Masonry Units: Field apply second coat of water-based sealer after ground face units have been cleaned.

## 3.15 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Excess Masonry Waste: Remove masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, and legally dispose of off Owner's property.

**END OF SECTION 04810**

# SECTION 05500 – METAL FABRICATIONS

## 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. Loose steel lintels.
2. Bent metal restraints at top of interior concrete masonry walls.

B. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.

### 1.3 SUBMITTALS

A. Product Data: For the following:

1. Paint products.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer.

### 1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

## PART 2 - PRODUCTS

### 2.1 METALS – GENERAL

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces, unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

### 2.2 FERROUS METALS

A. Steel Plates and Shapes: ASTM A 36.

### 2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Anchor Bolts: ASTM F 1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

D. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

1. Material for Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F 593 and nuts complying with ASTM F 594.

### 2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79.

C. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

### 2.5 FABRICATION – GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously to comply with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

H. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

**2.6 LOOSE STEEL LINTELS**

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8 inches, unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

D. Size angle and welded steel plate lintels in accordance with the following schedule, unless otherwise indicated:

| Clear Span | Wall Thickness | Angle (LLV) |
|---|---|---|
| 0' to 4' | 4" | 4" x 4" x 3/8" (ext) or 1/4" (int) |
| 4'+ to 6' | 4" | 4" x 4" x 3/8" (ext) or 1/4" (int) |
| 6'+ to 8'-8" | 4" | 5" x 4" x 3/8" |

| Clear Span | Wall Thickness | Vertical Plate(s) | Horizontal Plate |
|---|---|---|---|
| 0 to 4' | 4" to 8" | (1) 3-1/2" x 1/4" | 3/8" (ext) or 1/4" (int) x wall th. minus 1" |
| 0 to 4' | 8"+ to 12" | (2) 3-1/2" x 1/4", 4" o.c. | 3/8" (ext) or 1/4" (int) x wall th. minus 1" |
| 0 to 4' | 12"+ to 16" | (3) 3-1/2" x 1/4", 4" o.c. | 3/8" (ext) or 1/4" (int) x wall th. minus 1" |
| 4' to 6' | 4"+ to 8" | (1) 4" x 1/4" | 3/8" (ext) or 1/4" (int) x wall th. minus 1" |
| 4' to 6' | 8"+ to 12" | (2) 4" x 1/4", 4" o.c. | 3/8" (ext) or 1/4" (int) x wall th. minus 1" |
| 4' to 6' | 12"+ to 16" | (3) 4" x 1/4", 4" o.c. | 3/8" (ext) or 1/4" (int) x wall th. minus 1" |
| 6'+ to 8'-8" | 4"+ to 8" | (1) 5" x 3/8" | 3/8" (ext) or 1/4" (int) x wall th. minus 1" |
| 6'+ to 8'-8" | 8"+ to 12" | (2) 5" x 3/8", 4" o.c. | 3/8" (ext) or 1/4" (int) x wall th. minus 1" |
| 6'+ to 8'-8" | 12"+ to 16" | (3) 5" x 3/8", 4" o.c. | 3/8" (ext) or 1/4" (int) x wall th. minus 1" |

E. Size beam and welded steel plate lintels in accordance with the following schedule, unless otherwise indicated:

| Clear Span | Thickness | Beam Size | Horizontal Plate |
|---|---|---|---|
| 8'-8"+ to 12'-0" | 4"+ to 8" | W8 x 10 | 3/8" x wall thickness minus 1" |
| 8'-8"+ to 12'-0" | 8"+ to 12" | W8 x 10 | 3/8" x wall thickness minus 1" |
| 8'-8"+ to 12'-0" | 12"+ to 16" | W8 x 13 | 3/8" x wall thickness minus 1" including gusset reinforcement (32" o.c.) to resist deflection |
| 12'-0"+ | Refer to Drawings | | |

**2.7 BENT METAL RESTRAINTS**

A. Bent Metal Restraints: Provide bent metal restraints to restrain top of masonry walls as indicated on Drawings.

1. Fabricate bent metal restraints from 12 gage galvanized sheet steel.
2. Provide bent metal restraints 4 inches long, spaced at 2'-0" o.c., staggered each side of wall.

**2.8 FINISHES – GENERAL**

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

**2.9 STEEL AND IRON FINISHES**

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A 123/A 123M, for galvanizing steel and iron products.
2. ASTM A 153/A 153M, for galvanizing steel and iron hardware.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B): SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

**PART 3 - EXECUTION**

**3.1 INSTALLATION – GENERAL**

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

C. Field Welding: Comply with the following requirements:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

E. Corrosion Protection: Coat concealed surfaces of metals that come into contact dissimilar metals with a heavy coat of bituminous paint.

**3.2 ADJUSTING AND CLEANING**

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.

B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections.

C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

**END OF SECTION 05500**

# SECTION 06100 - ROUGH CARPENTRY

## 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. Wood blocking and nailers.
2. Plywood blocking.

### 1.3 DEFINITIONS

A. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. SPIB: The Southern Pine Inspection Bureau.

### 1.4 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 products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

B. Fire-Test-Response Characteristics: Where fire-retardant materials or products are indicated, provide materials and products with specified fire-test-response characteristics as determined by testing identical products per test method indicated by UL, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

B. Stack plywood and other panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

**PART 2 - PRODUCTS**

**2.1 WOOD PRODUCTS, GENERAL**

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Plywood: DOC PS 1.

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

C. Kiln-dry lumber after to a maximum moisture content of 19 percent and 15 percent for plywood.

**2.2 WOOD-PRESERVATIVE-TREATED MATERIALS**

A. Preservative Treatment by Pressure Process: AWPA C2 (lumber) and AWPA C9 (plywood), except that lumber that is not in contact with the ground and is continuously protected from liquid water may be treated according to AWPA C31 with inorganic boron (SBX).

B. Kiln-dry material after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark each treated item with the treatment quality mark of an inspection agency approved by the American Lumber Standards Committee Board of Review.

D. Application: Treat the following:

1. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
2. Wood plates that are installed over concrete slabs directly in contact with earth.

## 2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Where fire-retardant-treated materials are indicated, provide materials that comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL, U.S. Testing, Timber Products Inspection, or another testing and inspecting agency acceptable to authorities having jurisdiction.

1. Use treatment for which chemical manufacturer publishes physical properties of treated wood after exposure to elevated temperatures, when tested by a qualified independent testing agency according to ASTM D 5664, for lumber and ASTM D 5516, for plywood.
2. Use treatment that does not promote corrosion of metal fasteners.
3. Use Interior Type A.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent and 15 percent for plywood. Do not use material that is warped or does not comply with requirements for untreated material.

C. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

D. Application: Treat the following:

1. Provide fire retardant treated materials for all concealed lumber and plywood used on the interior of the building including but not limited to the following:

a. Concealed blocking.
b. Plywood backing panels.

## 2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. And elsewhere as indicated on Drawings.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of the following species:

1. Mixed southern pine; SPIB.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

## 2.5 PLYWOOD BLOCKING

A. Plywood Blocking: APA Structural I sheathing.

1. Exposure Durability Classification: Exterior.
2. Span Rating: 48/24.
3. Thickness: 3/4 inch or as otherwise indicated on Drawings.

## 2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153 or Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Screws for Fastening to Metal Framing: ASTM C 954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

E. Wood Screws: ASME B18.6.1.

F. Lag Bolts: ASME B18.2.1.

G. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and, where indicated, flat washers.

H. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B 633, Class Fe/Zn 5.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.

## 2.7 MISCELLANEOUS MATERIALS

A. Water-Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbamate, combined with an insecticide containing chloropyrifos as its active ingredient.

**PART 3 - EXECUTION**

**3.1 INSTALLATION, GENERAL**

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, grounds, and similar supports to comply with requirements for attaching other construction.

B. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

C. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

D. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

E. Securely attach rough carpentry work to substrate.

F. 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; do not countersink nail heads, unless otherwise indicated.

**3.2 WOOD BLOCKING AND NAILER INSTALLATION**

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

**END OF SECTION 06100**

# SECTION 07841 - FIRESTOP SYSTEMS

## 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:

1. Firestop systems for penetrations through fire-rated constructions, including both empty openings and openings containing penetrating items.
2. Perimeter fire-resistive joint systems consisting of floor-to-wall joints between perimeter edge of fire-resistance-rated floor assemblies and exterior curtain walls.

B. Related Sections include the following:

1. Division 15 Sections specifying duct and piping penetrations.
2. Division 16 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 that are produced and installed 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.
2. Fire-rated horizontal assemblies.

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 indicated, but not less than that equaling or exceeding fire-rating of constructions penetrated.
2. T-Rated Systems: Provide firestop systems with T-ratings indicated, 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 floor penetrations with annular spaces exceeding 4 inches in width and exposed to possible loading and traffic, provide firestop systems capable of supporting floor loads involved, either by installing floor plates or by other means.
3. For penetrations involving insulated piping, provide firestop systems not requiring removal of insulation.

D. For firestop/fire-resistive joint systemexposed 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/fire-resistive joint 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 or equivalent fire-rated assembly.

**1.5 QUALITY ASSURANCE**

A. Installer Qualifications: A firm experienced in installing firestop/fire-resistive joint 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. Manufacturer's willingness to sell its firestop/fire-resistive joint systemproducts to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.

B. Fire-Test Characteristics: Provide firestop/fire-resistive joint systems that comply with the following requirements and those specified in Part 1 "Performance Requirements" Article:

1. Firestopping/fire-resistance 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/fire-resistive joint 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/fire-resistive joint systemproducts bear classification marking of qualified testing and inspecting agency.
   b. Firestop system/fire-resistive joint 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/fire-resistive joint systemproducts 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/fire-resistive joint 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/fire-resistive joint systemper 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/fire-resistive joint systeminstallations 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/fire-resistive joint systems that are produced by one of the following manufacturers:

1. Grace, W. R. & Co. - Conn.
2. Hilti, Inc.
3. Johns Manville.
4. RectorSeal Corporation (The).
5. Specified Technologies Inc.
6. 3M; Fire Protection Products Division.
7. Tremco; Sealant/Weatherproofing Division.
8. Thermafiber, Inc.

**2.2 FIRESTOPPING, GENERAL**

A. Compatibility: Provide firestop/fire-resistive joint systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating firestop systems.

B. Accessories: Provide components for each firestop/fire-resistive joint system that are needed to install fill materials and to comply with Part 1 "Performance Requirements" Article. Use only components specified by firestop/fire-resistive joint 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/fire-resistive joint 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.

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.

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.

**2.4 MIXING**

A. For those products requiring mixing before application, comply with firestop/fire-resistive joint 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/fire-resistive joint systems to comply with firestop/fire-resistive joint 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/fire-resistive joint 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/fire-resistive joint system 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/fire-resistive joint system materials. Remove tape as soon as possible without disturbing firestop system's seal with substrates.

## 3.3 FIRESTOP SYSTEM INSTALLATION

A. General: Install systems to comply with Part 1 "Performance Requirements" Article and with firestop/fire-resistive joint 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/fire-resistive joint system 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 joints, 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 Cable Trays:

1. Type of Fill Materials: The following:

a. Intumescent putty.

F. 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.

G. 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.

H. Firestop Systems for Miscellaneous Mechanical Penetrants:

1. Type of Fill Materials: One or both of the following:

a. Latex sealant.
b. Mortar.

I. 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.

**END OF SECTION 07841**

# SECTION 07920 - JOINT SEALANTS

## 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 joint sealants for the following applications, including those specified by reference to this Section:

1. Exterior joints in the following vertical surfaces and horizontal nontraffic surfaces:

    a. Control and expansion joints in unit masonry.
    b. Joints in cast stone sills.
    c. Perimeter joints at frames of doors, aluminum storefronts, and windows.
    d. Other joints as indicated.

2. Interior joints in the following vertical surfaces and horizontal nontraffic surfaces:

    a. Control and expansion joints on exposed interior surfaces of exterior walls.
    b. Vertical joints on exposed surfaces of interior unit masonry, concrete walls and partitions.
    c. Perimeter joints of exterior doors, aluminum storefronts, and windows.
    d. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
    e. Joints between walls and counters.
    f. Other joints as indicated.

3. Interior joints in the following horizontal traffic surfaces:

    a. Control and expansion joints in tile flooring.
    b. Other joints as indicated.

B. Related Sections include the following:

1. Section 04810 "Unit Masonry Assemblies" for masonry control and expansion joint fillers and gaskets.
2. Section 07841 "Firestop Systems" for sealing joints in fire-rated construction.
3. Section 08800 "Glazing" for glazing sealants.
4. Section 09260 "Gypsum Board Assemblies" for sealing perimeter joints of gypsum board partitions to reduce sound transmission.
5. Section 09310 "Tiling" for sealing tile joints.

### 1.3 PERFORMANCE REQUIREMENTS

A. Provide elastomeric 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.

**1.4 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. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.

D. Product Test Reports: Based on comprehensive testing of product formulations performed by a qualified testing agency, indicating that sealants comply with requirements.

E. Warranties: Special warranties specified in this Section.

**1.5 QUALITY ASSURANCE**

A. Installer Qualifications: An Installer who experienced in the installation of elastomeric sealants required for this Project.

B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.

**1.6 PROJECT CONDITIONS**

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

**1.7 WARRANTY**

A. Special Installer's Warranty: Installer's standard form in which Installer agrees to repair or replace elastomeric joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 MATERIALS, GENERAL**

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer, based on testing and field experience.

B. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range of standard and optional colors.

1. For silicone sealants, Architect will select from manufacturer's full range with a minimum of 15 colors from which to select from.

C. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

**2.2 ELASTOMERIC JOINT SEALANTS**

A. Elastomeric Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.

1. Stain-Test-Response Characteristics: Nonstaining to porous substrates per ASTM C 1248.
2. Finish surface: Cures to dry matte finish surface.
3. Products:

a. Dow Corning Corporation; 756 SMS.
b. GE Advanced Materials - Silicones; SilPruf NB SCS9000.
c. May National Associates, Inc.; Bondaflex Sil 295.
d. Pecora Corporation; 895 NST.
e. Tremco Incorporated; Spectrem 3.

B. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.

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

a. Dow Corning Corporation; NS Parking Structure Sealant.
b. May National Associates, Inc.; Bondaflex Sil 728 NS.
c. Pecora Corporation; 311 NS.
d. Tremco Incorporated; Spectrem 800.

C. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Color: Clear.

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

a. Dow Corning Corporation; 786 Mildew Resistant.
b. GE Advanced Materials - Silicones; Sanitary SCS1700.
c. May National Associates, Inc.; Bondaflex Sil 100 WF.
d. Pecora Corporation; 898.
e. Tremco Incorporated; Tremsil 200 Sanitary.

**2.3 LATEX JOINT SEALANTS**

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

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

a. BASF Building Systems; Sonolac.
b. Bostik, Inc.; Chem-Calk 600.
c. May National Associates, Inc.; Bondaflex 600 or Bondaflex Sil-A 700.
d. Pecora Corporation; AC-20+.
e. Tremco Incorporated; Tremflex 834.

**2.4 JOINT-SEALANT BACKING**

A. General: Provide sealant backings that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bicellular material with a surface skin)] , sized 25 percent or greater than joint opening with proper density to control sealant depth and profile:

C. Bond-Breaker Tape: Polyethylene tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

**2.5 MISCELLANEOUS MATERIALS**

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine joints to receive joint sealants for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

1. Verify that joints in masonry walls and stone walls are not bridged by mortar.

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, old joint sealants, oil, grease, water, surface dirt, and frost.
2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

a. Concrete.
b. Masonry.
c. Unglazed surfaces of ceramic tile.

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

a. Metal.
b. Anodized aluminum surfaces.
c. Fluoropolymer painted surfaces.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer or by field adhesion tests. 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 with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

**3.3 INSTALLATION OF JOINT SEALANTS**

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backing 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 sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified 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 configuration per Figure 5A in ASTM C 1193, unless otherwise indicated.

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 and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

**3.6 JOINT-SEALANT SCHEDULE**

A. Joint-Sealant Application: Exterior vertical and horizontal nontraffic joints:

1. Joint Sealant: Single-component neutral-curing silicone sealant.
2. Locations:

a. Control and expansion joints in unit masonry.
b. Joints in cast stone sills.
c. Perimeter joints at frames of doors, aluminum storefronts, and windows.
d. Other joints as indicated.

B. Joint-Sealant Application: Interior perimeter joints of exterior frames of doors, aluminum storefronts, and windows:

1. Joint Sealant: Single-component neutral-curing silicone sealant.

C. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces:

1. Joint Sealant: Latex sealant.
2. Locations:

a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Vertical joints on exposed surfaces of interior unit masonry, concrete walls and partitions.
c. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
d. Other joints as indicated.

D. Joint-Sealant Application: Interior joints between walls and counters.

1. Joint Sealant: Single-component mildew-resistant acid-curing silicone sealant.

a. Joint-Sealant Color: Clear.

E. Joint-Sealant Application: Interior horizontal control, isolation an contraction joints in horizontal traffic surfaces:

1. Joint Sealant: Single-component, nonsag, traffic-grade, neutral-curing silicone joint sealant.
2. Locations:

a. Control and expansion joints in tile flooring.
b. Other joints as indicated.

**3.7 WASTE MANAGEMENT**

A. Separate and recycle waste materials, packaging, and all other materials in accordance with the Waste Management Plan and to the maximum extent possible, send to reuse or recycle centers.

B. Close and tightly seal all partly used containers and store protected in well-ventilated, fire-safe area at moderate temperature. Deliver to reuse and/or recycle facilities if not removed from site for Contractor's reuse.

**END OF SECTION 07920**

# SECTION 08110 - STANDARD STEEL DOORS AND FRAMES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes the following:

1. Standard hollow-metal steel frames.

B. Related Sections include the following:

1. Section 08211 "Flush Wood Doors" for doors for standard hollow-metal steel frames.
2. Section 08220 "Fiberglass Reinforced Plastic (FRP) Doors" for doors for standard hollow-metal steel frames.
3. Section 08710 "Door Hardware" for door hardware for standard steel doors.
4. Section 09912 "Painting" for field painting standard hollow-metal steel frames.
5. Door Schedule on Drawings.

### 1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.

### 1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, core descriptions, label compliance, fire-resistance and temperature-rise ratings, for each type of steel door and frame specified.

B. Shop Drawings: In addition to requirements below, provide a schedule of standard steel frames using same reference numbers for details and openings as those on Drawings:

1. Frame details for each frame type, including dimensioned profiles.
2. Details and locations of reinforcement and preparations for hardware.
3. Details of each different wall opening condition.
4. Details of anchorages, accessories, joints, and connections.
5. Details of glazing frames and stops showing glazing.

### 1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain standard steel frames through one source from a single manufacturer.

B. Fire-Rated Door Sidelight and Transom Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by Underwriters Laboratories, Inc., (UL) or Intertek Testing Service-Warnock-Hersey (WH), for fire-ratings indicated.

1. Test Pressure: Test according to NFPA 252 or UL 10C. After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.

**1.6 DELIVERY, STORAGE, AND HANDLING**

A. Deliver frames palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store frames under cover at Project site. Place units in a vertical position with heads up, spaced by blocking, on minimum 4-inch- high wood blocking. Avoid using nonvented plastic or canvas shelters that could create a humidity chamber.

1. If wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

**1.7 COORDINATION**

A. Coordinate installation of anchorages for standard steel frames. 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 masonry. Deliver such items to Project site in time for installation.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

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

1. Ceco Door Products; an ASSA ABLOY Group Company.
2. CURRIES Company; an ASSA ABLOY Group Company.
3. Pioneer Industries, Inc.
4. Steelcraft; an Ingersoll-Rand Company.

**2.2 MATERIALS**

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Supports and Anchors: After fabricating, galvanize units to be built into exterior walls according to ASTM A 153, Class B.

D. Inserts, Bolts, and Fasteners: Provide items to be built into exterior walls, hot-dip galvanized according to ASTM A 153.

E. Grout:

1. Comply with Section 04810 "Unit Masonry Assemblies" for grout for frames in masonry walls.
2. Comply with Section 09260 "Gypsum Board Assemblies" for grout for frames in gypsum board walls.

F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50 respectively; passing ASTM E 136 for combustion characteristics.

G. Glazing: Comply with requirements in Section 08800 "Glazing."

**2.3 STANDARD STEEL FRAMES**

A. General: Comply with ANSI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet.

1. Rated Fire Core Construction: Manufacturer's standard mineral-board core that produces doors complying with ANSI A250.8 and as required to provide fire-protection and temperature-rise ratings indicated.
2. Fabricate frames with mitered or coped and welded face corners and seamless face joints.
3. Frames for Wood Doors: 0.053-inch (16 gage) thick steel sheet.

C. Hardware Reinforcement: Fabricate reinforcement plates from same material as frames to comply with the following minimum sizes:

1. Hinges: Minimum 0.123 inch thick (10 gage) by 1-1/2 inches wide by 6 inches longer than hinge, secured by not less than 6 spot welds.
2. Continuous Hinges: 0.123 inch thick (10 gage) by 1–1/2 inch wide, continuous for height of frame.
3. Lock Face, Flush Bolts, Closers, and Concealed Holders: Minimum 0.067 inch thick (14 gage).
4. All Other Surface-Mounted Hardware: Minimum 0.067 inch thick.

D. Supports and Anchors: Fabricated from electrolytic zinc-coated or metallic-coated steel sheet.

E. Jamb Anchors:

1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick (18 gage).
2. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick (18 gage), with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick (7 gage).
3. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

F. Floor Anchors: Formed from same material as frames, not less than 0.042 inch thick (18 gage), and as follows:

1. Clip-type anchors, with two holes to receive fasteners.

G. Fabricate concealed stiffeners and hardware reinforcement from either cold- or hot-rolled steel sheet.

H. Plaster Guards: Formed from same material as frames, not less than 0.016-inch thick (27 gage).

**2.4 FABRICATION**

A. General: Fabricate standard steel frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal.

B. Standard Steel Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners.
3. Plaster Guards: Weld guards to frame at back of hardware mortises in frames installed in concrete or masonry.
4. Leave vertical mullions in frames open at top for grouting.
5. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
6. Jamb Anchors: Provide number and spacing of anchors as follows:

a. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Four anchors per jamb from 60 to 90 inches in height.
2) Five anchors per jamb from 90 to 96 inches in height.
3) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof more than 96 inches in height.

b. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Two anchors per jamb up to 60 inches in height.
2) Three anchors per jamb from 60 to 90 inches in height.
3) Four anchors per jamb from 90 to 120 inches in height.

c. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

7. Door Silencers: Except on weather-stripped doors, drill stops and provide door silencers as follows.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

C. Hardware Preparation: Factory prepare standard steel frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 08710 "Door Hardware."

1. Reinforce frames to receive nontemplated mortised and surface-mounted door hardware.
2. Comply with applicable requirements in ANSI A250.6 and ANSI/DHI A115 Series specifications for door and frame preparation for hardware. Locate hardware as indicated on Shop Drawings or, if not indicated, according to ANSI A250.8.

**2.5 STEEL FINISHES**

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Finish standard steel door and frames after assembly.

B. Steel Surface Preparation: Clean steel surfaces to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust. After cleaning, chemically treat steel surfaces to insure maximum adhesion of prime coating to be applied over it.

C. Factory Priming for Field-Painted Finish: Apply shop primer specified below immediately after surface preparation and pretreatment. Apply a smooth coat of even consistency to provide a uniform dry film thickness of not less than 0.7 mils.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI A250.10.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of standard steel frames.

1. Examine roughing-in for embedded and built-in anchors to verify actual locations of standard steel frame connections before frame installation.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 PREPARATION**

A. Remove welded-in shipping spreaders installed at factory.

B. Prior to installation and with installation spreaders in place, adjust and securely brace standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap frames to receive nontemplated mortised and surface-mounted door hardware.

**3.3 INSTALLATION**

A. General: Provide frames of sizes, thicknesses, and designs indicated. Install standard steel frames plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Standard Steel Frames: Install standard steel frames for doors, sidelights, transoms, borrowed lights and other openings, of size and profile indicated. Comply with SDI 105.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. At fire-protection-rated openings, install frames according to NFPA 80.
    b. Install door silencers in frames before grouting.
    c. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    d. Check plumb, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
    e. Apply bituminous coating to backs of non-fire rated frames that are filled with mortar and grout.

        1) Do not apply bituminous coating to fire-rated frames.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor and secure with postinstalled expansion anchors.

    a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Metal-Stud Partitions: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout or gypsum neat plaster as specified in Section 09260 "Gypsum Board Assemblies."
4. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar as specified in Section 04810 "Unit Masonry Assemblies."
5. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
6. In-Place Gypsum Board Partitions: Secure frames in place with postinstalled expansion anchors through floor anchors at each jamb. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
7. Installation Tolerances: Adjust standard steel door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

**3.4 ADJUSTING AND CLEANING**

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including standard steel doors or frames that are warped, bowed, or otherwise unacceptable.

B. Clean grout and other bonding material off standard steel frames immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.

**END OF SECTION 08110**

# SECTION 08211 - FLUSH WOOD DOORS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes the following:

1. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections include the following:

1. Section 08710 “Door Hardware.”
2. Door Schedule on Drawings.

### 1.3 SUBMITTALS

A. Product Data: For each type of door. Include details of core and edge construction. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire ratings for fire doors.

C. Samples for Verification:

1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three samples showing typical range of color, grain and sheen to be expected in the finished work.

### 1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain flush wood doors through one source from a single manufacturer.

B. Quality Standard: Comply with ANSI/WDMA I.S.1-A, "Architectural Wood Flush Doors."

C. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by Underwriters Laboratories, Inc., (UL) or Intertek Testing Service-Warnock-Hersey (WH), for fire ratings indicated, based on testing according to NFPA 252.

1. Test Pressure: After 5 minutes into the test, the neutral pressure level in furnace shall be established at 40 inches or less above the sill.
2. Temperature-Rise Rating: At exit enclosures, provide doors that have a temperature-rise rating of 450 deg F maximum in 30 minutes of fire exposure.

**1.5 DELIVERY, STORAGE, AND HANDLING**

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in plastic bags or cardboard cartons and wrap bundles of doors in plastic sheeting.

C. When storing prior to installation, raise off floor on pallets, stack flat with protective material between to eliminate chance of creating nicks, scratches, and other imperfections and damage to finish surfaces, wrap weather-tight and provide for air-circulation within and around stacks and under temporary coverings.

D. Do not allow materials to become damp. Maintain temperatures at 60 deg F or higher, and humidity between 20 percent and 60 percent prior to, during and after installation.

E. Do not store porous materials near other materials that may off-gas or emit harmful fumes, such as kerosene heaters, fresh paint, adhesive, etc.

F. Mark each door on top and bottom rail with opening number used on Shop Drawings.

**1.6 PROJECT CONDITIONS**

A. Environmental Limitations: Do not deliver or install doors until building is enclosed, wet work is complete, and HVAC system is operating and will maintain temperature and relative humidity at occupancy levels during the remainder of the construction period.

**1.7 WARRANTY**

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.

2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
3. Warranty Period for Solid-Core Interior Doors: Life of installation.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURER**

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

1. Algoma Hardwoods Inc.
2. Eggers Industries; Architectural Door Division.
3. GRAHAM Manufacturing Corp.
4. Marshfield DoorSystems, Inc.
5. Mohawk Flush Doors, Inc.
6. Oshkosh Architectural Door Company.
7. VT Industries Inc.

**2.2 DOOR CONSTRUCTION, GENERAL**

A. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

B. Doors for Transparent Finish:

1. Grade: Premium, with Grade AA faces.
2. Species and Cut: Red oak, plain cut.
3. Match between Veneer Leaves: Book match.
4. Assembly of Veneer Leaves on Door Faces: Balance match.
5. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
6. Room Match:

    a. Match door faces within each separate room or area of building. Corridor-door faces do not need to match where they are separated by 10 feet or more.
    b. Provide door faces of compatible color and grain within each separate room or area of building.

7. Exposed Vertical Edges: Applied wood-veneer edges of same species as faces and covering edges of faces.

**2.3 SOLID-CORE DOORS**

A. Particleboard Cores: Comply with the following requirements:

1. Particleboard: ANSI A208.1, Grade LD-1 or LD-2.
2. Blocking: Provide wood blocking in particleboard-core doors as follows:

    a. 5-inch top-rail blocking, in doors indicated to have closers.
    b. 5-inch bottom-rail blocking, in exterior doors and doors indicated to have kick or armor plates.
    c. 5-inch midrail blocking, in doors indicated to have exit devices.

B. Structural-Composite-Lumber-Core Doors:

1. Structural Composite Lumber: WDMA I.S.10.

a. Screw Withdrawal, Face: 700 lbf.
b. Screw Withdrawal, Edge: 400 lbf.

C. Interior Veneer-Faced Doors:

1. Core: Particleboard or structural composite lumber.
2. Construction: Five or seven plies with stiles and rails bonded to core, then entire unit abrasive planed before veneering.

D. Fire-Rated Doors:

1. Construction: Construction and core specified above for type of face indicated or manufacturer's standard mineral-core construction as needed to provide fire rating indicated.
2. Blocking: For mineral-core doors, provide composite blocking with improved screw-holding capability approved for use in doors of fire ratings indicated as follows**:**

a. 5-inch top-rail blocking.
b. 5-inch bottom-rail blocking, in doors indicated to have protection plates.
c. 5-inch midrail blocking, in doors indicated to have armor plates.
d. 5-inch midrail blocking, in doors indicated to have exit devices.

3. Edge Construction for Fire Rated Doors in Corridors and Smoke Partitions: Provide edge construction with intumescent seals concealed by outer stile matching face veneer, and laminated backing at hinge stiles for improved screw-holding capability and split resistance.
4. Pairs: Provide fire-rated pairs with fire-retardant stiles matching face veneer that are labeled and listed for kinds of applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals.

## 2.4 FABRICATION

A. Fabricate doors in sizes indicated for Project-site fitting.

B. Factory fit doors to suit frame-opening sizes indicated, with the following uniform clearances and bevels, unless otherwise indicated:

1. Comply with clearance requirements of referenced quality standard for fitting. Comply with requirements in NFPA 80 for fire-rated doors.

C. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate measurements of hardware mortises in metal frames to verify dimensions and alignment before factory machining.

**2.5 FACTORY FINISHING**

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Factory finish doors.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-4 conversion varnish, WDMA TR-6 catalyzed polyurethane, or manufacturer's standard uv-cured urethane.
3. Staining: To match existing wood doors and as approved by Architect.
4. Effect: Open-grain finish.
5. Sheen: Satin.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

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

**3.2 INSTALLATION**

A. Hardware: For installation, see Section 08710 "Door Hardware."

B. Manufacturer's Written Instructions: Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.

C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

**3.3 ADJUSTING**

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

**END OF SECTION 08211**

# SECTION 08220 – FIBERGLASS REINFORCED POLYESTER (FRP) DOORS

## 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. Fiberglass reinforced polyester panel (FRP) foam core doors.
2. Aluminum framing systems for FRP doors.

B. Related sections include the following:

1. Section 07920 "Joint Sealants."
2. Section 08410 "Aluminum-Framed Entrances and Storefronts."
3. Section 08710 "Door Hardware."
4. Section 08800 "Glazing."
5. Door Schedule on Drawings.

### 1.3 SUBMITTALS

A. Product Data: For each product specified. Include details of construction relative to materials, dimensions of individual components, profiles, and finishes.

B. Shop Drawings: Show details of fabrication and installation, including plans, elevations, sections, details of components, provisions for expansion and contraction, and attachments to other work.

1. Include hardware types, quantities, and locations.

C. Samples: Of FRP face sheets and aluminum finish required, in manufacturer's standard sizes. Where finishes involve normal color and texture variations, include Sample sets showing the full range of variations expected.

1. Submit actual samples of manufacturer's full range of FRP face sheet colors.

### 1.4 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has specialized in installing FRP doors and aluminum entrance and storefront systems similar to those required for this Project and who is acceptable to manufacturer.

A Pre-installation Conference: Prior to installation, a representative of the manufacturer shall meet with the installer to provide information, verify and reinforce a thorough and complete understanding of the entrance system.

## 1.5 DELIVERY, STORAGE AND HANDLING

A. Packing and Shipping: All materials supplied shall be packaged in individual corrugated cartons, with doors being "floated" so as no portion of the door or attached hardware is in contact with the corrugated shell.

B. Storage and Protection: All materials supplied shall be placed in secure locations where they will be safe from weather and protected against theft or damage until needed for installation.

C. All doors to be marked with individual opening numbers to correlate with the designation system used on shop drawings for doors, frames and hardware. Markings shall be temporary, removable, or concealed.

## 1.6 PROJECT CONDITIONS

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating systems without field measurements. Coordinate construction to ensure actual dimensions correspond to established dimensions.

## 1.7 WARRANTY

A. Material and workmanship of doors and frames shall be guaranteed to be free of defect for ten (10) years from date of installation.

B. Workmanship and materials involved with the installation of hardware is guaranteed for five (5) years from the date of installation.

C. The door manufacturer's liability shall be limited to the cost of repairing or replacing, at the manufacturer's option, defective products.

D. Field modification to the manufacturer's products performed by anyone other than authorized factory personnel or the application of hardware other than that which the door was engineered to receive will void the warranty.

E. Hardware provided and installed by door manufacturer will be guaranteed by hardware manufacturer for their applicable time span. Hardware attachment shall be warranted by manufacturer for five (5) years.

F. A written copy of manufacturer's warranty shall be supplied to the Owner.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

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

1. Doors:

a. Flush Doors SL-17; Special Lite, Inc.
b. Series 8000 FRP Flush Panel Doors; CMI Architectural Products, Inc.
c. Model F500I Doors; Commercial Door Systems.

2. Frames:

a. Tube Framing with Applied Stops as manufactured by Special Lite, Inc. or equal by one of the following:

1) CMI Architectural Products, Inc.
2) Commercial Door Systems.

B. All products shall be by the same manufacturer specializing in the production of the type of product required so that there will be one responsibility for the specified performance of all component parts.

**2.2 MATERIALS**

A. Doors: 1-3/4" thick, and constructed of 6063-T5 aluminum alloy rails and stiles, joined with 3/8" steel tie-rods or rigid mortise tenon joints and have inner core consisting of foamed-in-place urethane. Welded construction of any type will not be accepted.

1. Core Material: Urethane foam insulation of not less than 3 lb/cu. ft. density. Wood, polystyrene, mineral wool, of less than 3 lb./cu. ft. will not be accepted.
2. Door faces shall be fiberglass reinforced polyester, (FRP), 0.120 inch thickness, with pebble-like embossed finish. The colors shall be permanently bonded through the full thickness of the fiberglass door faces.

a. Color of FRP Door Faces: As selected by Architect from manufacturer's full range of colors.

1) Color and texture shall match existing FRP doors.

3. Glass and Glazing Materials: Provide laminated safety glass, complying with requirements of Section 08800 "Glazing", doors to be factory glazed.
4. Aluminum Members: Rails and stiles to be extruded 6063 T5 aluminum alloy. All exposed surfaces to be minimum .125" architectural thickness. Stiles shall be tubular to accept hardware as specified. Top and bottom rails to be extruded with legs for interlocking rigidity weather bar. Provide minimum 5 inch deep top rail member or extruded aluminum internal hardware reinforcements.

5. Face sheets to be locked in by extruded interlocking edges, which are to be an integral part of rails and stiles. No snap-on door edge will be accepted. Screw applied aluminum door edge trim is acceptable.

    a. Manufacture doors with cutouts for vision lights. Factory-finish and install all vision lights.

6. Fasteners: Aluminum or other materials warranted by manufacturer to be non-corrosive and compatible with aluminum components.

    a. Joinery to be 3/8" tie-rods, bolted through an extruded spline in the top and bottom rails and 3/16" reinforcing angles or Sigma weld dual moment connection.

7. Brackets and Reinforcements: Doors are to be internally reinforced for specified hardware using manufacturer's high-strength aluminum reinforcement before core is foamed in door.

    a. Provide manufacturer's standard reinforcement for each type of hardware required, not less than .125" thick.
    b. Provide manufacturer's recommended fastener reinforcement.

B. Frames:

1. Frame Members: To be one piece tubular extrusions of 6063-T5 aluminum alloy with a minimum 0.125 inch wall thickness. Frame members shall be tube type with four (4) enclosed sides, open back members are not acceptable.
2. Size: Size (width x depth) of framing members shall be as detailed on Drawings.
3. Fabrication: Joints are to be reinforced with internal anchors so that vertical and horizontal frame members are physically interlocked. Frame reinforcement at joints shall be full width of frame. Vertical frame members are to be the full height of the entrance opening.
4. Reinforcing: Frames to be internally reinforced at finish hardware attachment points. Members shall also be steel reinforced to meet wind load and/or dead load requirements.
5. Applied Door Stops: Applied stops with fasteners exposed on interior or secure side only.

## 2.3 HARDWARE

A. Hardware: Provide the following hardware for each door:

1. Recessed Door Pulls: Clear anodized aluminum recessed door pull with concealed fasteners.

    a. Provide pulls equal to Special-Lite No. SL-82.

2. Provide door manufacturer's standard adjustable bottom brush Insert with dual nylon brush sweeps on each door.
3. Balance of hardware is specified in Section 08710 "Door Hardware".

## 2.4 FABRICATION

A. General: Fabricate components that, when assembled, will have accurately fitted joints with ends coped or mitered to produce hairline joints free of burrs and distortion. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

B. Prefabrication: Hardware as specified in Section 08710 "Door Hardware" except door closers and thresholds will be shipped to door manufacturer. Door manufacturer shall install hardware on doors. Complete fabrication, assembly, finishing and other work before shipment to project site. Disassemble components only as necessary for shipment and installation.

C. Perform fabrication operations, including cutting, fitting, forming, drilling and grinding of material in manner which prevents damage to exposed surfaces.

D. Continuity: Maintain accurate relation of planes and angles, with hairline fit of contacting members.

E. Fasteners: Conceal fasteners wherever possible.

F. Clearances: Door shall be manufactured with proper hinge rail clearance depending upon hinge type used, and 1/8" at head, 1/8" at lock rail, and 3/16" at bottom rail above threshold or finished floor without threshold, and shall operate smoothly and easily.

**2.5 ALUMINUM FINISHES**

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations relative to applying and designating finishes.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Finish designations prefixed by AA conform to the system established by the Aluminum Association for designating aluminum finishes.

D. Finish: Finish all exposed aluminum on FRP doors as follows:

1. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine areas for compliance with requirements for installation tolerances and other conditions affecting performance of entrance and storefront systems. Do not proceed with installation until unsatisfactory conditions have been corrected.

1. Commencement of work shall signify acceptance of conditions and any subsequent adjustments shall be the responsibility of the door installer.

## 3.2 INSTALLATION

A. General: Comply with manufacturer's written instructions for protecting, handling, and installing FRP doors. Do not install damaged components. Fit frame joints to produce hairline joints free of burrs and distortion. Rigidly secure non-movement joints. Seal joints watertight.

B. Metal Protection: Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape recommended by manufacturer for this purpose. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints and condensation and moisture occurring or migrating within the system to the exterior.

D. Install framing components plumb and true in alignment with established lines and grades without warp or rack of framing members.

E. Install FRP entrance doors plumb and true in alignment with established lines and grades without warp or rack. Lubricate operating hardware and other moving parts according to hardware manufacturers' written instructions.

1. Install surface-mounted hardware according to manufacturer's written instructions using concealed fasteners to greatest extent possible.
2. Door manufacturer's dual integral door sweeps shall meet top of threshold and seal such that no daylight is visible under door. Adjust threshold to provide adequate seal between door and threshold. If field conditions prohibit adjustment of threshold report condition to Architect.

F. Install glazing to comply with requirements of Section 08800 "Glazing."

## 3.3 FIELD QUALITY CONTROL

A. Inspection: Test door and frame assembly for proper fit and smooth operation and confirm that no damage was done during installation.

## 3.4 ADJUSTING AND CLEANING

A. Adjust doors and hardware to provide tight fit at contact points and weather stripping, smooth operation, and weathertight closure.

B. Remove excess sealant and glazing compounds, and dirt from surfaces.

## 3.5 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure doors and framing are without damage or deterioration at the time of Substantial Completion.

**END OF SECTION 08220**

# SECTION 08311 - ACCESS DOORS AND FRAMES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes the following:

1. Access doors and frames for walls and ceilings.

B. Related Sections include the following:

1. Division 4 Section "Unit Masonry Assemblies" for anchoring and grouting access door frames set in masonry construction.

### 1.3 SUBMITTALS

A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

### 1.4 QUALITY ASSURANCE

A. Source Limitations: Obtain access door(s) and frame(s) through one source from a single manufacturer.

B. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to Project site in original, unopened packages with intact and legible manufacturers' labels identifying product and manufacturer, date of manufacture, and fire-resistance ratings applicable to Project.

B. Store materials inside, under cover, aboveground, and kept dry until ready for use. Remove from Project site and discard wet or deteriorated materials.

## PART 2 - PRODUCTS

### 2.1 STEEL MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36.

B. Steel Sheet: Uncoated or electrolytic zinc-coated, ASTM A 591 with cold-rolled steel sheet substrate complying with ASTM A 1008, Commercial Steel (CS), exposed.

C. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

## 2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

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

1. Babcock-Davis.
2. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
3. Karp Associates, Inc.
4. Larsen's Manufacturing Company.
5. Milcor Inc.
6. Nystrom, Inc.

B. Flush Access Doors and Frames with Exposed Trim: Fabricated from steel sheet.

1. Locations: Wall and ceiling surfaces.
2. Door: Minimum 0.060-inch thick sheet metal, set flush with exposed face flange of frame.
3. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
4. Hinges: Continuous piano.
5. Latch: Cam latch operated by screwdriver with interior release.

## 2.3 FABRICATION

A. General: Provide access door and frame assemblies and folding ladder attic access doors manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.

1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
2. Provide mounting holes in frame for attachment of masonry anchors. Furnish adjustable metal masonry anchors.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

A. Comply with manufacturer's written instructions for installing access doors and frames and folding ladder attic access doors.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

**3.2 ADJUSTING AND CLEANING**

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

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

**END OF SECTION 08311**

# SECTION 08410 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes the following:

1. Aluminum-framed storefronts.
2. Vestibule aluminum doors.

B. Related Sections include the following:

1. Section 07920 "Joint Sealants."
2. Section 08220 " Fiberglass Reinforced Plastic (FRP) Doors."
3. Section 08710 "Door Hardware" for hardware to the extent not specified in this Section.
4. Section 08800 "Glazing."

### 1.3 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum-framed systems, including anchorage, capable of withstanding, without failure, the effects of the following:

1. Structural loads.
2. Thermal movements.
3. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
4. Dimensional tolerances of building frame and other adjacent construction.
5. Failure includes the following:

a. Deflection exceeding specified limits.
b. Thermal stresses transferred to building structure.
c. Framing members transferring stresses, including those caused by thermal and structural movements, to glazing.
d. Noise or vibration created by wind and thermal and structural movements.
e. Loosening or weakening of fasteners, attachments, and other components.
f. Sealant failure.
g. Failure of operating units to function properly.

B. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span or an amount that restricts edge deflection of individual glazing lites to 3/4 inch (19 mm), whichever is less.

C. Structural-Test Performance: Provide aluminum-framed systems tested according to ASTM E 330 as follows:

1. When tested at positive and negative wind-load design pressures, systems do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, systems, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity but not less than 10 seconds.

D. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

E. Air Infiltration: Provide aluminum-framed systems with maximum air leakage through fixed glazing and framing areas of 0.06 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a minimum static-air-pressure difference of 6.24 lbf/sq. ft.

F. Water Penetration Under Static Pressure: Provide aluminum-framed systems that do not evidence water penetration through fixed glazing and framing areas when tested according to ASTM E 331 at a minimum static-air-pressure difference of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

G. Condensation Resistance: Provide aluminum-framed systems with fixed glazing and framing areas having condensation-resistance factor (CRF) of not less than 53 when tested according to AAMA 1503.

## 1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of product indicated.

B. Shop Drawings: For aluminum-framed systems. Include plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for draining moisture occurring within the system to the exterior.
2. For entrances, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

D. Welding certificates.

E. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

F. Warranties: Special warranties specified in this Section.

**1.5 QUALITY ASSURANCE**

A. Installer Qualifications: Capable of performing work of this Section and who is acceptable to manufacturer.

B. Product Options: Information on Drawings and in Specifications establishes requirements for systems' aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

C. Welding: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code--Aluminum."

**1.6 PROJECT CONDITIONS**

A. Field Measurements: Verify actual locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating aluminum-framed systems without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

**1.7 WARRANTY**

A. Special Finish Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components on which finishes fail within specified warranty period. Warranty does not include normal weathering.

1. Warranty Period: 20 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B 209 (ASTM B 209M).
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
3. Extruded Structural Pipe and Tubes: ASTM B 429.
4. Welding Rods and Bare Electrodes: AWS A5.10/A5.10M.

## 2.2 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

B. Storefront Framing System: Thermally improved framing system shall provide for flush glazing on all sides with no projecting stops, with glass in center of frame.

1. Framing members shall have nominal face dimension of 2 inches and overall depth of 4-1/2 inches.
2. Framing members are composite assemblies of two separate extruded-aluminum components permanently bonded by an elastomeric material of low thermal conductance or framing members are one-piece members that are internally slotted at regular intervals.
3. System shall be designed to accept 1 inch insulating glass. Provide inside and outside elastomeric extrusion glazing gaskets.
4. Provide applied glass stops for bottom of transom.
5. System shall be shear block assembled, with internal weep drainage system.
6. Products: Provide one of the following:

    a. Series 403(T); EFCO.
    b. Trifab VersaGlaze 451T; Kawneer Co., Inc.
    c. T14000 Series; Tubelite Inc.
    d. IT451; C.R. Lawrence/U.S. Aluminum
    e. Series 3000; Oldcastle

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

D. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration, use self-locking devices.
2. Reinforce members as required to receive fastener threads.
3. At any required exposed fasteners use countersunk Phillips screw heads, finished to match framing system.

E. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A 123/A 123M or ASTM A 153/A 153M requirements.

F. Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials. Form exposed flashing from sheet aluminum finished to match framing and of sufficient thickness to maintain a flat appearance without visible deflection.

G. Framing System Gaskets and Sealants: Manufacturer's standard recommended by manufacturer for joint type.

## 2.3 GLAZING SYSTEMS

A. Glazing: As specified in Section 08800 "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types, replaceable, molded or extruded, that maintain uniform pressure and watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric types.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

**2.4 DOORS**

A. Doors: Manufacturer's standard glazed doors, for manual swing operation.

1. Door Construction: 1-3/4-inch overall thickness, with minimum 0.125-inch-thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deep penetration and fillet welded or that incorporate concealed tie rods.
2. Door Design: Medium stile; 3-1/2-inch nominal stile and top rail width, 10 inch bottom rail width.
3. Glazing Stops and Gaskets: Beveled, snap-on, extruded-aluminum stops and preformed gaskets.

    a. Provide nonremovable glazing stops on outside of door.

**2.5 DOOR HARDWARE**

A. Door Hardware: Refer to Section 08710 “Door Hardware.”

**2.6 ACCESSORY MATERIALS**

A. Joint Sealants: For installation at perimeter of aluminum-framed systems, as specified in Section 07920 "Joint Sealants."

B. Bituminous Paint: Cold-applied asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos, formulated for 30-mil (0.762-mm) thickness per coat.

**2.7 FABRICATION**

A. Form aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.

6. Provisions for field replacement of glazing from exterior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing (without projecting stops).

E. Storefront Framing: Fabricate components for assembly using shear-block system.

F. Door Frames: Reinforce as required to support loads imposed by door operation and for installing hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

G. Doors: Reinforce doors as required for installing hardware.

1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

H. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

**2.8 ALUMINUM FINISHES**

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Central Elementary:

1. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

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

**3.2 INSTALLATION**

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.
6. Seal joints watertight, unless otherwise indicated.

B. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or by applying sealant or tape or installing nonconductive spacers as recommended by manufacturer for this purpose.
2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

D. Install components plumb and true in alignment with established lines and grades, without warp or rack.

E. Install glazing as specified in Division 8 Section "Glazing."

F. Entrances: Install to produce smooth operation and tight fit at contact points.

1. Exterior Entrances: Install to produce tight fit at weather stripping and weathertight closure.
2. Field-Installed Hardware: Install surface-mounted hardware according to hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

G. Install perimeter joint sealants as specified in Division 7 Section "Joint Sealants" and to produce weathertight installation.

H. Erection Tolerances: Install aluminum-framed systems to comply with the following maximum tolerances:

1. Location and Plane: Limit variation from true location and plane to 1/8 inch in 12 feet; 1/4 inch over total length.
2. Alignment:

   a. Where surfaces abut in line, limit offset from true alignment to 1/16 inch.
   b. Where surfaces meet at corners, limit offset from true alignment to 1/32 inch.

3. Diagonal Measurements: Limit difference between diagonal measurement to 1/8 inch.

## 3.3 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Services: Testing and inspecting of representative areas to determine compliance of installed systems with specified requirements shall take place as follows and in successive stages as indicated on Drawings. Do not proceed with installation of the next area until test results for previously completed areas show compliance with requirements.

1. Water Spray Test: Before installation of interior finishes has begun, a minimum area of 75 feet (23 m) by 1 story of aluminum-framed systems designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

C. Repair or remove work where test results and inspections indicate that it does not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

## 3.4 ADJUSTING

A. Entrances: Adjust operating hardware for smooth operation according to hardware manufacturers' written instructions.

**END OF SECTION 08410**

# SECTION 08520 - ALUMINUM WINDOWS

## 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 types of aluminum-framed windows:

1. Fixed windows.
2. Casement windows.
3. Casement emergency egress windows.

B. Related Sections include the following:

1. Section 07920 "Joint Sealants."
2. Section 08410 " Aluminum-Framed Entrances and Storefronts."
3. Section 08800 "Glazing."

### 1.3 DEFINITIONS

A. AW: Architectural.

B. Performance grade number, included as part of the AAMA/NWWDA product designation code, is actual design pressure in pounds force per square foot used to determine structural test pressure and water test pressure.

C. Structural test pressure, for uniform load structural test, is equivalent to 150 percent of design pressure.

D. Minimum test size is smallest size permitted for performance class (gateway test size). Products must be tested at minimum test size or at a size larger than minimum test size to comply with requirements for performance class.

### 1.4 PERFORMANCE REQUIREMENTS

A. General: Provide aluminum windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified and that are of test size indicated below:

1. Minimum size required by AAMA/NWWDA 101/I.S.2/A440.
2. Minimum size required by gateway performance requirements for determining compliance with AAMA/NWWDA 101/I.S.2/A440 for both gateway performance requirements and optional performance grades.
3. Size indicated.

B. AAMA/NWWDA Performance Requirements: Provide aluminum windows of the performance class and grade indicated that comply with AAMA/NWWDA 101/I.S.2/A440.

1. Performance Class: AW.
2. Performance Grade: 80 minimum.

C. Air Infiltration: Maximum rate not more than indicated when tested according to AAMA/NWWDA 101/I.S.2, Air Infiltration Test.

1. Maximum Rate: 0.1 cfm/sq. ft. of area at an inward test pressure of 6.24 lbf/sq. ft..

D. Water Resistance: No water leakage as defined in AAMA/NWWDA referenced test methods at a water test pressure equaling that indicated, when tested according to AAMA/NWWDA 101/I.S.2, Water Resistance Test.

1. Test Pressure: 20 percent of positive design pressure, but not more than 12 lbf/sq. ft..

E. Condensation-Resistance Factor: Provide aluminum windows tested for thermal performance according to AAMA 1503, showing a CRF of 50 (minimum).

F. Thermal Transmittance: Provide aluminum windows with a whole-window U-value maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to NFRC 100.

1. U-Value: 0.55 Btu/sq. ft. x h x deg F (maximum).

G. Thermal Movements: Provide aluminum windows, including anchorage, that accommodate thermal movements of units resulting from the following maximum change (range) in ambient and surface temperatures without buckling, distortion, opening of joints, failure of joint sealants, damaging loads and stresses on glazing and connections, and other detrimental effects. Base engineering calculation on actual surface temperatures of materials due to solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F material surfaces.

H. Life-Cycle Testing: Test according to AAMA 910 and comply with AAMA/NWWDA 101/I.S.2.

I. Casement Windows: Comply with AAMA/NWWDA 101/I.S.2 for the following tests:

1. Vertical Deflection Test.
2. Hardware Load Test.
3. Torsion Test.

**1.5 SUBMITTALS**

A. Product Data: Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions for each type of aluminum window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other Work, operational clearances, and the following:

1. Mullion details, including reinforcement and stiffeners.
2. Joinery details.
3. Expansion provisions.
4. Flashing and drainage details.
5. Weather-stripping details.
6. Thermal-break details.
7. Glazing details.
8. Window stools.

C. Samples for Verification: For each type of exposed finish required.

D. Product Test Reports: Based on evaluation of comprehensive tests performed within the last four years by a qualified testing agency, for each type, grade, and size of aluminum window. Test results based on use of down-sized test units will not be accepted.

E. Maintenance Data: For operable window sash, operating hardware, weather stripping, and finishes to include in maintenance manuals.

**1.6 QUALITY ASSURANCE**

A. Source Limitations: Obtain aluminum windows specified in this section through one source from a single manufacturer.

B. Installer Qualifications: An installer acceptable to aluminum window manufacturer for installation of units required for this Project.

C. Product Options: Drawings indicate size, profiles, and dimensional requirements of aluminum windows and are based on the specific system indicated. Refer to Division 1 Section "Product Requirements."

1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If modifications are proposed, submit comprehensive explanatory data to Architect for review.

D. Fenestration Standard: Comply with AAMA/NWWDA 101/I.S.2, "Voluntary Specifications for Aluminum, Vinyl (PVC) and Wood Windows and Glass Doors," for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

E. Glazing Publications: Comply with published recommendations of glass manufacturers and GANA's "Glazing Manual" unless more stringent requirements are indicated.

F. Preinstallation Conference: Conduct conference at Project site to review methods and procedures related to aluminum windows including, but not limited to, the following:

1. Inspect and discuss condition of substrate and other preparatory work performed by other trades.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review required testing and inspecting procedures.
4. Review window installation procedures and methods.

**1.7 PROJECT CONDITIONS**

A. Field Measurements: Verify aluminum window openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating aluminum windows without field measurements. Coordinate wall construction to ensure that actual opening dimensions correspond to established dimensions.

**1.8 WARRANTY**

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace aluminum windows that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Failure to meet performance requirements.
2. Structural failures including excessive deflection.
3. Water leakage, air infiltration, or condensation.
4. Faulty operation of movable sash and hardware.
5. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
6. Insulting glass failure.

B. Warranty Period: Five years from date of Substantial Completion.

C. Warranty Period for Glass: Refer to Section 08800 “Glazing”.

D. Warranty Period for Metal Finishes: Twenty years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

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

1. Central Elementary - Fixed and Casement Windows:

a. EFCO Corporation; 2700T Series.
b. Graham Architectural Products; 6500 Series.
c. Kawneer Company, Inc.; 8225TL IsoLock.
d. Winco Window Company; 1150 Series.

2. High School - Fixed Windows:

   a. EFCO Corporation; 2900T Series.
   b. Graham Architectural Products; 6900 Series.
   c. Kawneer Company, Inc.; 8400TL IsoLock.
   d. Winco Window Company; 1450H Series.

**2.2 MATERIALS, GENERAL**

A. Aluminum Extrusions: Alloy and temper recommended by aluminum window manufacturer for strength, corrosion resistance, and application of required finish, but not less than 22,000-psi ultimate tensile strength, not less than 16,000-psi minimum yield strength, and not less than 0.062-inch thickness at any location for the main frame and sash members.

B. Fasteners: Aluminum, nonmagnetic stainless steel, epoxy adhesive, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum window members, trim, hardware, anchors, and other components.

   1. Reinforcement: Where fasteners screw-anchor into aluminum less than 0.125 inch thick, reinforce interior with aluminum or nonmagnetic stainless steel to receive screw threads, or provide standard, noncorrosive, pressed-in, splined grommet nuts.
   2. Exposed Fasteners: Unless unavoidable for applying hardware, do not use exposed fasteners. For application of hardware, use fasteners that match finish of member or hardware being fastened, as appropriate.

C. Anchors, Clips, and Accessories: Aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

D. Reinforcing Members: Aluminum, nonmagnetic stainless steel, nickel/chrome-plated steel complying with ASTM B 456 for Type SC 3 severe service conditions, or zinc-coated steel or iron complying with ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

E. Compression-Type Weather Stripping: Provide compressible weather stripping designed for permanently resilient sealing under bumper or wiper action, and completely concealed when aluminum window is closed.

   1. Weather-Stripping Material: Manufacturer's standard system and materials complying with AAMA/NWWDA 101/I.S.2.

G. Replaceable Weather Seals: Comply with AAMA 701/702.

H. Sealant: For sealants required within fabricated windows, provide window manufacturer's standard, permanently elastic, nonshrinking, and nonmigrating type recommended by sealant manufacturer for joint size and movement.

**2.3 GLAZING**

A. Glass and Glazing Materials: Refer to Section 08800 "Glazing" for glass units and glazing requirements applicable to glazed aluminum window units.

## 2.4 HARDWARE

A. General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with aluminum; designed to smoothly operate, tightly close, and securely lock aluminum windows and sized to accommodate sash or ventilator weight and dimensions. Do not use aluminum in frictional contact with other metals. Where exposed, provide solid bronze, extruded, cast, or wrought aluminum or nonmagnetic stainless steel.

B. Casement Windows: Provide the following operating hardware:

1. Hinge: Heavy-duty, concealed, four- or six-bar friction egress hinges with adjustable-slide friction shoe; designed to achieve 90-degree ventilator opening and to permit ventilator operation for inside cleaning of outside glass face; two per ventilator.

    a. Comply with AAMA 904.
    b. Friction Shoes: Provide friction shoes of nylon or other nonabrasive, nonstaining, noncorrosive, durable material.

2. Lock: Single lever handle controlling tie rod and multi-point combination cam-action locks with keepers in number required for window size as recommended by window manufacturer.
3. Handle: Manufacturer's standard sash handle/pull.

C. Emergency Egress Casement Windows: Provide the following operating hardware:

1. General: When combined, all hardware shall allow a clear opening that complies with the minimum net clear area and minimum dimensions required by authorities having jurisdiction.
2. Emergency Egress Identification: Manufacturer's standard signage with lettering complying with authorities having jurisdiction for letter style, size, spacing, color, and location. Locate as required by State of Michigan, Bureau of Fire Services.
3. Hinge: Heavy-duty, five-knuckle butt hinge with nylon bushings including manufacturer's standard friction adjuster. Exposed hinges shall be finished to match window.
4. Lock: Single lever handle controlling tie rod and multi-point combination cam-action locks with keepers in number required for window size as recommended by window manufacturer.
5. Handle: Manufacturer's standard sash handle/pull.

## 2.5 INSECT SCREENS

A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Locate screens on inside of window and provide for each operable exterior sash or ventilator. Screens at emergency egress windows shall comply with State of Michigan, Bureau of Fire Services requirements.

1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," Architectural C-24 class.
2. Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows," for minimum standards of appearance, fabrication, attachment of screen fabric, hardware, and accessories unless more stringent requirements are indicated.
3. Wickets: Provide sliding or hinged wickets, framed and trimmed for a tight fit and durability during handling.

B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints, concealed fasteners and removable PVC spline/anchor concealing edge of frame.

1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
2. Extruded-Aluminum or Aluminum Tubular Framing Sections and Cross Braces: Not less than 0.050-inch wall thickness.
3. Finish: Match aluminum window members.

C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.

1. Wire-Fabric Finish: Charcoal gray.

**2.6 FABRICATION**

A. General: Fabricate aluminum windows, in sizes indicated, that comply with requirements and that meet or exceed AAMA/NWWDA 101/I.S.2/A440 performance requirements for the following window type and performance class. Include a complete system for assembling components and anchoring windows.

1. Casement Windows: AW-80 minimum.
2. Fixed Windows: AW-80 minimum.

B. Framing:

1. Central Elementary:

a. Aluminum windows shall have a minimum frame depth of 2 inches and a maximum frame depth of 2-1/4 inches.
b. Extrusion Thickness: Minimum 0.125 inch thick.

2. High School:

a. Aluminum windows shall have a minimum frame depth of 4 inches and a maximum frame depth of 4-1/2 inches.
b. Extrusion Thickness: Minimum 0.125 inch thick.

C. Fabricate aluminum windows that are reglazable without dismantling sash or ventilator framing.

D. Thermally Improved Construction: Fabricate aluminum windows with an integral, concealed, low-conductance thermal barrier; located between exterior materials and window members exposed on interior side; in a manner that eliminates direct metal-to-metal contact.

1. Provide thermal-break construction that has been in use for not less than three years and has been tested to demonstrate resistance to thermal conductance and condensation and to show adequate strength and security of glass retention.

E. Weather Stripping: Provide full-perimeter weather stripping for each operable ventilator.

F. Weep Holes: Provide weep holes and internal passages to conduct infiltrating water to exterior.

G. Provide water-shed members above side-hinged ventilators and similar lines of natural water penetration.

H. Mullions: Provide mullions and cover plates as shown, matching window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units.

I. Subframes (Receptors and Subsills): Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch- thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Finish to match window units. Provide subframes capable of withstanding design loads of window units.

1. Sill Extensions: Provide extruded aluminum sill extensions for window units as shown, of profile and dimensions indicated with concealed fasteners. Finish to match window units.

J. Factory-Glazed Fabrication: Glaze aluminum windows in the factory where practical and possible for applications indicated. Comply with requirements in Division 8 Section "Glazing" and with AAMA/NWWDA 101/I.S.2.

K. Glazing Stops: Provide snap-on glazing stops coordinated with Section 08800 "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

**2.7 FINISHES**

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

C. Central Elementary:

1. Class I, Clear Anodic Finish: AA-M12C22A41 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, clear coating 0.018 mm or thicker) complying with AAMA 611.

D. High School:

1. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

a. Color: Dark bronze.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine openings, substrates, structural support, anchorage, and conditions for compliance with requirements for installation tolerances; rough opening dimensions; levelness of sill plate; coordination with wall flashings, vapor retarders, and other built-in components; operational clearances; and other conditions affecting performance of work.

1. Masonry Surfaces: Visibly dry and free of excess mortar, sand, and other construction debris.
2. Metal Surfaces: Dry; clean; free of grease, oil, dirt, rust, corrosion, and welding slag; without sharp edges or offsets at joints.

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

**3.2 INSTALLATION**

A. General: Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components; Drawings; and Shop Drawings.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

1. Compounds, joint fillers, and gaskets to be installed after installation of window units are specified as work in Section 07920 “Joint Sealants”.

D. Install windows and components to drain condensation, water penetrating joints, and moisture migrating within windows to the exterior.

E. Install insect screens at all operable windows. Screens at emergency egress windows shall be installed in compliance with State of Michigan, Bureau of Fire Services requirements..

F. Metal Protection: Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in Appendix B in AAMA/NWWDA 101/I.S.2.

**3.3 FIELD QUALITY CONTROL**

A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and to prepare test reports.

B. Testing Services: Testing and inspecting of installed windows shall take place as follows:

1. Testing Methodology: Testing of windows for water resistance shall be performed according to AAMA 502, Test Method A, by applying same test pressures required to determine compliance with AAMA/NWWDA 101/I.S.2 in Part 1 "Performance Requirements" Article.

2. Testing Extent: One overall window assembly/ frame type as selected by Architect and a qualified independent testing and inspecting agency. Windows shall be tested immediately after installation.
3. Test Reports: Shall be prepared according to AAMA 502.

C. Remove and replace windows where test results indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

**3.4 ADJUSTING**

A. Adjust operating ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

**3.5 PROTECTION AND CLEANING**

A. Protect window surfaces from contact with contaminating substances resulting from construction operations. In addition, monitor window surfaces adjacent to and below exterior concrete and masonry surfaces during construction for presence of dirt, scum, alkaline deposits, stains, or other contaminants. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written recommendations.

B. Clean aluminum surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

C. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

**END OF SECTION 08520**

**SECTION 08710 – DOOR HARDWARE**

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. Furnish all items of Door Hardware specified, scheduled, shown or required herein.

B. Related Sections include the following:

1. Section 08110 "Standard Steel Doors and Frames."
2. Section 08211 "Flush Wood Doors."
3. Section 08220 "Fiberglass Reinforced Polyester (FRP) Doors."
4. Section 08410 "Aluminum-Framed Entrances and Storefronts."
5. Division 16 for electrical rough-in, conduit junction boxes, wiring, primary power and final hook-up of all finish hardware components requiring electrical connections.

### 1.3 QUALITY ASSURANCE

A. Requirements of Regulatory Agencies:

1. Furnish door hardware to comply with the requirements of laws, codes, ordinances, and regulations of the governmental authorities having jurisdiction where such requirements exceed the requirements of the Specifications.
2. Furnish door hardware to comply with the requirements of the regulations for public building accommodations for physically handicapped persons of the governmental authority having jurisdiction and to comply with Americans with Disabilities Act.

B. Hardware Supplier:

1. Shall be an established firm dealing in contract builder's hardware. Firm shall be a factory authorized distributor for all products required, and shall have in employment an Architectural Hardware Consultant. (AHC), and personnel trained and experienced in preparing Hardware Schedule, issuing templates, ordering, furnishing and servicing door hardware.
2. Supplier shall meet with Owner to determine keying requirements.

C. Pre-installation Meeting:

1. Before hardware installation, General Contractor shall schedule a door hardware installation seminar be conducted on the installation of door hardware; specifically of locksets, closers, exit devices, overhead stops and coordinators. Manufacturer's representatives of the above products shall conduct seminar. Seminar to be held at job site and attended by installers of door hardware for aluminum, hollow metal and wood doors. Seminar to address proper coordination and installation of hardware, in accordance with hardware schedule for this specific project by using installation manuals, hardware schedule, templates, physical product samples and installation video's.

a. Convene one week prior to commencing work of this Section.

D. Manufacturer:

1. Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements. Only domestic manufacturers are acceptable.

## 1.4 SUBMITTALS:

A. Hardware Schedule

1. Submit proper number of Hardware Schedules to allow the General Contractor to retain two copies for his use, plus the number of copies required by the General Contractor for their distribution and use. But, in any event, do not submit more than six copies.
2. Include the following:

a. Preface sheet listing category only and manufacturer's names of items being furnished as follows:

| CATEGORY | SPECIFIED | SCHEDULED |
|---|---|---|
| | | |
| Hinges | Manufacturer A | Manufacturer B |
| Lock sets | Manufacturer X | Manufacturer X |
| Kick Plates | Open | Manufacturer Z |

b. Hardware Locations.
c. Opening Description: Single or pair, number, room locations, hand, active leaf, degree of swing, size, door material, frame material, and UL listing.
d. Hardware Description: Quantity, category, product number, fasteners, and finish.
e. Headings that refer to the specified Hardware Set Numbers.
f. Scheduling Sequence shown in Hardware Sets.
g. Product data of each hardware item, and shop drawings where required, for special conditions and specialty hardware.
h. Typed Copy.
i. U.S. Standard finish symbols or BHMA finish symbols.

3. Product Data:

a. Submit Product Data of items of hardware listed in supplier's schedule.
b. Submit Product Data concurrently with hardware schedule.

4. Inspection Report:

a. Submit inspection report specified in Part 2 for closers and exit devices.

## 1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Label each item of hardware with the appropriate door number and Hardware Schedule heading number, and deliver to the installer so designated by the General Contractor.

## 1.6 WARRANTIES

A. Closers shall carry manufacturer's 10-year warranty against manufacturing defects and workmanship.

B. Exit devices shall carry manufacturer's 3-year warranty against manufacturing defects and workmanship.

C. Continuous gear hinges shall carry manufacturer's guarantee to be free from defects in material and workmanship.

D. Balance of items shall carry a manufacturer's 1-year warranty against manufacturing defects and workmanship.

## PART 2 - PRODUCT

### 2.1 PRODUCTS

A. General:

1. Furnish each category with the products of only one manufacturer unless specified otherwise; this requirement is mandatory whether various manufacturers are listed or not.
2. Provide the products of manufacturer designated or if more than one manufacturer is listed, the comparable product of one of the other manufacturers listed. Where only one manufacturer or product is listed, "no substitution" is implied.

B. Hinges:

1. Numbers used are Hager, equal products of Bommer, Ives, McKinney, and Stanley are acceptable.
2. Unless specified otherwise in sets furnish hinges of class and size as follows:

    a. At doors up to 36" wide, furnish class BB1279 and size 4-1/2 x 4-1/2 inches.
    b. At doors 37" through 40" wide, furnish class BB1168 and size 4-1/2 x 4-1/2.
    c. At doors over 40", furnish class BB1168 and size 5 x 4-1/2.

C. Continuous Hinges:

1. Continuous Gear Hinges: 6063-T6 aluminum alloy, anodized finish (cap on entire hinge painted if specified). Manufacture to template, uncut hinges non-handed, pinless assembly, three interlocking extrusion, full height of door and frame, lubricated polyacetal thrust bearing, fasteners 410 stainless steel plated and hardened. All hinge profiles to be manufactured to template bearing locations, with standard duty bearing configurations at 5-1/8" spacing with a minimum of 16 bearings**:** and heavy duty at 2-9/16" spacing with a minimum of 32 bearings**.**

    a. Length: 1" less than door opening height.
    b. Furnish fire rated hinges "FR" at labeled opening.
    c. Fastener 12-24 x 1/2" #3 Phillips keen form self tapping at aluminum and hollow metal doors, 12 x 1/2" #3 Philips, flathead full thread at wood doors.
    d. Numbers used are Select Products, Ltd., Kalamazoo, Michigan. Equal products by Architectural Builders Hardware, Bommer, Hager-Roton, McKinney, Pemko, Stanley and Zero are acceptable.

D. Locksets and Latchsets - Mortise Type:

1. Function numbers are Schlage.

a. Lockset

| | | |
|---|---|---|
| 1) | Best | 45H |
| 2) | Corbin Russwin | ML2000 |
| 3) | Sargent | 8200 |
| 4) | Schlage | L |
| 5) | Yale | 8700 |

b. Trim:

| | | |
|---|---|---|
| 1) | Best | 14H |
| 2) | Corbin Russwin | NSA |
| 3) | Sargent | LNL |
| 4) | Schlage | 17A |
| 5) | Yale | PBR |

c. Ergonomic Thumbturn:

| | | |
|---|---|---|
| 1) | Corbin Russwin | 707F58 |
| 2) | Sargent | 130LB |
| 3) | Schlage | L583-363 |

2. Provide strikes with extended lips where required to protect trim from being marred by latch bolt. Provide strike lips which do not project more than 1/8 inch beyond doorframe trim at single doors and have 7/8 inch lip to center at pairs of 1-3/4 inch doors. Provide wrought box strikes on all locks and latches.

E. Exit Devices:

1. Exit devices shall be UL listed panic exit hardware. All exit devices for fire rated openings shall be UL labeled fire exit hardware.
2. Exit Devices: Function designations as listed in Sets.

a. Von Duprin 98

3. Exit Device Trim:

a. Von Duprin 990 Series

F. Electric Strikes:

1. Type numbers are Von Duprin. Coordinate voltage requirements with Electrical Drawings and Specifications.

a. Von Duprin Series 6300

G. Push and Pull Hardware:

1. Push Plates: Plain design, wrought, 8 x 16 x .050 inches, square corners, beveled edges
2. Pull Plates: Plain design, with wrought plate 4 x 16 x .050 inches, square corners, beveled edges: 3/4 inch round rod, straight grip with 8 inch centers.
3. Manufacturer: Provide push and pull hardware from any member of B.H.M.A., except for products specified by particular manufacturer.

H. Closers:

1. LCN 4000 Smoothee Series unless otherwise listed in sets.

   a. Surface Mounted: Non-sized, adjustable from size 1 through size 5.

2. Refer to door and frame details and furnish accessories such as drop plates, panel adapters, thick-hub shoes, blade stop spacers and shoe supports as required to install door closers correctly. State degree of door swing in the hardware schedule.

I. Kick Plates:

1. Furnish .050 inches thick, 10 inch high x door width less 1-1/2 inch at single doors, and less one (1) inch at pairs.

   a. Where glass prevent this height, supply with height equal to height of bottom rail less one (1) inch.

2. Drill and countersink screw holes for oval head undercut screws. Pan head screws not acceptable.

J. Overhead Holders and Stops:

1. Manufacture products using base material of 300 Stainless Steel for US32 and US32D finished products.
2. Type, function, and fasteners must be the same as Glynn-Johnson specified. Size per manufacturer's sizing chart.

   a. Architectural Builders Hardware
   b. Glynn-Johnson
   c. Rixson

K. Wall Holders

1. Products specified by series only; furnish strike length to exceed projection of all other hardware.

| | | |
|---|---|---|
| a. | Hager | 326W |
| b. | Ives | WS40 |
| c. | MAG Security | 9231 |
| d. | Rockwood | 494 |
| e. | Trimco | 1254 |

L. Bumpers:

1. Ives WS406 CCV
2. B.H.M.A. L02101. Wrought, forged, or cast, approximately 2-1/2 inch diameter, concave rubber center, concealed fasteners.

M. Bottom Sweeps:

1. Surface: Attach to outside face of doors, to make contact with thresholds.

| | | |
|---|---|---|
| a. | Hager | 750SNX |
| b. | National Guard | 200NA |
| c. | Pemko | 315CN |
| d. | Reese | 323C |
| e. | Zero | 39A |

N. Thresholds: as scheduled.

1. Numbers specified are National Guard.
2. Products from other manufacturers are acceptable if equal in material, shape, thickness, and contain equal bumper gaskets and foot seals.
3. Cope at jambs.
4. Furnish full wall opening width when frames are recessed.
5. Cope in front of mullions if thresholds project beyond door faces.
6. Furnish one unit or assembly per door opening, at batteries, butted together with only hairline joints.

O. Cylinders and Keying:

1. Cylinders and keying for all hardware components capable of being locked.

    a. Furnish cylinders factory master and grand master keyed to existing Kaba-Peaks system, according to Owner's instructions. Furnish two change keys for each cylinder and master and grand master keys as required by Owner.
    b. Supply cylinders with interchangeable construction cores for use during the construction period. When so directed, and in the presence of the Owner's Representative, replace construction cores with final cores.
    c. Furnish construction master keys as required by Contractor.

P. Miscellaneous:

1. Furnish items not categorized in the above descriptions but specified by manufacturers names in the Hardware Sets.

Q. Fasteners:

1. Furnish fasteners of the proper type, size, quantity, and finish. Provide stainless steel fasteners for stainless steel hardware.
2. "TEK" type screws are not acceptable.
3. Use machine screws and expansion shields for attaching hardware to concrete or masonry.

4. Use wall grip inserts at hollow wall construction.
5. Install exit devices with fasteners supplied by exit device manufacturer.
6. Furnish machine screws for attachment to reinforced hollow metal doors and frames and reinforced aluminum doors and frames.
7. Furnish full thread wood screws for attachment to solid wood doors.
8. Attach closers to hollow metal doors with machine screws and to wood doors with wood screws.

R. Finishes:

1. Generally, provide Satin Chrome, US26D.

a. Continuous gear hinges, Satin Aluminum, Clear Anodized, US28.
b. Exit device touchpads, push and pull hardware, kick plates, overhead holders and stops and wrought bumpers, Satin Stainless Steel, US32D.
c. Bottom sweeps, furnish Satin Aluminum, Clear Anodized, US28.
d. Cast or forged bumpers and all other, furnish Satin Chrome, US26D.
e. Closers: Powder coated finish, color AL, (Aluminum).

1) At exterior doors, protect all closer cylinders, arms, drop, finish, and adapter plates with Special Rust Inhibiting (SRI) finish prior to final Powder Coat Aluminum; also, wherever SRI is specified.

f. Extruded Thresholds: Mill Finish Aluminum.

S. Quantities:

1. Furnish quanity of hinges as follows:

a. Three Hinges: For doors with heights 61 to 90 inches.
b. Four Hinges: For doors with heights 91 to 120 inches.
c. Four Hinges: For doors over 42 inches wide.
d. For doors with heights more than 120 inches, provide 4 hinges, plus 1 hinge for every 30 inches of door height greater than 120 inches.

T. Templates and Hardware Location:

1. Furnish hardware made to template. Supply required templates and hardware locations to the door and frame manufacturers.
2. Furnish metal template to frame/door supplier for continuous hinge.
3. Refer to Locations Article, and coordinate with templates.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. General:

1. Install hardware according to manufacturers installation instructions and to manufacturers template dimensions. Attach all items of hardware to doors, frames, walls, etc. with fasteners furnished and required by the manufacturer of the item.

a. Reinforced hollow metal doors and frames and reinforced aluminum doors and frames: drill and tap for machine screws.
b. Solid wood doors: full thread wood screws. Drill pilot holes before inserting screws.
c. Continuous Gear Hinges attached to hollow metal doors and frames and aluminum doors and frames: Use 12-24 x 1/2" #3 Phillips Keenform self tapping screws. Use #13 or 3/16 drill for pilot hole.
d. Do not cut fin type stop of aluminum frames to install exit device strikes designed to work with fin stops.
e. Refer to Cylinders and Keying Article regarding replacement of construction cores with final cores.

B. Locations:

1. Dimensions are from finish floor to center line of items.
2. Include this list in Hardware Schedule.

| CATEGORY | DIMENSION |
|---|---|
| Hinges | Door Manufacturer's Standard |
| Lockset Levers | Door Manufacturer's Standard |
| Deadlbolt Cylinder | 48 inches |
| Exit Devices Touchbars | Manufacturer's Template |
| Push Plates | 45 inches |
| Pull Plates | 42 inches |

## 3.2 ADJUSTING AND DEMONSTRATING

A. Final Adjustment:

1. Provide the services of a Hardware Supplier's or Manufacturer's Representative to inspect hardware furnished and its installation and adjustment, to make final hardware adjustment.

   a. Replace units that cannot be adjusted to operate freely and smoothly or as intended for the application made.

2. Locksets, closers and exit devices shall be inspected by the factory representative and adjusted after installation to insure correct installation and proper adjustment in operation. The manufacturer's representative shall prepare a written report stating compliance, and also recording locations and kinds of noncompliance. The original report shall be forwarded to the Architect with copies to the Contractor, Hardware Distributor, Hardware Installer and Building Owner.
3. Instruct the Owner's personnel in adjustment, care and maintenance of hardware.
4. Clean, polish and lubricate hardware.

## 3.3 HARDWARE SETS:

**LINDEN HIGH SCHOOL**
**SET # HS1**

| | |
|---|---|
| HINGES | BB1279 4-1/2 X 4-1/2 FIELD VERIFY HINGE SIZE AND LOCATION |
| DEADBOLT | B663P (CLASSROOM DEADBOLT) FIELD VERIFY LOCATION |
| CYLINDER | |
| PUSH PLATE | |

| | |
|---|---|
| PULL PLATE | |
| CLOSER | 4011 |
| O.H. SURFACE MTD HOLDER | GJ-900H |
| KICK PLATE | |
| BUMPER | |

**SET # HS2**

| | |
|---|---|
| HINGES | BB1279 4-1/2 X 4-1/2 |
| LOCKSET | L9486 (PRIVACY W/ OCCUPIED INDICATOR) |
| CYLINDER | |
| CLOSER | 4011 |
| KICK PLATE | |
| BUMPER | |

**SET # HS3**

| | |
|---|---|
| HINGES | BB1279 4-1/2 X 4-1/2 |
| LATCHSET | L9010 (PASSAGE) |
| CYLINDER | |
| CLOSER | 4111 |
| O.H. CONCEALED HOLDER | GJ-100H |
| KICK PLATE | |

**CENTRAL ELEMENTARY SCHOOL**
**SET # CE1**

REUSE EXISTING DOOR HARDWARE

**SET # CE2**

| | |
|---|---|
| CONTINUOUS HINGE | SL-11HD |
| EXIT DEVICE | 98E0 |
| CLOSER | 4111 |
| O.H. CONCEALED HOLDER | GJ-100H |
| BOTTOM SWEEP | |
| THRESHOLD | 713 X 4S |

**SET # CE3**

| | |
|---|---|
| CONTINUOUS HINGES | SL-11HD |
| EXIT DEVICE | 98NL X 990NL-R/V |
| CYLINDER | |
| EXIT DEVICE | 98DT X 990DT |
| ELECTRIC STRIKE | 6300 |
| CLOSERS | 4111 |
| O.H. CONCEALED HOLDERS | GJ-100H |
| BOTTOM SWEEPS | |
| THRESHOLD ASSEMBLY | 8139 X 8146 X BAR 1 X STOP STRIP 4S (7-1/8 INCH WIDE) |
| DOOR CONTACTS | REUSE EXISTING |

**SET # CE4**

| | |
|---|---|
| CONTINUOUS HINGE | SL-11HD |
| LOCKSET | L9463 (ENTRANCE) |
| CYLINDER | |
| CLOSER | 4031T |
| WALL HOLDER | |
| BOTTOM SWEEP | |
| THRESHOLD | 713 X 4S |

**END OF SECTION 08710**

# SECTION 08800 - GLAZING

## 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 glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:

1. Windows.
2. Storefront.
3. Doors

B. Related Sections include the following:

1. Section 08220 “Fiberglass Reinforced Plastic (FRP) Doors."
2. Section 08410 "Aluminum-Framed Entrances and Storefronts."
3. Section 08520 "Aluminum Windows."

### 1.3 DEFINITIONS

A. Manufacturers of Glass Products: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.

C. Interspace: Space between lites of an insulating-glass unit that contains dehydrated air or a specified gas.

D. Deterioration of Coated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in metallic coating.

E. Deterioration of Insulating Glass: Failure of hermetic seal under normal use that is attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

F. Deterioration of Laminated Glass: Defects developed from normal use that are attributed to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

## 1.4 PERFORMANCE REQUIREMENTS

A. General: Provide glazing systems capable of withstanding normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, and installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Thermal Movements: Provide glazing that allows for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

## 1.5 SUBMITTALS

A. Product Data: For each glass product and glazing material indicated.

B. Samples: For the following products, in the form of 12-inch- square Samples for glass.

1. Each color of tinted float glass.
2. Each type of laminated glass with colored interlayer.
3. Insulating glass for each designation indicated.

C. Product Certificates: Signed by manufacturers of glass and glazing products certifying that products furnished comply with requirements.

1. For solar-control low-e-coated glass, provide documentation demonstrating that manufacturer of coated glass is certified by coating manufacturer.

D. Qualification Data: For installers.

E. Warranties: Special warranties specified in this Section.

## 1.6 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who has completed glazing similar in material, design, and extent to that indicated for this Project; whose work has resulted in glass installations with a record of successful in-service performance; and who employs glass installers for this Project who are certified under the National Glass Association Certified Glass Installer Program.

B. Source Limitations for Glass: Obtain the following through one source from a single manufacturer for each glass type: clear float glass, coated float glass, laminated glass, and insulating glass.

C. Source Limitations for Glazing Accessories: Obtain glazing accessories through one source from a single manufacturer for each product and installation method indicated.

D. Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.

1. Subject to compliance with requirements, obtain safety glazing products permanently marked with certification label of the Safety Glazing Certification Council or another certification agency or manufacturer acceptable to authorities having jurisdiction.
2. Where glazing units, including Kind FT glass and laminated glass, are specified in Part 2 articles for glazing lites more than 9 sq. ft. in exposed surface area of one side, provide glazing products that comply with Category II materials, for lites 9 sq. ft. or less in exposed surface area of one side, provide glazing products that comply with Category I or II materials, except for hazardous locations where Category II materials are required by 16 CFR 1201 and regulations of authorities having jurisdiction.

E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: GANA Laminated Division's "Laminated Glass Design Guide" and GANA's "Glazing Manual."
2. IGMA Publication for Insulating Glass: SIGMA TM-3000, "Glazing Guidelines for Sealed Insulating Glass Units."

F. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of the following testing and inspecting agency:

1. Insulating Glass Certification Council.

## 1.7 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions and as needed to prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. For insulating-glass units that will be exposed to substantial altitude changes, comply with insulating-glass manufacturer's written recommendations for venting and sealing to avoid hermetic seal ruptures.

## 1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install liquid glazing sealants when ambient and substrate temperature conditions are outside limits permitted by glazing sealant manufacturer or below 40 deg F.

**1.9 WARRANTY**

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer's standard form, made out to Owner and signed by coated-glass manufacturer agreeing to replace coated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

B. Manufacturer's Special Warranty on Laminated Glass: Manufacturer's standard form, made out to Owner and signed by laminated-glass manufacturer agreeing to replace laminated-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: Five years from date of Substantial Completion.

C. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form, made out to Owner and signed by insulating-glass manufacturer agreeing to replace insulating-glass units that deteriorate as defined in "Definitions" Article, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated below.

1. Warranty Period: 10 years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Product: Subject to compliance with requirements, provide product specified.

**2.2 GLASS PRODUCTS**

A. Annealed Float Glass: ASTM C 1036, Type I (transparent flat glass), Quality-Q3; of class indicated.

B. Heat-Treated Float Glass: ASTM C 1048; Type I (transparent flat glass); Quality-Q3; of class, kind, and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed, unless otherwise indicated.
2. Provide Kind HS (heat-strengthened) float glass in place of annealed float glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
3. For uncoated glass, comply with requirements for Condition A.
4. For coated vision glass, comply with requirements for Condition C (other coated glass).
5. Provide Kind FT (fully tempered) float glass in place of annealed or Kind HS (heat-strengthened) float glass where safety glass is indicated.

C. Sputter-Coated Float Glass: ASTM C 1376, float glass with metallic-oxide or -nitride coating deposited by vacuum deposition process after manufacture and heat treatment (if any), and complying with other requirements specified.

D. Laminated Glass: ASTM C 1172, and complying with other requirements specified and with the following:

1. Interlayer: Polyvinyl butyral of thickness indicated with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.

   a. For polyvinyl butyral interlayers, laminate lites in autoclave with heat plus pressure.

2. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.

E. Insulating-Glass Units, General: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, and complying with ASTM E 774 for Class CBA units and with requirements specified in this Article and in Part 2 "Insulating-Glass Units" Article.

1. Provide Kind HS (heat-strengthened) float glass in place of annealed glass where needed to resist thermal stresses induced by differential shading of individual glass lites and to comply with glass design requirements specified in Part 1 "Performance Requirements" Article.
2. Provide Kind FT (fully tempered) glass lites where safety glass is indicated.
3. Overall Unit Thickness and Thickness of Each Lite: Dimensions indicated for insulating-glass units are nominal and the overall thicknesses of units are measured perpendicularly from outer surfaces of glass lites at unit's edge.
4. Sealing System: Dual seal, with primary and secondary sealants as follows:

   a. Polyisobutylene and silicone.

5. Spacer Specifications: Manufacturer's standard spacer material and construction complying with the following requirements:

   a. Spacer Material: Aluminum with mill or clear anodic finish.
   b. Desiccant: Molecular sieve or silica gel, or blend of both.
   c. Corner Construction: Manufacturer's standard corner construction.

## 2.3 GLAZING GASKETS

A. Dense Compression Gaskets: Molded or extruded gaskets of material indicated below, complying with standards referenced with name of elastomer indicated below, and of profile and hardness required to maintain watertight seal:

1. EPDM, ASTM C 864.
2. Silicone, ASTM C 1115.
3. Thermoplastic polyolefin rubber, ASTM C 1115.
4. Any material indicated above.

B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned gaskets of material indicated below; complying with ASTM C 509, Type II, black; and of profile and hardness required to maintain watertight seal:

1. EPDM.
2. Silicone.
3. Thermoplastic polyolefin rubber.
4. Any material indicated above.

**2.4 GLAZING SEALANTS**

A. General: Provide products of type indicated, complying with the following requirements:

1. Compatibility: Select glazing sealants that are compatible with one another and with other materials they will contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
3. Colors of Exposed Glazing Sealants: Black.

B. Elastomeric Glazing Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied chemically curing sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

1. Class 25 Neutral-Curing Silicone Glazing Sealant:

a. Products:

1) Dow Corning Corporation; 799.
2) GE Silicones; UltraGlaze SSG4000.
3) Tremco; Tremsil 600.

b. Type and Grade: S (single component) and NS (nonsag).
c. Class: 25.
d. Use Related to Exposure: NT (nontraffic).
e. Uses Related to Glazing Substrates: G, A, and, as applicable to glazing substrates indicated, O.

1) Use O Glazing Substrates: Color anodic aluminum.

## 2.5 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based elastomeric tape with a solids content of 100 percent; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer rod as recommended in writing by tape and glass manufacturers for application indicated; packaged on rolls with a release paper backing; and complying with ASTM C 1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

## 2.6 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions with a Shore, Type A durometer hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

## 2.7 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

## 2.8 LAMINATED-GLASS UNITS

A. Clear Laminated-Glass Units (Located in Doors):

1. Kind LA, consisting of two lites of annealed float glass.
2. Outer Lite: Class 1 (clear) float glass.

    a. Thickness: 3.0 mm.

3. Plastic Interlayer:

    a. Thickness: 0.030 inch, but not less than that required to comply as a Type II safety glass material.
    b. Interlayer Color: Clear.

4. Inner Lite: Class 1 (clear) float glass.

    a. Thickness: 3.0 mm.

**2.9 INSULATING-GLASS UNITS**

A. Central Elementary -Tinted Insulated-Glass Units:

1. Products:

    a. "Solarban 60 Gray" by PPG Industries, Inc. or equal by one of the following:

        1) Guardian Industries Corp
        2) Viracon

2. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm (1 inch and 1/4 inch nominal).
3. Interspace Content: Air.
4. Outdoor Lite: Class 2 (tinted) float glass.

    a. Tint Color: Gray.
    b. Kind HS (heat strengthened)
    c. Kind FT (fully tempered) at Emergency Egress Windows.

5. Indoor Lite: Class 1 (clear) float glass.

    a. Kind FT (fully tempered) at Emergency Egress Windows.

6. Low-E Coating: Sputtered on third surface.
7. Visible Light Transmittance: 35 percent minimum.
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: 0.28 maximum.
10. Solar Heat Gain Coefficient: 0.29 percent maximum.

B. High School - Tinted Insulated-Glass Units:

1. Products:

    a. "Solarban 60 Bronze" by PPG Industries, Inc. or equal by one of the following:

        1) Guardian Industries Corp
        2) Viracon

2. Overall Unit Thickness and Thickness of Each Lite: 25 and 6.0 mm (1 inch and 1/4 inch nominal).
3. Interspace Content: Air.
4. Outdoor Lite: Class 2 (tinted) float glass.

    a. Tint Color: Bronze.
    b. Kind HS (heat strengthened)
    c. Kind FT (fully tempered) at Emergency Egress Windows.

5. Indoor Lite: Class 1 (clear) float glass.

   a. Kind FT (fully tempered) at Emergency Egress Windows.

6. Low-E Coating: Sputtered on third surface.
7. Visible Light Transmittance: 41 percent minimum.
8. Winter Nighttime U-Factor: 0.29 maximum.
9. Summer Daytime U-Factor: 0.28 maximum.
10. Solar Heat Gain Coefficient: 0.32 percent maximum.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine framing glazing, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep system.
3. Minimum required face or edge clearances.
4. Effective sealing between joints of glass-framing members.

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

**3.2 PREPARATION**

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

**3.3 GLAZING, GENERAL**

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Glazing channel dimensions, as indicated on Drawings, provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by Project conditions during installation.

C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass is glass with edge damage or other imperfections that, when installed, could weaken glass and impair performance and appearance.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction sealant-substrate testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50 inches as follows:

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

K. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

**3.4 TAPE GLAZING**

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first and then to jambs. Cover horizontal framing joints by applying tapes to jambs and then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until just before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant.

G. Center glass lites in openings on setting blocks and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape.

**3.5 GASKET GLAZING (DRY)**

A. Fabricate compression gaskets in lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Install gaskets so they protrude past face of glazing stops.

**3.6 CLEANING AND PROTECTION**

A. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

B. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

**END OF SECTION 08800**

# SECTION 08830 - MIRRORS

## 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. Film-backed glass mirrors qualifying as safety glazing.

B. Related Sections include the following:

1. Section 10801"Toilet and Bath Accessories" for framed mirrors.

### 1.3 PERFORMANCE REQUIREMENTS

A. Provide mirrors that will not fail under normal usage. Failure includes glass breakage and deterioration attributable to defective manufacture, fabrication, and installation.

### 1.4 SUBMITTALS

A. Product Data: For mirror hardware and mastic.

B. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachments to other work.

C. Samples: For each type of mirror product required, in the form indicated below:

1. Mirrors, 12 inches square, including edge treatment on 2 adjoining edges.
2. Mirror clips.

### 1.5 QUALITY ASSURANCE

A. Glazing Publications: Comply with GANA's "Glazing Manual" and GANA Mirror Division's "Mirrors, Handle with Extreme Care: Tips for the Professional on the Care and Handling of Mirrors" unless more stringent requirements are indicated

### 1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect mirrors according to mirror manufacturer's written instructions and as needed to prevent damage to mirrors from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors, protected from moisture including condensation.

**1.7 PROJECT CONDITIONS**

A. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.

**1.8 WARRANTY**

A. Special Warranty: Manufacturer's standard form made out to Owner and signed by mirror manufacturer agreeing to replace mirrors that deteriorate, f.o.b. the nearest shipping point to Project site, within specified warranty period indicated in second subparagraph below.

1. Deterioration of Mirrors: Defects developed from normal use that are attributable to the manufacturing process and not to causes other than glass breakage and practices for maintaining and cleaning mirrors contrary to mirror manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.
2. Warranty Period: Five years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 SILVERED FLAT GLASS MIRROR MATERIALS**

A. Clear Glass Mirrors: ASTM C 1503, Mirror Select Quality.

1. Nominal Thickness: 6.0 mm (1/4 inch nominal).

**2.2 MISCELLANEOUS MATERIALS**

A. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges with low or no VOC.

B. Mirror Mastic: An adhesive setting compound, produced specifically for setting mirrors and certified by both mirror manufacturer and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed with low or no VOC.

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

a. Gunther Mirror Mastics.
b. Palmer Products Corporation.

**2.3 MIRROR HARDWARE**

A. Mirror Clips: Nickel plated finish, J-shape, 3/4 inch wide, 2-11/16 inch high stationary bottom clips and adjustable two piece upper male clip and female clip that slide into each other.

Products:

a. CRL Bishop Mirror Clips, Model No. SW6003 Lower Stationary Bottom Clip, Model SW5232 Upper Clip-Male and SW5233 Upper Clip-Female; C. R. Laurence Company, (800) 421-6144.

**2.4 FABRICATION**

A. Mirror Sizes: As indicated on Drawings, cut mirrors to final sizes and shapes.

B. Mirror Edge Treatment: Beveled polished edge.

1. Seal edges of mirrors after edge treatment to prevent chemical or atmospheric penetration of glass coating. Seal in factory immediately after cutting to final sizes.

C. Film-Backed Safety Mirrors: Apply film backing with pressure-sensitive adhesive coating over mirror backing paint as recommended in writing by film-backing manufacturer to produce a surface free of bubbles, blisters, and other imperfections. Use adhesives and film backing compatible with mirror backing paint as certified by mirror manufacturer.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance.

1. Verify compatibility with and suitability of substrates, including compatibility of mirror mastic with existing finishes or primers.
2. Proceed with mirror installation only after unsatisfactory conditions have been corrected and surfaces are dry.

**3.2 PREPARATION**

A. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating surfaces with mastic manufacturer's special bond coating where applicable.

**3.3 INSTALLATION**

A. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced GANA publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

B. Provide a minimum air space of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

C. For wall-mounted mirrors, install with mastic and mirror hardware.

1. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.
2. Install bottom and top clips symmetrically placed and evenly spaced.
3. Install mastic as follows:

a. Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.
b. Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.

c. After mastic is applied, align mirrors and press into place while maintaining a minimum air space of 1/8 inch between back of mirrors and mounting surface.

**3.4 PROTECTION**

A. Do not permit edges of mirrors to be exposed to standing water.

B. Protect mirrors from breakage and contaminating substances resulting from construction operations.

**END OF SECTION 08830**

# ROOM FINISH SCHEDULE

| RM NO. | ROOM NAME | FLOOR | | BASE | | WALL | | CEILING | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | MATERIAL/FINISH | CC | MATERIAL/FINISH | CC | MATERIAL/FINISH | CC | MATERIAL/FINISH | CC | REMARKS |
| | | | | | | | | | | |
| 313,314,533,534,619,'620 | TOILET ROOMS | PORC T | F1 | CERAMIC T | B1 | (E) CMU/ PT | P1 | GYP BD/ E PT | P1 | 1,5,10 |
| | | | | | | CERAMIC T | W1 | | | |
| | | | | | | PORC T (ACCENT) | W2 | | | |
| | | | | | | PORC T (ACCENT) | W3 | | | |
| | | | | | | PORC T (ACCENT) | W4 | | | |
| | | | | | | PORC T (ACCENT) | W5 | | | |
| | | | | | | | | | | |
| 309 | RECEPTION | --- | --- | --- | --- | (E) CMU/ PT | P2 | AC PANEL | C1 | 2,3,4,7 |
| | | | | | | GYP BD/ PT | P2 | | | |
| | | | | | | | | | | |
| 309A | ATHLETIC DIRECTOR OFFICE | --- | --- | --- | --- | (E) CMU/ PT | P2 | AC PANEL | C1 | 2,3,7 |
| | | | | | | GYP BD/ PT | P2 | | | |
| | | | | | | | | | | |
| 309B | RECEPTION | --- | --- | --- | --- | (E) CMU/ PT | P2 | AC PANEL | C1 | 2,3,7 |
| | | | | | | GYP BD/ PT | P2 | | | |
| | | | | | | | | | | |
| 309C | COMMUNITY EDUCATION OFFICE | --- | --- | --- | --- | (E) CMU/ PT | P2 | AC PANEL | C1 | 2,3,7,8 |
| | | | | | | GYP BD/ PT | P2 | | | |
| | | | | | | | | | | |
| 310 | TOILET ROOM | PORC T | F1 | CERAMIC T | B1 | (E) CMU/ PT | P1 | AC PANEL | C1 | 3,5,6,9 |
| | | | | | | CERAMIC T | W1 | | | |
| | | | | | | | | | | |
| 311 | STORAGE | (E) CONC | --- | --- | --- | (E) CMU/ PT | --- | AC PANEL | C1 | 7 |
| | | CONC/ SLR | --- | | | (E) CMU/ PT | P1 | | | |

# COLOR CODES

| CODE | PRODUCT | MANUFACTURER | PRODUCT NAME | PRODUCT NUMBER | COLOR NAME | FINISH | REMARKS |
|---|---|---|---|---|---|---|---|
| B1 | CERAMIC T | AMERICAN OLEAN | | AO0042 | MT LIGHT SMOKE | 4-1/4" X 4-1/4" | B |
| | | | | | | | |
| C1 | AC PANEL | USG | FISSURED | 562 | WHITE | 2' X 4' | |
| | | | | | | | |
| F1 | PORC T | CROSSVILLE | MAIN STREET | AV214 | GALLERY GREY | 12" X 12" | A |
| | | | | | | | |
| P1 | PAINT | SHERWIN WILLIAMS | | SW7014 | EIDER WHITE | | |
| P2 | PAINT | SHERWIN WILLIAMS | | SW7006 | EXTRA WHITE | | |
| P3 | POWDERCOAT | TIGER DRYLAC | | RAL 9003 | | | |
| P4 | PAINT | | | | TO MATCH EXISTING | | |
| | | | | | | | |
| M1 | TOILET PARTITION | GLOBAL PARTITIONS | | 2123 | CHARCOAL | | |
| M2 | MARBLE THRESHOLD | | | | CHARCOAL | | |
| | | | | | | | |
| PL1 | PLASTIC LAMINATE | PIONITE | | | TBD BY OWNER | | |
| | | | | | | | |
| SS1 | SOLID SURFACE | CORIAN | | | SAVANNAH | | |
| | | | | | | | |
| W1 | CERAMIC T | AMERICAN OLEAN | | 0004 | MT LIGHT SMOKE | 4-1/4" X 4-1/4" | B |
| W2 | PORC T | AMERICAN OLEAN | | A43 | LIGHT SMOKE | 1" X 1" | B |
| W3 | PORC T | AMERICAN OLEAN | | A22 | STORM GRAY | 1" X 1" | B |
| W4 | PORC T | AMERICAN OLEAN | | A33 | CHARCOAL | 1" X 1" | B |
| W5 | PORC T | AMERICAN OLEAN | | A42 | CINNABAR | 1" X 1" | B |

B (Base) /C (Ceiling) /F (Floor) M (Miscellaneous)/ P (Paint)/ PL (Plastic Laminate) / W (Wood)

## ROOM FINISH SCHEDULE GENERAL REMARKS

| | |
|---|---|
| * | B (BASE) / C (CEILING) / F (FLOOR) / M (MISCELLANEOUS) / P (PAINT) / PL (PLASTIC LAMINATE) / W (WOOD) |
| A | "ROOM NUMBER AND ROOM NAME" CORRESPOND TO THE NUMBER AND NAMES INDICATED ON THE DRAWINGS. |
| B | "MATERIAL/FINISH" INDICATE THE SPECIFIC MATERIALS AND FINISHES TO BE USED TO CONSTRUCT AND FINISH THE FLOORS, BASE, WALLS AND CEILINGS. |
| C | "CC" INDICATES THE COLOR CODE FOR EACH MATERIAL AND/OR FINISH, REFER TO "COLOR CODES." |
| D | "REMARKS" INDICATE ANY SPECIAL REQUIREMENTS FOR THE MATERIAL AND FINISH IN A ROOM - SEE "ROOM FINISH SCHEDULE REMARKS." |
| E | "STAIR NUMBER" CORRESPONDS TO THE NUMBERS INDICATED ON THE DRAWINGS. |
| F | "LEVEL" INDICATES THE BUILDING FLOOR LINE FROM WHICH MATERIALS AND FINISHES ARE DESCRIBED AND EXTENDS TO THE BUILDING FLOOR LINE ABOVE. |
| G | "FLOORS" OCCUR AT BUILDING FLOOR LINES AND "LANDINGS" OCCUR IN BETWEEN BUILDING FLOOR LINES. |
| H | "CEILING" IS THE MATERIAL AND FINISH AT THE UNDERSIDE OF THE FLOOR OR ROOF ABOVE. "SOFFIT" IS THE MATERIAL AND FINISH AT THE UNDERSIDE OF THE STAIR RUN AND/OR LANDING ABOVE. |

## ROOM FINISH REMARKS

| | |
|---|---|
| 1 | TOILET PARTITIONS SHALL BE M1. |
| 2 | CARPET AND BASE BY OWNER. |
| 3 | EXISTING CEILING GRID SHALL BE PAINTED P3. |
| 4 | CASEWORK SHALL BE PL1. COUNTERTOP SHALL BE SS1. |
| 5 | REFER TO TYPICAL WALL PATTERN ON SHEET AM1.1HS. |
| 6 | TOILET ROOM 310 SHALL HAVE A MARBLE THRESHOLD M2. |
| 7 | NEW DOOR FRAMES SHALL BE P1. |
| 8 | WINDOWSILL SHALL BE SS1. |
| 9 | DOOR FRAME TO MATCH EXISTING PAINT (P4) OF DOOR FRAMES IN CORRIDOR. |
| 10 | W2, W3, W4, W5 SHALL BE A RANDOM PATTERN MIX USING 25% OF EACH COLOR. |
| 11 | PAINT P1 SHALL ONLY BE APPLIED TO SOUTH WALL. |

## COLOR CODE REMARKS

| | |
|---|---|
| A | EPOXY GROUT SHALL BE ACCUCOLOR #927 LIGHT PEWTER. |
| B | EPOXY GROUT SHALL BE ACCUCOLOR #949 SILVERADO. |

**ROOM FINISH SCHEDULE ABBREVIATIONS**

| | |
|---|---|
| AC PANEL | ACOUSTICAL PANEL |
| AC TILE | ACOUSTICAL TILE |
| AC WP | ACOUSTICAL WALL PANEL |
| CC | COLOR CODE |
| CMU | CONCRETE MASONRY UNIT |
| CT | CERAMIC TILE |
| CEM PLAS | CEMENT PLASTER |
| CONC | CONCRETE |
| DEFS | DIRECT APPLIED EXTERIOR FINISH SYSTEM |
| (E) | EXISTING |
| EIFS | EXTERIOR INSULATION FINISH SYSTEM |
| E PT | EPOXY PAINTED |
| E TERR | EPOXY TERRAZZO |
| ENTR MAT | ENTRANCE MAT |
| EXP CONST | EXPOSED CONSTRUCTION |
| FWC | FABRIC WALL COVERING |
| GF CMU | GROUND FACE CONCRETE MASONRY UNIT |
| GL CMU | GLAZED CONCRETE MASONRY UNIT |
| GYP BD | GYPSUM BOARD |
| HD/SLR | HARDENER/SEALER |
| IR GYP BD | IMPACT RESISTANT GYPSUM BOARD |
| LIMEST | LIMESTONE |
| LIN MET | LINEAR METAL |
| LINO | LINOLEUM |
| MCC | MULTI-COLORED COATING |
| MET PANEL | METAL PANEL |
| MET TILE | METAL TILE |
| P LAM | PLASTIC LAMINATE |
| PAVER T | PAVER TILE |
| PLAS | PLASTER |
| PORC T | PORCELAIN TILE |
| PT | PAINT |
| QT | QUARRY TILE |
| RT | RUBBER TILE |
| RESIN FLR | RESINOUS FLOORING |
| RESIL | RESILIENT |
| RESIL T | RESILIENT TILE |
| SGFT | STRUCTURAL GLAZED FACING TILE |
| SHT V | SHEET VINYL |
| STN | STAIN |
| TC | TRAFFIC COATING |
| TERR | TERRAZZO |
| VC GYP BD | VINYL COVERED GYPSUM BOARD |
| VCT | VINYL COMPOSITION TILE |
| VT | VINYL TILE |
| VWC | VINYL WALL COVERING |
| VEN PLAS | VENEER PLASTER |
| WD | WOOD |

**END OF SECTION 09060**

# SECTION 09260 - GYPSUM BOARD ASSEMBLIES

## 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. Interior gypsum wallboard.
2. Non-load-bearing steel framing.

B. Related Sections include the following:

1. Section 06100 "Rough Carpentry" for wood blocking.

### 1.3 DEFINITIONS

A. Gypsum Board Terminology: Refer to ASTM C 11 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, details of components, and attachments to other units of Work.

C. Samples: For the following products:

1. Trim Accessories: Full-size sample in 12-inch- long length for each trim accessory indicated.

### 1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For gypsum board assemblies with fire-resistance ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.

1. Fire-Resistance-Rated Assemblies: Indicated by design designations from FM's "Approval Guide, Building Products", UL's "Fire Resistance Directory" or GA-600, "Fire Resistance Design Manual."

B. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.

1. STC-Rated Assemblies: Indicated by design designations from GA-600, "Fire Resistance Design Manual."

**1.6 DELIVERY, STORAGE, AND HANDLING**

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes. Stack gypsum panels flat to prevent sagging.

**1.7 PROJECT CONDITIONS**

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

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

1. Steel Framing and Furring:

a. Clark Dietrich Building Systems.
b. Consolidated Systems, Inc.
c. Jamies Industries, Inc.
d. Marino\Ware.
e. MBA Building Supplies, Inc.
f. Scafco Corporation.
g. State Building Products, Inc.

2. Gypsum Board and Related Products:

a. Certainteed.
b. G-P Gypsum Corp.
c. Lafarge Gypsum, Division of Lafarge Corp.
d. National Gypsum Company.
e. United States Gypsum Co.

**2.2 STEEL PARTITION AND SOFFIT FRAMING**

A. Components, General: As follows:

1. Comply with ASTM C 754 for conditions indicated.

2. Steel Sheet Components: Complying with ASTM C 645 requirements for metal and with ASTM A 653, G40, hot-dip galvanized zinc coating.

B. Steel Studs and Runners: ASTM C 645.

1. Minimum Base Metal Thickness: 0.027 inch, (22 gage), 0.0312 inch, (20 gage) or 20 gage equivalent if using double helix embossed dimpled members.
2. Depth: As indicated.
3. Location: For all interior stud walls where stud height is less than 14 feet.

C. Proprietary Deflection Track: Steel sheet top runner manufactured to prevent cracking of gypsum board applied to interior partitions resulting from deflection of structure above; in thickness indicated for studs and in width to accommodate depth of studs.

1. Product: Subject to compliance with requirements, provide the following:

a. SLP-TRK Slotted Deflection Track as manufactured by Clark Dietrich Building Systems or equal.

D. Flat Strap and Backing Plate: Steel sheet for blocking and bracing in length and width indicated.

1. Minimum Base Metal Thickness: 0.0568 inch, (16 gage).

E. Cold-Rolled Channel Bridging: 0.0538-inch (16 gage) bare steel thickness, with minimum 1/2-inch-wide flange.

1. Depth: 1-1/2 inches.
2. Clip Angle: 1-1/2 by 1-1/2 inch, 0.068-inch- thick, galvanized steel.

F. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

## 2.3 INTERIOR GYPSUM WALLBOARD

A. Panel Size: Provide in maximum lengths and widths available that will minimize joints in each area and correspond with support system indicated.

B. Gypsum Wallboard: ASTM C 36.

1. Type X:

a. Thickness: 5/8 inch.
b. Long Edges: Tapered.

## 2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet or plastic.
2. Shapes:

a. Cornerbead: Screw applied, use at outside corners.

b. J-Bead: Screw applied, muddable type J-shaped; exposed long flange receives joint compound; use at exposed panel edges.
c. Expansion (Control) Joint: 3/16 inch "Vee" shape reveal with removable tape. Use where indicated.

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

1. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221, alloy 6063-T5.
2. Finish: Corrosion-resistant primer compatible with joint compound and finish materials specified.
3. Aluminum Wall Cap: Aluminum end cap for wall terminations or cased openings.

a. Products: Provide one of the following:

1) "Drywall Molding End Closure, Model DMEC-4975"; Fry Reglet Corp. (800) 237-9773.
2) "Final Forms 1, Model 911-EC-487"; Gordon, Inc. (800) 747-8954.
3) "Softforms SWC-358-2"; Pittcon Industries, Inc., (800) 637-7638.

**2.5 JOINT TREATMENT MATERIALS**

A. General: Comply with ASTM C 475.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.

a. Use setting-type compound for installing paper-faced metal trim accessories.

2. Fill Coat: For second coat, use drying-type, all-purpose compound.
3. Finish Coat: For third coat, use drying-type, all-purpose compound.

**2.6 ACOUSTICAL SEALANT**

A. Acoustical Sealant for Exposed and Concealed Joints: Nonsag, paintable, nonstaining, latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24) complying with ASTM C 834 that effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

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

   a. Ohio Sealants, Inc.; Pro-Series SC-170 Rubber Base Sound Sealant.
   b. Pecora Corp.; BA-98.
   c. Tremco, Inc.; Tremco Acoustical Sealant.

**2.7 AUXILIARY MATERIALS**

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from slag wool, or rock wool.

1. Thickness: 3 inches unless otherwise indicated.

D. Grout: ASTM C 475, setting-type joint compound or gypsum neat plaster recommended for grouting hollow metal door frames.

E. Neoprene Closure Strips: ASTM D 1056, Grade SCE41 and RE41E1, black, closed-cell neoprene, 1/2" thick.

1. Products: Williams Neoprene Type NN1, 1040 Series, Williams Products, Inc. (248) 643-6400.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

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

**3.2 PREPARATION**

A. Suspended Ceilings: Coordinate installation of ceiling suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers at spacing required to support ceilings and that hangers will develop their full strength.

**3.3 INSTALLING STEEL FRAMING, GENERAL**

A. Installation Standards: ASTM C 754, and ASTM C 840 requirements that apply to framing installation.

B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with gypsum board manufacturer's written recommendations or, if none available, with United States Gypsum's "Gypsum Construction Handbook."

C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement.

1. Isolate ceiling assemblies where they abut or are penetrated by building structure.
2. Isolate partition framing and wall furring where it abuts structure, except at floor. Install slip-type joints at head of assemblies that avoid axial loading of assembly and laterally support assembly.

a. Use deflection track where indicated.

D. Do not bridge building control and expansion joints with steel framing or furring members. Frame both sides of joints independently.

**3.4 INSTALLING STEEL PARTITION AND SOFFIT FRAMING**

A. Install tracks (runners) at floors, ceilings, and structural walls and columns where gypsum board assemblies abut other construction.

B. Installation Tolerance: Install each steel framing and furring member so fastening surfaces vary not more than 1/8 inch from the plane formed by the faces of adjacent framing.

C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.

1. Cut studs 1/2 inch short of full height to provide perimeter relief. Do not fasten studs to top track to allow independent movement of studs and track.
2. For fire-rated and sound attenuation insulated partitions that extend to the underside of floor/roof slabs and decks to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed to support gypsum board closures and to make partitions continuous from floor to underside of solid structure.

a. Terminate partition framing at suspended ceilings where indicated.

D. Install steel studs and furring at the following spacings:

1. Single-Layer Construction: 16 inches o.c., unless otherwise indicated.

E. Install steel studs so flanges point in the same direction and leading edge or end of each panel can be attached to open (unsupported) edges of stud flanges first.

F. Frame door openings to comply with GA-600 and with gypsum board manufacturer's applicable written recommendations, unless otherwise indicated. Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

1. Install two 20 gage studs at each jamb.

    a. Refer to Section 06100 "Rough Carpentry" for wood blocking.

2. 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.
3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
4. Provide full head wood blocking at top runner at all door frames.

    a. Refer to Section 06100 "Rough Carpentry" for wood blocking.

G. 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.

**3.5 APPLYING AND FINISHING PANELS, GENERAL**

A. Gypsum Board Application and Finishing Standards: ASTM C 840 and GA-216.

B. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

C. Install gypsum 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. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

F. Attach gypsum panels to framing provided at openings and cutouts.

G. Form control and expansion joints with space between edges of adjoining gypsum panels.

H. Cover both faces of steel stud partition 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 open concrete joists, and other structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

I. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with U-bead edge trim where edges of gypsum panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

J. Acoustically Insulated Assemblies: Seal construction at perimeters, behind control and expansion joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through gypsum board assemblies, including sealing partitions above acoustical ceilings and sealing around receptacles and switches.

K. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's written recommendations.

1. Space screws a maximum of 12 inches o.c. for vertical applications.

L. Space fasteners in panels that are tile substrates a maximum of 8 inches o.c.

M. Fully grout hollow metal door frames and window frames. Apply grout at each jamb and immediately insert gypsum panels into frames.

**3.6 PANEL APPLICATION METHODS**

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to the 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 board.
b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

B. Single-Layer Fastening Methods: Apply gypsum panels to supports with steel drill screws.

**3.7 INSTALLING TRIM ACCESSORIES**

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

## 3.8 FINISHING GYPSUM BOARD ASSEMBLIES

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 those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below, according to ASTM C 840, for locations indicated:

1. Level 1: Embed tape at joints in ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Embed tape and apply separate first coat of joint compound to tape, fasteners, and trim flanges where panels are substrate for tile and where indicated.
3. Level 4: Embed tape and apply separate first, fill, and finish coats of joint compound to tape, fasteners, and trim flanges at panel surfaces that will be exposed to view, unless otherwise indicated.

**END OF SECTION 09260**

# SECTION 09310 - TILING

## 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. Wall tile.
2. Mosaic tile.
3. Paver tile.
4. Stone thresholds installed as part of tile installations.
5. Waterproof/crack suppression membrane for thin-set tile installations.

B. Related Sections include the following:

1. Section 02222 "Selective Demolition" for removing existing finishes.
2. Section 03300 "Cast-in-Place Concrete" for monolithic slab finishes specified for tile substrates.
3. Section 09060 "Room Finish Schedule."

### 1.3 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum 0.6.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification:

1. Full-size units of each type and composition of tile and for each color and finish required.
2. Assembled samples with grouted joints for each type and composition of tile and for each color and finish required, at least 12 inches square and mounted on rigid panel. Use grout of type and in color or colors approved for completed work.
3. Stone thresholds in 6-inch lengths.

### 1.5 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain all tile of same type and color or finish from one source or producer.

1. Obtain tile 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 a single manufacturer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section through one source from a single manufacturer for each product:

1. Stone thresholds.
2. Waterproofing/crack suppression membranes.

**1.6 DELIVERY, STORAGE, AND HANDLING**

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirement in ANSI A137.1 for labeling sealed tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.

C. Store waterproofing/crack suppression membranes in unopened containers and protected from freezing.

**1.7 PROJECT CONDITIONS**

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

**1.8 EXTRA MATERIALS**

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish 1 box for each type, composition, color, pattern, and size indicated.

**PART 2 - PRODUCTS**

**2.1 PRODUCTS, GENERAL**

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1, "Specifications for Ceramic Tile," for types, compositions, and other characteristics indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI standards referenced in "Setting and Grouting Materials" Article.

C. Colors, Textures, and Patterns: Where manufacturer's standard products are indicated for tile, grout, and other products requiring selection of colors, surface textures, patterns, and other appearance characteristics, provide specific products or materials complying with the following requirements:

1. As indicated by manufacturer's designations in Room Finish Schedule.

D. Factory Blending: For tile exhibiting color variations within ranges selected during Sample submittals, 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.

E. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer, unless otherwise indicated.

**2.2 TILE PRODUCTS**

A. Wall Tile – W1: Flat tile as follows:

1. Composition: Ceramic.
2. Facial Dimensions: 4-1/4 by4-1/4 inches nominal.
3. Thickness: 5/16 inch.
4. Face: Plain with square or cushion edges.
5. Finish: Matte glazed.
6. Products:

    a. Matte Wall Tile; American Olean

B. Mosaic Tile – W2, W3, W4, W5: Factory-mounted flat tile as follows:

1. Composition: Porcelain.
2. Facial Dimensions: 1 by 1 inch nominal.
3. Thickness: 1/4 inch.
4. Face: Plain with square or cushion edges.
5. Finish: Unglazed.
6. Products:

    a. Unglazed Mosaics; American Olean

C. Unglazed Paver Tile – F1: Flat tile as follows:

1. Composition: Porcelain.
2. Facial Dimensions: 12 by 12 inches nominal,
3. Thickness: 3/8 inch.
4. Face: Plain with square or cushion edges.
5. Finish: Cross-Sheen.
6. Products:

    a. Main Street; Crossville, Inc.

D. Trim Units: Matching characteristics of adjoining flat tile and coordinated with sizes and coursing of adjoining flat tile where applicable. Provide shapes as follows, selected from manufacturer's standard shapes:

1. Cove Base – B1: Bullnose, module size 4-1/4 by4-1/4 inches nominal.

a. Composition: Ceramic.
b. Thickness: 5/16 inch.
c. Finish: Matte glazed.
d. Products:

1) Matte Wall Tile; American Olean

**2.3 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, aligning lower edge of bevel with adjacent floor finish. Limit height of bevel to 1/2 inch or less, and finish bevel to match face of threshold.

B. Marble Thresholds: ASTM C 503 with a minimum abrasion resistance of 12 per ASTM C 1353 or ASTM C 241 and with honed finish.

1. Description: Provide the following:

a. Marble threshold to match Architect's sample as indicated in Room Finish Schedule.

**2.4 WATERPROOFING/CRACK SUPPRESSION MEMBRANES**

A. General: Manufacturer's standard product that complies with ANSI A118.10, selected from the following.

B. Fabric-Reinforced, Fluid-Applied Product: System consisting of liquid-latex rubber and fabric reinforcement.

1. Products: Waterproofing and Anti-Fracture Membranes as follows

a. Bostik; Black-Top 90210
b. Custom Building Products; Custom 9240 Waterproofing and Anti-Fracture Membrane.
c. LATICRETE International Inc.; Laticrete 9235.
d. Mapei Corp; Mapelastic HPG.
e. TEC/H.B. Fuller Construction Products Inc.; Hydraflex.

C. Unreinforced, Fluid-Applied Product: Self-curing liquid rubber polymer in a consistency suitable for brush or roller application and intended for use as waterproofing/anti-fracture membrane.

1. Products:

a. Custom Building Products; RedGard Waterproofing and Crack Prevention Membrane.
b. LATICRETE International Inc.; Laticrete Hydro Ban.

**2.5 SETTING AND GROUTING MATERIALS**

A. Prepackaged Dry Set Portland Cement Mortar Containing Polymer Admixture (ANSI 118.4 and ANSI 118.11):

1. Products:

a. Bostik; Hydroment Single Flex Premium Multi-Purpose Latex Modified Thin Set Mortar.
b. Custom Building Products; FlexBond Fortified Thin Set Mortar.
c. Laticrete International Inc.; Laticrete 254 Platinum Multipurpose Thin-Set Mortar.
d. Mapei Corp.; Ultraflex 3 Polymer Modified Thin Set Mortar.
e. TEC/H.B. Fuller Construction Products Inc.; Full Flex Latex Modified Thin Set Mortar.

B. Water-Cleanable Epoxies and Urethane Grouts (ANSI A118.3):

1. Products:

a. Bostik; Hydroment Tru-Color Pre-Mixed Grout.
b. Custom Building Products; Fusion Pro Grout.
c. Laticrete International Inc.; SpectraLock Pro Grout.
d. Mapei Corp.; Opticolor Stain Free Grout.
e. TEC/H.B. Fuller Construction Products Inc.; Accucolor EFX Epoxy Grout.

**2.6 ELASTOMERIC SEALANTS**

A. General: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer and characteristics indicated that comply with applicable requirements in Division 7 Section "Joint Sealants."

1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints,

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; formulated with fungicide, intended for sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures of high humidity and extreme temperatures.

1. Products:

a. Laaticrete International inc.; Latasil
b. Mapei Corp.; Mapesil

c. TEC/H.B. Fuller Construction Products Inc.; TEC 155 AccuColor 100 - 100% Silicone Sealant.

**2.7 MISCELLANEOUS MATERIALS**

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

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

**2.8 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 for compliance with requirements for installation tolerances and other conditions affecting performance of installed tile.

1. Verify that substrates for setting tile are firm; dry; clean; free of oil, waxy films, and curing compounds; and within flatness tolerances required by referenced ANSI A108 Series of tile installation standards for installations indicated.
2. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed before installing tile.
3. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

**3.2 PREPARATION**

A. Remove coatings, including curing compounds and other substances that contain soap, wax, oil, or silicone, that are incompatible with tile-setting materials.

B. Provide concrete substrates for tile floors installed with thin-set mortar that comply with flatness tolerances specified in referenced ANSI A108 Series of tile installation standards.

1. Fill cracks, holes, and depressions with trowelable leveling and patching compound according to tile-setting material manufacturer's written instructions. Use product specifically recommended by tile-setting material manufacturer.
2. Remove protrusions, bumps, and ridges by sanding or grinding.

C. Blending: For tile exhibiting color variations within ranges selected during Sample submittals, 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.

**3.3 INSTALLATION, GENERAL**

A. ANSI Tile Installation Standards: Comply with parts of ANSI A108 Series "Specifications for Installation of Ceramic Tile" that apply to types of setting and grouting materials and to methods indicated in ceramic tile installation schedules.

B. TCA Installation Guidelines: TCA's "Handbook for Ceramic Tile Installation." Comply with TCA installation methods indicated in ceramic tile installation schedules.

C. 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.

D. 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.

E. Jointing Pattern: Lay tile in grid pattern indicated. Align joints when adjoining tiles on floor, base, walls, and trim are same size. Lay out tile work and center tile fields in both directions in each space or on each wall area. Adjust to minimize tile cutting. 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.

F. Expansion Joints: Locate expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Locate joints in tile surfaces directly above joints in concrete substrates.
2. Prepare joints and apply sealants to comply with requirements in Section 07920 "Joint Sealants."

G. Grout tile to comply with requirements of the following tile installation standards:

1. For epoxy and urethane grouts, comply with ANSI A108.6.

**3.4 WATERPROOFING/CRACK-SUPPRESSION MEMBRANE INSTALLATION**

A. Install waterproofing/crack suppression membrane to comply with ANSI A108.13 and waterproofing/crack suppression manufacturer's written instructions to produce waterproof/crack suppression membrane of uniform thickness bonded securely to substrate.

1. Install waterproofing/crack suppression membrane under all tile floors.

**3.5 FLOOR TILE INSTALLATION**

A. General: Install tile to comply with requirements in the Floor Tile Installation Schedule, including those referencing TCA installation methods and ANSI A108 Series of tile installation standards.

1. For installations indicated below, follow procedures in ANSI A108 Series tile installation standards for providing 95 percent mortar coverage.

a. Tile floors composed of tiles 8 by 8 inches or larger.

B. Joint Widths: Install tile on floors with the following joint widths:

1. Paver Tile: 3/16 inch.

C. Stone Thresholds: Install stone thresholds at locations indicated; set in same type of setting bed as abutting field tile, unless otherwise indicated.

1. Set thresholds in latex-portland cement mortar for locations where mortar bed would otherwise be exposed above adjacent nontile floor finish.

**3.6 WALL TILE INSTALLATION**

A. Install types of tile designated for wall installations to comply with requirements in the Wall Tile Installation Schedule, including those referencing TCA installation methods and ANSI setting-bed standards.

B. Joint Widths: Install tile on walls with the following joint widths:

1. Mosaic Tile: 1/8 inch.
2. Wall Tile: 1/16 inch.

**3.7 CLEANING AND PROTECTING**

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-portland cement mortar residue and epoxy or urethane 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. Use only cleaners recommended by tile and mortar/grout manufacturers. Flush surfaces with clean water before and after cleaning.

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 cleaner from tile surfaces.

**3.8 FLOOR TILE INSTALLATION SCHEDULE**

A. Tile Installation: Interior floor installation on waterproof/crack-suppression membrane over concrete; thin-set mortar; TCA F122 and ANSI A108.5.

1. Tile Type: Unglazed paver tile.
2. Thin-Set Mortar: Latex-portland cement thin-set mortar.
3. Grout: Epoxy or urethane grout.

**3.9 WALL TILE INSTALLATION SCHEDULE**

A. Tile Installation: Interior wall installation over concrete masonry units; thin-set mortar; TCA W202l and ANSI A108.5.

1. Tile Type: Wall tile and mosaic tile.
2. Thin-Set Mortar: Latex- portland cement mortar.
3. Grout: Epoxy or urethane grout.

**END OF SECTION 09310**

# SECTION 09511 – ACOUSTICAL PANEL CEILINGS

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes:

1. Acoustical ceiling panels and exposed metal grid system.
2. Removal, modifications, and reinstallation of existing acoustical ceiling panels and existing grid system as required to facilitate new work.

B. Related Sections include the following:

1. Section 09913 "Electrostatic Painting" for painting existing suspended acoustical panel ceiling grid members.

### 1.3 DEFINITIONS

A. CAC: Ceiling Attenuation Class.

B. LR: Light Reflectance coefficient.

C. NRC: Noise Reduction Coefficient.

### 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.

1. Acoustical Panel: Set of 6-inch- square Samples of each type, color, pattern, and texture.
2. Exposed Suspension System Members, Moldings, and Trim: Set of 12-inch- long Samples of each type, finish, and color.

C. Fire Performance Affidavit: Signed by manufacturer of acoustical ceiling panels indicating compliance with specified fire performance requirements.

D. Maintenance Data: For finishes to include in maintenance manuals.

### 1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of acoustical ceiling panel and supporting suspension system through one source from a single manufacturer.

B. Fire-Test Characteristics: Provide acoustical panel ceilings that comply with the following requirements:

1. Surface-Burning Characteristics: Provide acoustical panels with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:

a. Smoke-Developed Index: 450 or less.

**1.6 DELIVERY, STORAGE, AND HANDLING**

A. Deliver acoustical panels, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.

B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.

**1.7 PROJECT CONDITIONS**

A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

**1.8 COORDINATION**

A. Coordinate layout and installation of acoustical panels and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

**1.9 EXTRA MATERIALS**

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Acoustical Ceiling Panels: 2 packages of full-size panels of each type, color and size installed.

**PART 2 - PRODUCTS**

**2.1 MINERAL-BASE ACOUSTICAL PANELS**

A. Mineral-Base Acoustical Panels – C1: Provide acoustical panels complying with the following:

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

a. Fissured, No. 755; Armstrong World Industries, Inc.

b. Fissured, No. 562; USG Corp.

2. Color: White
3. LR: Not less than 0.81.
4. NRC: Not less than 0.55.
5. CAC: Not less than 30.
6. Edge Detail: Square.
7. Thickness: 5/8 inch.
8. Size: 24 by 48 inches.

**2.2 METAL SUSPENSION SYSTEMS, GENERAL**

A. Metal Suspension System Standard: Provide manufacturer's standard direct-hung metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.

B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.

C. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated.

D. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Zinc-Coated Carbon-Steel Wire: ASTM A 641, Class 1 zinc coating, soft temper.
2. Size: Select wire diameter so its stress at three times hanger design load (ASTM C 635, Table 1, "Direct Hung") will be less than yield stress of wire, but provide not less than 0.106-inch diameter wire.

**2.3 METAL SUSPENSION SYSTEM FOR ACOUSTICAL PANEL CEILINGS**

A. Wide-Face, Capped, Double-Web, Hot-Dip Galvanized, G60, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet, hot-dip galvanized according to ASTM A 653, G60 coating designation, with prefinished, cold-rolled, 15/16-inch- wide, aluminum caps on flanges.

1. Structural Classification: Intermediate-duty system.
2. Face Design: Flat, flush.
3. Face Finish: Painted white.
4. Products: Subject to compliance with requirements, provide one of the following:

a. Prelude XL; Armstrong World Industries, Inc.
b. Donn DX; USG Corp.
c. Or equal by Chicago Metallic Corporation.

**2.4 METAL EDGE MOLDINGS AND TRIM**

A. Roll-Formed Sheet-Metal Edge Moldings and Trim: Manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.

1. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.
2. Provide outside corner caps, radiused to match bullnose concrete masonry units.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

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

**3.2 REMOVAL, SALVAGE AND REINSTALLATION OF EXISTING ACOUSTICAL CEILING PANELS AND GRID SYSTEM**

A. Remove, salvage and reinstall existing acoustical ceiling panels and grid system as required to facilitate new construction.

1. Take care not to scratch, chip, gouge, dent or otherwise damage acoustical panel faces or edges.
2. Take care not to scratch, bend, dent, twist, rack or otherwise damage grid members.
3. Store removed materials in location where they will not be damaged by construction operations or vandalism.

B. Modify existing grid system to accommodate new work.

C. Reinstall according to Article 3.3 of this Section.

D. Replace any damaged or missing grid with new.

1. Match existing grid system in size, color, texture, and material.

E. Replace any damaged or missing acoustical ceiling panels with new.

1. Match existing acoustical panels in size, color, texture, and material.

**3.3 INSTALLATION, GENERAL**

A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

B. Suspend ceiling hangers from building's structural members and as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.

    a. Install hangers for paired channel metal fascia trim vertically straight, do not splay. Space hangers evenly and symmetrically on floating ceiling areas.

2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
5. Do not attach hangers to steel roof deck. Attach hangers to structural members.
6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.

    a. Provide additional hanger wires where lighting fixtures and supply and return units occur in ceiling.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to steel deck or steel deck tabs.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.

1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.

E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.

F. Install acoustical panels with undamaged edges and fit accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide a neat, precise fit.

1. For reveal-edged panels on suspension system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.

    a. Panels requiring field cut reveal edges shall be cut using a table mounted router or "Falcon Cutter". Hand cut reveal edges are not allowed.

2. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

## 3.4 CLEANING

A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

**END OF SECTION 09511**

# SECTION 09653 - RESILIENT WALL BASE AND ACCESSORIES

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes the following:

1. Wall base.
2. Molding accessories.

B. Related Sections include the following:

1. Section 09060 "Room Finish Schedules."

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each type of product indicated, in manufacturer's standard-size.

### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

### 1.5 PROJECT CONDITIONS

A. Maintain temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. After post installation period, maintain temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

### 1.6 EXTRA MATERIALS

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish 1 roll for each color of resilient base installed.

## PART 2 - PRODUCTS

### 2.1 RESILIENT WALL BASE

A. Wall Base: ASTM F 1861.

1. Manufacturer: Johnsonite, A Tarkett Company or Roppe
2. Type (Material Requirement): TS (rubber, vulcanized thermoset) or TP (rubber, thermoplastic).
3. Group (Manufacturing Method): I (solid, homogeneous).
4. Style: Cove (with top-set toe) as scheduled.
5. Minimum Thickness: 0.125 inch.
6. Height: 4 inches as scheduled.
7. Lengths: Coils in manufacturer's standard length.
8. Outside Corners: Job formed.
9. Inside Corners: Job formed.
10. Surface: Smooth.
11. Colors: As indicated in Section 09060 Room Finish Schedule.

### 2.2 RESILIENT MOLDING ACCESSORIES

A. Description:

1. Resilient edge strip for carpet to concrete: EG-XX-G/H/W; Johnsonite, or approved equal.

B. Material: Rubber.

### 2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic cement based formulation provided or approved by resilient product manufacturers for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

a. Wall Base Adhesives: 50 g/L.
b. Rubber Floor Accessories Adhesives: 60 g/L.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances, moisture content, and other conditions affecting performance.

1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

**3.2 PREPARATION**

A. Prepare substrates according to manufacturer's written recommendations to ensure adhesion of resilient products.

B. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

1. Do not install resilient products until they are the same temperature as the space where they are to be installed.

C. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation. After cleaning, examine substrates for moisture, alkaline salts, carbonation, and dust. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.3 RESILIENT WALL BASE INSTALLATION**

A. Apply wall base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

B. Install wall base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

C. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

D. Do not stretch wall base during installation.

E. Job-Formed Corners:

1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends. Shave back of base at points where bends occur and remove strips perpendicular to length of base that are only deep enough to produce a snug fit without removing more than half the wall base thickness.
2. Inside Corners: Use straight pieces of maximum lengths possible. Form by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce a snug fit to substrate.

**3.4 RESILIENT ACCESSORY INSTALLATION**

A. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor coverings that would otherwise be exposed.

**3.5 CLEANING AND PROTECTION**

A. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.
2. Sweep and vacuum surfaces thoroughly.

3. Damp-mop surfaces to remove marks and soil.

    a. Do not wash surfaces until after time period recommended by manufacturer.

B. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods recommended in writing by manufacturer.

**END OF SECTION 09653**

# SECTION 099100 - PAINTING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes surface preparation and field painting of the following:

1. Exposed exterior items and surfaces.
2. Exposed interior items and surfaces.
3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.

B. Paint exposed surfaces, except where these Specifications indicate that the surface or material is not to be painted or is to remain natural. If an item or a surface is not specifically mentioned, paint the item or surface the same as similar adjacent materials or surfaces. If a color of finish is not indicated, Architect will select colors and finishes. Painting includes but is not limited to the following:

1. Painting of all semi-concealed areas (e.g. inside of light troughs and valances, behind grilles, above floating ceilings, and projecting edges above and below sight lines.
2. Exterior substrates include, but is not limited to, the following:

    a. Hollow metal doors and frames.
    b. Exposed structural steel and steel lintels.
    c. Steel railings and guardrails.
    d. Metal stair stringers and framing.
    e. Steel ladders.
    f. Steel piping and conduit and pipe and conduit supports.
    g. Concrete masonry units (CMU).

3. Interior substrates include, but is not limited to, the following:

    a. Concrete.
    b. Concrete masonry units (CMU).
    c. Steel.
    d. Galvanized steel.
    e. Gypsum board.

4. Painting includes field painting of exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron supports, and surfaces of mechanical and electrical equipment that do not have a factory-applied final finish.

C. Do not paint prefinished items, concealed surfaces, finished metal surfaces, operating parts, and labels.

1. Prefinished items include the following factory-finished components:

   a. Galvanized gratings, grating stair treads and ladder rungs.
   b. Architectural woodwork.
   c. Acoustical wall panels.
   d. Metal toilet enclosures.
   e. Finished mechanical and electrical equipment.
   f. Light fixtures.

2. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:

   a. Foundation spaces.
   b. Furred areas.
   c. Ceiling plenums.
   d. Utility tunnels.
   e. Pipe spaces.
   f. Duct shafts.

3. Finished metal surfaces include the following:

   a. Anodized aluminum.
   b. Stainless steel.
   c. Chromium plate.
   d. Copper and copper alloys.
   e. Bronze and brass.

4. Operating parts include moving parts of operating equipment and the following:

   a. Valve and damper operators.
   b. Linkages.
   c. Sensing devices.
   d. Motor and fan shafts.

5. Labels: Do not paint over UL, FMG, or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
6. Telephone backing panels.

D. Related Sections include the following:

1. Section 05500 "Metal Fabrications" for shop priming ferrous metal.
2. Section 08110 "Hollow Metal Doors and Frames" for factory priming steel frames.
3. Section 09260 "Gypsum Board Assemblies" for surface preparation of gypsum board.
4. Section 09913 "Electrostatic Painting" for painting existing suspended acoustical panel ceiling grid members.
5. Section 09060 "Room Finish Schedule" for room finish schedule.

**1.3 DEFINITIONS**

A. Dry Film Thickness (DFT): The thickness of the dry film of a coating measured in mils.

B. Mils: One one-thousandth of an inch. Used to measure thickness of coating films.

C. Sheen/Gloss: Defined in ASTM D 523 apply to this Section.

1. Gloss Level 1 (Matte or Flat Finish): Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
2. Gloss Level 2 (Velvet Finish): Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
3. Gloss Level 3 (Eggshell Finish): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
4. Gloss Level 4 (Satin Finish): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
5. Gloss Level 5 (Semi-Gloss Finish): 35 to 70 units at 60 degrees, according to ASTM D 523.
6. Gloss Level 6 (Gloss Finish): 70 to 85 units at 60 degrees, according to ASTM D 523.
7. Gloss Level 7 (High Gloss Finish): More than 85 units at 60 degrees, according to ASTM D 523.

**1.4 SUBMITTALS**

A. Product Data: For each type of product. Include preparation requirements and application instructions, include the following:

1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.

B. Samples for Verification: For each color and material to be applied, with texture to simulate actual conditions, on representative Samples of the actual substrate.

1. On draw down display cards submit three samples of each color and finish.

C. Qualification Data: For Applicator.

D. Maintenance Data: Submit the following

1. Color Chips: After final approval of all colors, submit color chips of all coatings used with manufacturer's name and mix formulation of each color and coating for the purpose of future re-ordering of coatings. Color chips shall be at least six (6) inches square.

**1.5 QUALITY ASSURANCE**

A. Applicator Qualifications: A firm and individuals experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project.

B. Source Limitations: Obtain block fillers and primers for each coating system from the same manufacturer as the finish coats.

## 1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. 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. Protect from freezing. Keep storage area neat and orderly.
3. Remove rags and waste from storage areas daily.

C. Take all necessary precautionary and safety measures to prevent fire hazards and spontaneous combustion and to protect the environment from hazard spills. Materials that constitute a fire hazard (paints, solvents, drop clothes, etc.) shall be stored in suitable closed and rated containers and removed from the site on a daily basis.

## 1.7 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 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.

## 1.8 EXTRA MATERIALS

A. Furnish extra paint materials from the same production run as the materials applied and in the quantities described below. Package with protective covering for storage and identify with labels describing contents. Deliver extra materials to Owner.

1. Quantity: Furnish Owner with extra paint materials in quantities indicated below:

a. Interior, Paints: 5 gal. of each color and gloss applied.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

A. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

B. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:

1. Benjamin Moore & Co. (Benjamin Moore).
2. PPG Industries, Inc. (Pittsburgh Paints).
3. Sherwin-Williams Co. (Sherwin-Williams).

**2.2 PAINT MATERIALS, GENERAL**

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. All paint shall be ready-mixed and pre-tinted. Re-mix all paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and color and gloss uniformity.

C. Material Quality: Provide manufacturer's paint material of the various coating types specified that are factory formulated and recommended by manufacturer for application indicated. Paint-material containers not displaying manufacturer's product identification will not be acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other specified manufacturers.

D. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24)].

1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Dry-Fog Coatings: 400 g/L.
4. Primers, Sealers, and Undercoaters: 200 g/L.
5. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
6. Zinc-Rich Industrial Maintenance Primers: 340 g/L.
7. Floor Coatings: 100 g/L.

E. Restricted Components: Paints and coatings shall not contain any of the following:

1. Acrolein.

2. Acrylonitrile.
3. Antimony.
4. Benzene.
5. Butyl benzyl phthalate.
6. Cadmium.
7. Di (2-ethylhexyl) phthalate.
8. Di-n-butyl phthalate.
9. Di-n-octyl phthalate.
10. 1,2-dichlorobenzene.
11. Diethyl phthalate.
12. Dimethyl phthalate.
13. Ethylbenzene.
14. Formaldehyde.
15. Hexavalent chromium.
16. Isophorone.
17. Lead.
18. Mercury.
19. Methyl ethyl ketone.
20. Methyl isobutyl ketone.
21. Methylene chloride.
22. Naphthalene.
23. Toluene (methylbenzene).
24. 1,1,1-trichloroethane.
25. Vinyl chloride.

F. Colors: As indicated in Room Finish Schedule.

**2.3 CONCRETE UNIT MASONRY BLOCK FILLERS**

A. Block Filler, Latex, Interior/Exterior:

1. Benjamin Moore; Superspec Masonry High Build Interior/Exterior Block Filler No. 206 (45g/L VOC): Applied at a dry film thickness of not less than 8.5 mils.
2. Pittsburgh Paints; 6-15 SpeedHide Interior/Exterior Masonry Latex Block Filler (47.50 g/L VOC): Applied at a dry film thickness of not less than 7.2 mils.
3. Sherwin-Williams; PrepRite Interior/Exterior Block Filler B25W25 (42 g/L VOC): Applied at a dry film thickness of not less than 8.0 mils.

**2.4 EXTERIOR PRIMERS**

A. Exterior Galvanized Metal Primer: Factory-formulated galvanized metal primer for exterior application.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04 (51g/L VOC): Applied at a dry film thickness of not less than 2.0 mils.
2. Pittsburgh Paints; 90-909 Pitt-Tech Plus Interior/Exterior Industrial DTM Primer (90 g/L VOC): Applied at a dry film thickness of not less than 2.0 mils.
3. Sherwin-Williams; S-W Pro Industrial Pro-Cryl Universal Primer B66-310 Series (100 g/L VOC): Applied at a dry film thickness of not less than 2.5 mils.

**2.5 INTERIOR PRIMERS**

A. Adhesion Promoting Primer: Factory-formulated alkali-resistant acrylic-latex interior adhesion promoting primer/stain blocker for topcoat adhesion to slick, hard to paint interior surfaces.

1. Benjamin Moore; Fresh Start Hi-Hiding All Purpose Primer 046 (0.44 g/L VOC).
2. Pittsburgh Paints; Seal-Grip Interior/Exterior 100% Acrylic Universal Primer/Sealer 17-921 (84 g/L VOC).
3. Sherwin-Williams; PrepRite ProBlock Interior/Exterior Latex Primer/Sealer B51, (96 g/L VOC).

B. Interior Wood and Gypsum Board Primer: Factory-formulated latex-based primer for interior application.

1. Benjamin Moore; Ultra Spec 500 Interior Latex Primer No. N534 (0 g/L VOC): Applied at a dry film thickness of not less than 0.8 mils.
2. Pittsburgh Paints; 9-900 Pure Performance Interior Latex Primer (0 g/L VOC): Applied at a dry film thickness of not less than 1.4 mils.
3. Sherwin-Williams; S-W ProMar 200 Zero VOC Interior Latex Primer B28 W02600 (0 g/L VOC): Applied at a dry film thickness of not less than 1.5 mils.

C. Interior Ferrous-Metal Primer: Factory-formulated quick-drying rust-inhibitive acrylic metal primer.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04 (51g/L VOC): Applied at a dry film thickness of not less than 2.0 mils.
2. Pittsburgh Paints; 90-909 Pitt-Tech Plus Interior/Exterior Industrial DTM Primer (90 g/L VOC): Applied at a dry film thickness of not less than 2.0 mils.
3. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer B66-310 Series (100 g/L VOC): Applied at a dry film thickness of not less than 3.0 mils.

D. Interior Zinc-Coated-Metal Primer: Factory-formulated quick-drying rust-inhibitive acrylic metal primer.

1. Benjamin Moore; Moore's IMC Acrylic Metal Primer No. M04 (51g/L VOC): Applied at a dry film thickness of not less than 2.0 mils.
2. Pittsburgh Paints; 90-909 Pitt-Tech Plus Interior/Exterior Industrial DTM Primer (90 g/L VOC): Applied at a dry film thickness of not less than 2.0 mils.
3. Sherwin-Williams; Pro Industrial Pro-Cryl Universal Primer B66-310 Series (100 g/L VOC): Applied at a dry film thickness of not less than 3.0 mils.

**2.6 EXTERIOR FINISH COATS**

A. Exterior Full-Gloss Acrylic Enamel for Metals: Factory-formulated full-gloss waterborne acrylic-latex enamel for exterior application.

1. Benjamin Moore; Moore's Super Spec HP DTM Acrylic Gloss No. P28 (147 g/L VOC): Applied at a dry film thickness of not less than 3.0 mils.
2. Pittsburgh Paints; Pitt-Tech Plus Low VOC Interior/Exterior Gloss Industrial Enamel 90-1310 (88.6 g/L VOC): Applied at a dry film thickness of not less than 2.5 mils.
3. Sherwin-Williams; S-W Pro Industrial Zero VOC Gloss Acrylic B66-600 Series (0 g/L VOC): Applied at a dry film thickness of not less than 2.5 mils.

## 2.7 INTERIOR FINISH COATS

A. Interior Flat Acrylic Paint: Factory-formulated flat acrylic-emulsion latex paint for interior application.

1. Benjamin Moore; Ultra Spec 500 Interior Latex Finish Flat No. N536 (0 g/L VOC): Applied at a dry film thickness of not less than 1.8 mils.
2. Pittsburgh Paints; 9-100 Series Pure Performance Interior Flat Latex (0 g/L VOC): Applied at a dry film thickness of not less than 1.8 mils.
3. Sherwin-Williams; S-W ProMar 200 Zero VOC Interior Latex Flat B30-2600 Series (0 g/L VOC): Applied at a dry film thickness of not less than 1.6 mils.

B. Interior Eggshell Acrylic Enamel: Factory-formulated eggshell acrylic-latex interior enamel.

1. Benjamin Moore; Ultra Spec 500 Interior Eggshell Finish No. N538 (0 g/L VOC): Applied at a dry film thickness of not less than 1.8 mils.
2. Pittsburgh Paints; 9-300 Series Pure Performance Interior Eggshell (0 g/L VOC): Applied at a dry film thickness of not less than 1.5 mils.
3. Sherwin-Williams; S-W ProMar 200 Zero VOC Interior Latex Eg-Shel B20-2600 Series (0 g/L VOC): Applied at a dry film thickness of not less than 1.6 mils.

C. Interior Semigloss Acrylic Enamel: Factory-formulated semigloss acrylic-latex enamel for interior application.

1. Benjamin Moore; Ultra Spec 500 Interior Semi-Gloss Finish No. N539 (0 g/L VOC): Applied at a dry film thickness of not less than 1.8 mils.
2. Pittsburgh Paints; 9-500 Series Pure Performance Interior Semi-Gloss (0 g/L VOC): Applied at a dry film thickness of not less than 1.7 mil.
3. Sherwin-Williams; S-W ProMar 200 Zero VOC Interior Latex Semi-Gloss B31-2600 Series (0 g/L VOC): Applied at a dry film thickness of not less than 1.6 mils.

D. Interior Semigloss Acrylic Enamel for Metals: Factory-formulated quick-drying rust-inhibitive acrylic.

1. Benjamin Moore; Moore's Super Spec DTM Acrylic Semi-Gloss No. P29 (206 g/L VOC): Applied at a dry film thickness of not less than 3.0 mils.
2. Pittsburgh Paints; Pitt-Tech Plus Low VOC Interior/Exterior Semi-gloss Industrial Enamel 90-1210 (87.9 g/L VOC): Applied at a dry film thickness of not less than 2.5 mils.
3. Sherwin-Williams; S-W Pro Industrial Zero VOC Semi-Gloss Acrylic B66-650 Series (0 g/L VOC): Applied at a dry film thickness of not less than 2.5 mils.

## 2.8 CLEANING MATERIALS

A. Cleaning Materials: Cleaners and degreasers which contain no solvents, phosphates, halogens or alkali hydroxides:

1. Products: Provide the following:

a. T. S. P. Substitute Heavy Duty Cleaner; DAP Inc..
b. Custom T. S. P. Substitute; Custom Building Products, Inc.
c. TSP-PF or Liquid TSP Substitute; Savogran.
d. Devoe Devprep 88; ICI.

**2.9 PAINT STRIPPERS**

A. Paint Stripper: Safe for wood and metal, containing no methylene chloride, methanol or caustic ingredients. Material shall not raise the grain of wood.

1. Products: Provide the following:

a. Peel Away 7; Dumond Chemicals, Inc. (212) 869-6350.
b. Architect approved equal.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine substrates and conditions 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 (CMU): 12 percent.
3. Gypsum Board: 12 percent.

C. Conduct all moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple cover patch test.

D. Test concrete, masonry and plaster surfaces for alkalinity as required.

E. Gypsum Board Substrates: Verify that finishing compound is sanded smooth and is dust free.

F. Verify suitability of substrates, including surface conditions and compatibility with finishes and primers.

1. Notify Architect about anticipated problems when using the materials specified over substrates primed by others.

G. 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. Remove and securely store hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of size or weight of the item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

C. Repair Of Existing Drywall Surfaces: Spackle and sand smooth minor surface imperfections in existing drywall and plaster surfaces. Repair is limited to imperfections of not more than 2 sq. inches in area and 3/8 inch in depth.

D. Protect all adjacent interior surfaces and areas, including rating and instruction labels on doors, frames, equipment, piping, etc., from painting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.

E. Substrate defects shall be made good and sanded by others ready for painting particularly after the first coat of paint. Start of finish painting of defective surfaces (e.g. gypsum board) shall indicate acceptance of substrate and any costs of making good defects shall be borne by the painter including re-painting of entire defective surface (no touch-up painting).

F. Cleaning, General: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings including dust, dirt, oil, grease, and incompatible paints.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

G. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.
2. 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.

H. 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.

I. Ferrous Metals: Clean ungalvanized ferrous-metal surfaces that have not been shop primed; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations as follows:

1. SSPC-SP 2, "Hand Tool Cleaning."
2. SSPC-SP 3, "Power Tool Cleaning."

J. Shop-Primed Steel Substrates: Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer, and touch up with the same primer as the shop coat

K. Galvanized Surfaces: Clean galvanized surfaces, including floor and roof deck, with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

L. Existing Surfaces: Remove all surface contamination such as, oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, and mortar to assure sound bonding to the tightly adhered existing paint.

1. Clean previously painted surfaces to remove dirt, masking tape, labels, adhesives, and other materials that would either be deleterious to adhesion of, or show through, new paint.
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. Thoroughly wash surfaces and dull by sanding, including concrete masonry surfaces, gypsum board, plaster and metal surfaces.
4. Spot prime all bare areas with appropriate primer before priming entire surface.

M. Existing Hollow Metal Frames: Strip paint from hollow metal frames indicated to be repainted using water rinsable organic non-solvent based chemical paint remover.

1. Apply chemical paint remover in accordance with manufacturer's instruction. Allow sufficient time to permit paint to soften, but do not allow chemical paint remover to dry out.
2. Remove softened paint using putty knives, paint scrappers or other tools.
3. Repeat application of chemical paint remover until paint is completely removed.
4. Thoroughly rinse frames with clean water to remove all residue of chemical paint remover and leave frames ready for painting.

N. Material Preparation: Mix and prepare paint materials according to manufacturer's written instructions.

1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
3. Use only thinners approved by paint manufacturer and only within recommended limits.

**3.3 APPLICATION**

A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Paint colors, surface treatments, and finishes are indicated in the schedules.
2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
3. Provide finish coats that are compatible with primers used.
4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.

5. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
6. 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 where visible through registers or grilles.
7. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
8. Finish exterior doors on tops, bottoms, and all four edges the same as exterior faces.

B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. The number of coats and film thickness required are the same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
2. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
3. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, and does not deform or feel sticky under moderate thumb pressure, and until application of another coat of paint does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for type of material applied. Use brush of appropriate size for surface or item being painted.
2. Rollers: Use rollers of carpet, velvet-back, or high-pile sheep's wool as recommended by manufacturer for material and texture required.
3. Spray Equipment: Use airless spray equipment with orifice size as recommended by manufacturer for material and texture required.

D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate to achieve dry film thickness indicated. Provide total dry film thickness of the entire system as recommended by manufacturer.

E. Mechanical Work: Painting of mechanical work is limited to the following:

1. Exterior: Unless otherwise indicated, painting includes, but is not limited to, the following:

a. Structural supports for mechanical equipment.
b. Mechanical equipment (except pre-finished equipment).
c. Piping (including insulated piping), pipe hangers, and supports.

1) For all new or existing exterior natural gas piping running above the roof, paint Safety Yellow.
2) For all new and existing piping running horizontally or vertically against a building wall exposed to public view, paint to match building wall.

d. Ductwork.
e. Accessory items.

2. Interior Occupied Areas: Unless otherwise indicated, painting includes, but is not limited to, the following when exposed to view in finished construction:

a. Structural supports for mechanical equipment.
b. Mechanical equipment (except pre-finished equipment).
c. Piping (including insulated piping), pipe hangers, and supports.
d. Ductwork.
e. Insulation on pipe and ductwork.
f. Accessory items.
g. Fire suppression system piping.

3. Interior Spaces, Concealed Above Acoustic Ceilings: Unless otherwise indicated, paint the following:

a. Fire suppression piping, 3-inch diameter and larger shall be painted Red.
b. Natural Gas piping shall be painted Safety Yellow
c. All junction boxes and couplings containing DDC related wiring or pneumatic tubing shall be painted a "Sky Blue" color.

4. Interior Service Areas (Equipment Rooms, Mechanical Rooms, Electrical Rooms, Elevator Equipment Rooms, Utility Spaces, etc.): Unless otherwise indicated, painting includes, but is not limited to, the following items when exposed to view in finished construction:

a. Structural supports for mechanical equipment.
b. Mechanical equipment (except pre-finished equipment).
c. Piping (including insulated piping), pipe hangers, and supports.
d. Ductwork.
e. Accessory items.
f. Fire suppression system piping shall be painted Red.
g. For all exposed natural gas piping exposed in Service Areas (Mechanical Rooms, etc.), paint Safety Yellow.
h. All junction boxes and couplings containing DDC related wiring or pneumatic tubing shall be painted a "Sky Blue" color.

F. Electrical Work: Painting of electrical work is limited to the following:

1. Exterior: Unless otherwise indicated, painting includes, but is not limited to, the following, color coding not required:

a. Structural supports for electrical equipment.
b. Electrical equipment (except pre-finished equipment).
c. Conduit and fittings, panels and boxes, and wiremold.
d. Panelboards, including telephone equipment.
e. Accessory items.

2. Interior Occupied Areas: Unless otherwise indicated, painting includes, but is not limited to, the following when items exposed to view in finished construction, color coding not required:

a. Structural supports for electrical equipment.

b. Electrical equipment (except pre-finished equipment).
c. Conduit and fittings, panels and boxes, and wiremold.
d. Panelboards, including telephone equipment.
e. Accessory items.

3. Interior Service Areas (Equipment Rooms, Mechanical Rooms, Electrical Rooms, Elevator Equipment Rooms, Utility Spaces, etc.): Unless otherwise indicated, painting includes, but is not limited to, the following items exposed to when view in finished construction:

a. Structural supports for electrical equipment.
b. Electrical equipment (except pre-finished equipment).
c. Conduit and fittings, panels and boxes, and wiremold.

1) All junction boxes and couplings Fire Alarm circuits and Emergency Power circuits shall be painted Red.
2) All junction boxes and couplings containing Clock circuits shall be painted Orange.

d. Panelboards, including telephone equipment.
e. Accessory items.
f. Backprime and paint face and edges of plywood service panels for telephone and electrical equipment before installation gray, semi-gloss. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

4. Interior Spaces, Concealed Above Acoustic Ceilings: Paint the following:

a. All junction boxes and couplings Fire Alarm circuits and Emergency Power circuits shall be painted Red.
b. All junction boxes and couplings containing Clock circuits shall be painted Orange.

G. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

H. Prime Coats: Before applying finish coats, apply a prime coat, as recommended by manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.

I. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

J. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

K. Painted exterior and interior surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent:

1. Brush / 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. Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
3. Damage due to touching before paint is sufficiently dry or any other contributory cause.
4. Damage due to application on moist surfaces or caused by inadequate protection from the weather.
5. Damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).

L. Painted surfaces shall be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces and final lighting source (including daylight) for interior surfaces:

1. Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
2. Visible defects are evident on horizontal surfaces when viewed at normal viewing angles from a distance of not less than 39 inches.
3. Visible defects are evident on ceiling, soffit and other overhead surfaces when viewed at normal viewing angles.
4. When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.

M. Painted surfaces rejected by the Architect shall be made good at the expense of the Contractor. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

**3.4 CLEANING**

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

1. Dispose wash water from latex paint to the sanitary sewer. Excess latex paint shall be salvaged for reuse or solidified for disposal with other construction materials. Dry empty latex paint cans and dispose with other construction materials. Contact UM OSEH Hazardous Materials (734-763-4568) to arrange for disposal of solvent based paints and other solvents.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

**3.5 PROTECTION**

A. Protect adjacent surfaces against damage from paint application. Correct damage to adjacent surfaces by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

B. Provide "Wet Paint" signs to protect newly painted finishes. After completing painting operations, remove temporary protection.

1. After work of other trades is complete, touch up and restore damaged or defaced painted surfaces.

**3.6 EXTERIOR PAINT SCHEDULE**

A. Zinc-Coated Metal: Provide the following finish systems over exterior zinc-coated metal surfaces, including but not limited to, exposed structural steel, steel lintels, exterior hollow metal doors and frames, exterior steel stairs and steel pipe railings, exterior ladders.

1. Full-Gloss Acrylic-Enamel Finish: Two finish coats over a rust-inhibitive primer.

a. Primer: Exterior galvanized-metal primer.
b. Finish Coats: Exterior full-gloss acrylic enamel for metals.

**3.7 INTERIOR PAINT SCHEDULE**

A. Concrete Unit Masonry: Provide the following finish systems over interior concrete masonry:

1. Semigloss Acrylic-Enamel Finish: Two finish coats finish coats over a block filler.

a. Block Filler: Concrete unit masonry block filler.
b. Finish Coats: Interior semigloss acrylic enamel.

B. Gypsum Board: Provide the following finish systems over interior gypsum board surfaces:

1. Flat Acrylic Finish: Two finish coats over a primer. Provide flat finish on all gypsum board ceilings, ceiling drops and soffits.

a. Primer: Interior gypsum board primer.
b. Primer: Acrylic-latex interior adhesion promoting primer/stain blocker on existing painted gypsum board.
c. Finish Coats: Interior flat acrylic paint.

2. Eggshell Acrylic-Enamel Finish: Two finish coats over a primer. Provide eggshell finish on all gypsum board walls in public areas.

a. Primer: Interior gypsum board primer.
b. Primer: Acrylic-latex interior adhesion promoting primer/stain blocker on existing painted gypsum board.
c. Finish Coats: Interior eggshell acrylic enamel.

3. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer. Provide semi-gloss finish for all gypsum board walls in Electrical Rooms, TR Rooms, Storage Rooms and Closets.

    a. Primer: Interior gypsum board primer.
    b. Primer: Acrylic-latex interior adhesion promoting primer/stain blocker on existing painted gypsum board.
    c. Finish Coats: Interior semigloss acrylic enamel.

C. Ferrous Metal: Provide the following finish systems over ferrous metal, including but not limited to, exposed portions of stair stringers, risers, support brackets, tread and landing pan edges, underside of stairs, including tread and landing pans, handrails and guardrails, steel lintels, steel ladders, hollow metal doors and frames, access panels, supports for mechanical ducts, piping and equipment, gas piping, fire protection piping, supports for electrical equipment, all metal exposed in elevator shafts (except guide rails):

1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.

    a. Primer: Interior ferrous-metal primer.
    b. Finish Coats: Interior semigloss acrylic enamel.

D. Zinc-Coated Metal: Provide the following finish systems over interior zinc-coated metal surfaces, including, but not limited to access panels, supports for mechanical equipment, ductwork, electrical conduit:

1. Semigloss Acrylic-Enamel Finish: Two finish coats over a primer.

    a. Primer: Interior zinc-coated metal primer.
    b. Finish Coats: Interior semigloss acrylic enamel.

E. All-Service Jacket over Insulation: Provide the following finish system on pipe and duct insulation:

1. Semi-Gloss Acrylic Finish: Two finish coats over primer.

    a. Primer: Adhesion promoting primer.
    b. Finish Coats: Interior flat acrylic dryfall paint.
    c. Finish Coats: Interior semigloss acrylic paint.

**3.8 WASTE MANAGEMENT**

A. Close and tightly seal all partly used containers and store protected in well-ventilated, fire-safe area at moderate temperature. Deliver to reuse and/or recycle facilities if not removed from site for Contractor's reuse.

B. Separate and recycle waste materials, packaging, and all other materials in accordance with the Waste Management Plan and to the maximum extent possible, send to reuse or recycle centers.

C. Check with manufacturer for recycling options. Many manufacturers take back scrap and unused portions for resale or manufacturing into new product.

**END OF SECTION 099100**

# SECTION 09913 — ELECTROSTATIC PAINTING

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

A. This Section includes application of electrostatic coating systems including surface preparation, prime coats and topcoats.

B. Items to be electrostatically painted include the following:

1. Existing suspended acoustical panel ceiling grid members.

C. Related Sections include the following:

1. Section 09511" Acoustical Panel Ceilings."
2. Section 09912" Painting."

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: Of each color for review of color and texture only.

1. Provide samples of each color and material to be applied, with texture to simulate actual conditions, on draw down display cards. Resubmit samples as requested until the required sheen, color and texture is achieved.

### 1.4 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying electrostatic coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain primers for each coating system from the same manufacturer as the finish coats.

### 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.
8. VOC content.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain storage containers in a clean condition, free of foreign materials and residue.

1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily.

**1.6 PROJECT CONDITIONS**

A. Apply electrostatic coatings only when temperatures of surfaces to be painted and surrounding air are between 50 and 90 deg F.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

A. Metal Cleaner: Biodegradable general purpose industrial cleaner and degreaser.

1. Products: Provide the following:

a. RCHD Citaprep Cleaner; Accessa Coatings Solutions, (800) 593-0126.
b. Architect approved equal.

B. Primer: Rust inhibitive, anti-corrosive metal primer and intermediate barrier coat, resistant to finish coats containing strong solvents.

1. Products: Provide the following:

a. Universal Primer; Accessa Coatings Solutions, (800) 593-0126.
b. Architect approved equal.

C. Electrostatic Enamel: High quality, fast drying, alkyd enamel specifically formulated for electrostatic application.

1. Products: Provide the following:

a. Super Star Electrostatic Enamel; Accessa Coatings Solutions, (800) 593-0126.
b. Architect approved equal.

D. Color: To match RAL 9003, Signal White.

1. Match samples approved by Architect for color, texture, and coverage.

**PART 3 - EXECUTION**

**3.1 PREPARATION**

A. Surface Preparation and Cleaning: Before applying electrostatic paint, clean metal surfaces of substances that could impair bond of the electrostatic paint. Remove all surface contamination such as, oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold and mildew to assure sound bonding to the tightly adhered existing paint.

1. Scrape all loose, blistered, scratched or otherwise imperfect paint down to bare metal and sand tightly adhering paint to feather edge.

2. Degrease and clean surfaces by wet sanding with " RCHD Citaprep Cleaner " reduced in water, rinsing with clean water. Rinse with warm water and wipe down with clean rags until surface is dry.

B. Provide surface-applied protection before application of electrostatic paint.

1. Provide masking on existing floors, walls, glass and columns and other adjacent surfaces.

C. Material Preparation: Mix and prepare electrostatic paint materials according to manufacturer's written instructions.

1. Use only thinners approved by electrostatic paint manufacturer and only within recommended limits.

**3.2 APPLICATION**

A. General: Apply electrostatic paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
2. Provide finish coats that are compatible with primers used.

B. Scheduling Painting: Apply primer coat to surfaces that have been cleaned, and prepared for electrostatic painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
2. If undercoats, stains, or other conditions show through final coat of electrostatic paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure that edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

C. Application Procedures: Apply electrostatic paints by Ramsburg #2 electrostatic deposition method.

D. Prime Coats: Before applying finish coats, apply rust inhibitive primer to act as an intermediate coat between existing painted surfaces and new coating.

E. Finish Coats: Completely cover surfaces to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

1. Over primer apply a dustcoat of finish paint in order to prevent runs and stop lifting.
2. Apply final coat of paint of uniform film thickness and with a smooth and clean appearance.

F. Completed Work: Match approved samples for color, texture, and coverage. Repaint work not complying with requirements.

## 3.3 CLEANING

A. Cleanup: At the end of each workday, remove all masking, empty cans, rags, rubbish, and other discarded paint materials from Project site.

1. After completing painting, clean adjacent paint-spattered surfaces. Remove spattered paint by washing and scraping without scratching or damaging adjacent finished surfaces.

## 3.4 PROTECTION

A. Protect adjacent construction against damage from electrostatic painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.

B. Provide "Wet Paint" signs to protect newly painted finishes.

**END OF SECTION 09913**

# SECTION 10155 - TOILET COMPARTMENTS

## 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 baked-enamel units as follows:

1. Toilet Enclosures: Overhead braced.

B. Related Sections include the following:

1. Division 10 "Toilet and Bath Accessories" for toilet tissue dispensers, grab bars, and similar accessories.

### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show locations of cutouts for compartment-mounted toilet accessories.
2. Show locations of reinforcements for compartment-mounted grab bars.

C. Samples for Verification: Of each type of color and finish required for units, prepared on 6-inch-square Samples of same thickness and material indicated for Work.

### 1.4 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating toilet compartments without field measurements. Coordinate wall, floor, ceilings, and other contiguous construction to ensure that actual dimensions correspond to established dimensions.

**PART 2 - PRODUCTS**

**2.1 METAL UNITS**

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

1. Accurate Partitions Corporation.
2. Ampco.
3. Bradley Corporation; Mills Partitions.
4. Flush Metal Partition Corp.
5. General Partitions Mfg. Corp.
6. Global Steel Products Corp.
7. Hadrian Inc.
8. Knickerbocker Partitions Corp.
9. Metpar Corp.
10. Sanymetal; a Crane Plumbing Company.

B. Baked-Enamel Units: Facing sheets and closures fabricated from ASTM A 591/A 591M, 80Z (electrolytically zinc-coated) or ASTM A 653/A 653M (hot-dip galvanized or galvannealed), commercial steel sheet for exposed applications, that is mill phosphatized, and selected for smoothness.

1. Facing Sheet Thicknesses: Minimum base-metal (uncoated) thicknesses as follows:

a. Pilasters, Braced at Both Ends: Manufacturer's standard thickness, but not less than 0.0329 inch.
b. Panels: Manufacturer's standard thickness, but not less than 0.0269 inch.
c. Doors: Manufacturer's standard thickness, but not less than 0.0269 inch.
d. Integral-Flange, Wall-Hung Urinal Screens: Manufacturer's standard thickness, but not less than 0.0269 inch.

2. Finish: Manufacturer's standard pigmented, organic coating, including thermosetting, electrostatically applied, and powder coatings. Provide coating system that complies with coating manufacturer's written instructions for pretreatment, application, baking, and minimum dry film thickness.

a. Color: Match colors indicated in Section 09060 "Room Finish Schedule."

C. Door, Panel, and Pilaster Construction: Seamless, metal facing sheets are pressure laminated to core material. Units have continuous, interlocking molding strip or lapped and formed edge closures. Exposed surfaces are free of pitting, seam marks, roller marks, stains, discolorations, telegraphing of core material, or other imperfections. Corners are sealed by welding or clips. Exposed welds are ground smooth.

1. Core Material: Manufacturer's standard sound-deadening honeycomb of resin-impregnated kraft paper in thickness required to provide finished thickness of 1 inch for doors and panels and 1-1/4 inches for pilasters.
2. Grab-Bar Reinforcement: Provide concealed internal reinforcement for grab bars mounted on units.
3. Tapping Reinforcement: Provide concealed reinforcement for tapping (threading) at locations where machine screws are used for attaching items to units.

D. Pilaster Shoes and Sleeves (Caps): Stainless steel, ASTM A 666, Type 302 or 304, not less than 0.0312 inch specified thickness and 3 inches high, finished to match hardware.

E. Brackets (Fittings):

1. Full-Height (Continuous) Type: Manufacturer's standard design; stainless steel.

## 2.2 ACCESSORIES

A. Hardware and Accessories: Manufacturer's standard design, heavy-duty operating hardware and accessories.

1. Material: Stainless steel.

B. Overhead Bracing: Manufacturer's standard continuous, extruded-aluminum head rail with antigrip profile and in manufacturer's standard finish.

C. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel or chrome-plated steel or brass, finished to match hardware, with theft-resistant-type heads. Provide sex-type bolts for through-bolt applications. For concealed anchors, use hot-dip galvanized or other rust-resistant, protective-coated steel.

## 2.3 FABRICATION

A. Overhead-Braced Units: Provide manufacturer's standard corrosion-resistant supports, leveling mechanism, fasteners, and anchors at pilasters to suit floor conditions. Make provisions for setting and securing continuous head rail at top of each pilaster. Provide shoes at pilasters to conceal supports and leveling mechanism.

B. Doors: Unless otherwise indicated, provide 24-inch- wide in-swinging doors for standard toilet compartments and 36-inch- wide out-swinging doors with a minimum 32-inch- wide clear opening for compartments indicated to be accessible to people with disabilities.

1. Hinges: Manufacturer's standard self-closing type that can be adjusted to hold doors open at any angle up to 90 degrees.
2. Latch and Keeper: Manufacturer's standard surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities.
3. Coat Hook: Manufacturer's standard combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.
4. Door Bumper: Manufacturer's standard rubber-tipped bumper at out-swinging doors.
5. Door Pull: Manufacturer's standard unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

A. General: Comply with manufacturer's written installation instructions. Install units rigid, straight, level, and plumb. Secure units in position with manufacturer's recommended anchoring devices.

1. Maximum Clearances:

a. Pilasters and Panels: 1/2 inch.
b. Panels and Walls: 1 inch.

2. Continuous Brackets: Secure panels to walls and to pilasters with continuous brackets.

a. Locate anchors so holes for wall anchors occur in masonry or tile joints.

B. Overhead-Braced Units: Secure pilasters to floor and level, plumb, and tighten. Secure continuous head rail to each pilaster with not less than two fasteners. Hang doors to align tops of doors with tops of panels and adjust so tops of doors are parallel with overhead brace when doors are in closed position.

**3.2 ADJUSTING**

A. Hardware Adjustment: Adjust and lubricate hardware according to 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 doorsto return doors to fully closed position.

**END OF SECTION 10155**

# SECTION 10200 - LOUVERS AND VENTS

## 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. Wall vents (brick vents).

B. Related Sections include the following:

1. Section 07920 "Joint Sealants" for sealants installed in perimeter joints between vent frames and adjoining construction.
2. Division 15 for ductwork and dampers for metal vents.

### 1.3 DEFINITIONS

A. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.

### 1.4 PERFORMANCE REQUIREMENTS

A. Thermal Movements: Provide vents that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

### 1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For vents and accessories. Include plans, elevations, sections, details, and attachments to other Work. Show blade profiles, angles, and spacing.

C. Samples: Of factory-applied color finishes.

### 1.6 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to the following:

1. AWS D1.2, "Structural Welding Code--Aluminum."

**1.7 PROJECT CONDITIONS**

A. Field Measurements: Verify vents openings by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish opening dimensions and proceed with fabricating vents without field measurements. Coordinate construction to ensure that actual opening dimensions correspond to established dimensions.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

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

1. Wall Vents (Brick Vents): Provide Model BVE as manufactured by Greenheck or equal by one of the following:

a. Airline Products Co.
b. Airolite Company (The).
c. Construction Specialties, Inc.
d. Hohmann & Barnard, Inc.
e. Industrial Louvers, Inc.
f. Reliable Products; Hart & Cooley, Inc.
g. Ruskin Company; Tomkins PLC.

**2.2 MATERIALS**

A. Aluminum Extrusions: ASTM B 221, alloy 6063-T5 or T-52.

B. Aluminum Sheet: ASTM B 209, alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.

C. Fasteners: Of same basic metal and alloy as fastened metal or 300 Series stainless steel, unless otherwise indicated. Do not use metals that are incompatible with joined materials.

1. Use types and sizes to suit unit installation conditions.
2. Use Phillips flat-head screws for exposed fasteners, unless otherwise indicated.

D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

**2.3 FABRICATION, GENERAL**

A. Assemble vents in factory to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

B. Maintain equal vents blade spacing to produce uniform appearance.

C. Fabricate frames to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

D. Include supports, anchorages, and accessories required for complete assembly.

E. Join frame members to each other and to fixed ventsblades with fillet welds, threaded fasteners, or both, as standard with vent manufacturer, concealed from view, unless otherwise indicated or size of vent assembly makes bolted connections between frame members necessary.

**2.4 WALL VENTS (BRICK VENTS)**

A. Extruded-Aluminum Wall Vents: Extruded-aluminum louvers and frames, not less than 0.125-inch nominal thickness, assembled by welding; with 18-by-14- mesh, aluminum insect screening on inside face; incorporating weep holes, continuous drip at sill, and integral waterstop on inside edge of sill; of load-bearing design and construction.

**2.5 FINISHES, GENERAL**

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish vents after assembly.

**2.6 ALUMINUM FINISHES**

A. Finish designations prefixed by AA comply with system established by the Aluminum Association for designating aluminum finishes.

B. Class I, Color Anodic Finish: AA-M12C22A42/A44 (Mechanical Finish: nonspecular as fabricated; Chemical Finish: etched, medium matte; Anodic Coating: Architectural Class I, integrally colored or electrolytically deposited color coating 0.018 mm or thicker) complying with AAMA 611.

1. Color: Dark bronze.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine substrates and openings for compliance with requirements for installation tolerances and other conditions affecting performance.

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

**3.2 INSTALLATION**

A. Locate and place vents level, plumb, and at indicated alignment with adjacent work.

B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

C. Form closely fitted joints with exposed connections accurately located and secured.

D. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.

E. Protect aluminum surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.

F. Install concealed gaskets, flashings and joint fillers, as vent installation progresses, where weathertight vent joints are required. Comply with Section 07920 "Joint Sealants" for sealants applied during vent installation.

**3.3 ADJUSTING AND CLEANING**

A. Clean exposed surfaces of vents that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate until final cleaning.

B. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.

C. Restore vents damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

1. Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

**END OF SECTION 10200**

# SECTION 10505 - METAL LOCKERS

## 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. Knocked-down, quiet metal lockers

B. Related Sections include the following:

1. Section "Rough Carpentry" for furring, blocking, and shims required for installing metal lockers and concealed within other construction before metal locker installation.

### 1.3 DEFINITIONS

A. Uncoated Steel Sheet Thicknesses: Indicated as the minimum thicknesses.

### 1.4 SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker and bench.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Show base, sloping tops, filler panels, trim and other accessories including colors.
2. Include locker identification system.
3. Coordinate identification plate numbering with Owner.

C. Samples for Verification: For metal lockers with factory-applied color finishes, in manufacturer's standard sizes.

D. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

E. Warranty: Special warranty specified in this Section.

### 1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative of metal locker manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain metal lockers and accessories through one source from a single manufacturer.

1. All lockers and related hardware and accessories shall be new. Refurbished items are not permitted.

C. Regulatory Requirements: Where metal lockers are indicated to comply with accessibility requirements, comply with the U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disabilities Act (ADA), Accessibility Guidelines for Buildings and Facilities (ADAAG)."

1. Provide not less than 1 shelf located no higher than 48 inches above the floor for forward reach and 54 inches above the floor for side reach.
2. Provide 1 shelf located at bottom of locker no lower than 15 inches above the floor for forward reach and 9 inches above the floor for side reach.
3. Provide hardware that does not require tight grasping, pinching, or twisting of the wrist, and that operates with a force of not more than 5 lbf.

**1.6 DELIVERY, STORAGE, AND HANDLING**

A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for metal locker installation.

B. Deliver master and control keys, and combination control charts to Owner.

**1.7 PROJECT CONDITIONS**

A. Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings:

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish recessed opening dimensions and proceed with fabricating metal lockers without field measurements. Coordinate wall and floor construction to ensure that actual recessed opening dimensions correspond to established dimensions.

**1.8 COORDINATION**

A. Coordinate size and location of masonry bases and wood blocking for metal lockers.

**1.9 WARRANTY**

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures.
b. Faulty operation of latches and other door hardware.

2. Damage from deliberate destruction and vandalism is excluded.

3. Warranty Period for Knocked-Down Metal Lockers: Two years from date of Substantial Completion.

**1.10 EXTRA MATERIALS**

A. Furnish extra materials described below, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. The following metal locker hardware items equal to 2 percent of the amount installed for each type and finish installed, but no fewer than 10 units:

a. Locks.
b. Identification plates.
c. Hooks.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

A. Cold-Rolled Steel Sheet: ASTM A 1008, Commercial Steel (CS) Type B, suitable for exposed applications.

B. Galvanized Steel Sheet: ASTM A 653, commercial quality, G60 coating designation; mill phosphatized; suitable for exposed applications, and stretcher leveled or roller leveled to stretcher-leveled flatness.

C. Electrolytic Zinc-Coated Steel Sheet: ASTM A 591, commercial quality, coating Class C; mill phosphatized; suitable for exposed applications; and stretcher leveled or roller leveled to stretcher-leveled flatness.

D. Stainless-Steel Sheet: ASTM A 666, Type 304.

E. Fasteners: Zinc- or nickel-plated steel, slotless-type exposed bolt heads, and self-locking nuts or lock washers for nuts on moving parts.

F. Anchors: Select material, type, size, and finish required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

**2.2 KNOCKED-DOWN, QUIET METAL LOCKERS**

A. Basis-of-Design Product: Quiet Lockers as manufactured by Republic Storage Systems, LLC or a comparable product by one of the following:

1. List Industries Inc.; Quiet KD Lockers.
2. Penco Products, Inc.; Guardian Lockers.
3. ASI Storage Solutions; Traditional Plus Lockers

B. Locker Size:

1. High School: 12 inches wide by 15 inches deep by 72 inches high.
2. Central Elementary: 12 inches wide by 12 inches deep by 60 inches high.

C. Locker Arrangement:

1. Single tier.

D. Body: Assembled by riveting or bolting body components together. Fabricate from unperforated, cold-rolled steel sheet with thicknesses as follows:

1. Tops and Intermediate Dividers:

a. 0.0209 inch, (24 gage) with single bend at sides.

2. Locker Bottoms: Form locker bottoms of galvanized steel sheet or electrolytic zinc-coated steel sheet as follows:

a. 0.0528 inch, (16 gage) with single bend at sides.

3. Backs and Sides: Include full-height, double-flanged connections.

a. 0.0209 inch, (24 gage) with single bend at sides.

4. Shelves:

a. 0.0209 inch, (24 gage) thick, with double bend at front and single bend at sides and back.

1) High School: Provide one shelf at top of locker at mounting height as indicated on Drawings.
2) Central Elementary: Provide two (2) shelves per locker at mounting heights as indicated on Drawings; one at top and one at bottom of each locker.

E. Frames: Channel formed; fabricated from 0.0528-inch- thick, (16 gage) cold-rolled steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.

1. Frame Vents: Fabricate vertical or horizontal face frames with vents as standard with manufacturer.

F. Doors: One-piece; fabricated from 0.0528-inch- thick, (16 gage) cold-rolled steel sheet; formed into channel shape with double bend at vertical edges, and with right-angle single bend at horizontal edges.

1. Door Style: Vented panel as follows:

a. Concealed Vents: Slotted perforations in top and bottom horizontal return flanges of doors.

G. Hinges: Self-closing; welded to door and attached to door frame with not less than 2 factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Knuckle Hinges: Steel, full loop, 5 or 7 knuckles, tight pin; minimum 2 inches high. Provide not less than 3 hinges for each door more than 42 inches high.

H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; pry resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, or padlocks; positive automatic and prelocking.

a. Latch Hooks: Equip doors 48 inches and higher with 3 latch hooks; fabricated from minimum 0.0966-inch- thick steel; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
b. Latching Mechanism: Manufacturer's standard rattle-free latching mechanism and moving components isolated with vinyl or nylon to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

I. Built-in Combination Locks: Key-controlled, three-number dialing combination locks; capable of at least five combination changes made automatically with a control key.

1. Bolt Operation: Manually locking deadbolt or automatically locking spring bolt.
2. Provide built-in combination locks at High School.
3. Central Elementary shall not have built-in combination locks.

J. Equipment: Equip each metal locker with identification plate and the following:

1. Single-Tier Units:

a. High School: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
b. Central Elementary: One top shelf, one lower shelf, one double-prong ceiling hook, and two single-prong wall hooks.

K. Accessories:

1. Continuous Base: Provide where indicated on Drawings.

a. Fabricated from cold-rolled steel sheet, manufacturer's standard thickness, but not less than 0.0528 inch, (16 gage) thick.

1) Height: 4 inches.

2. Filler Panels: Fabricated from cold-rolled steel sheet, manufacturer's standard thickness, but not less than 0.0329 inch (20 gage) thick.
3. Boxed End Panels: Fabricated from 0.0528-inch- thick (16 gage), cold-rolled steel sheet.

4. Continuous Sloping Tops: Fabricated from cold-rolled steel sheet, 0.0428-inch (18 gage) thick.

   a. Closures: Vertical-end type.
   b. Sloped top corner fillers, mitered.

L. Finish: Baked enamel or powder coat.

1. High School Colors:

   a. Locker Body and Door: Match one of the following colors:

      1) Penco: Burgundy 736
      2) Republic: Red Velvet 82

2. Central Elementary Colors:

   a. Locker Body: Match one of the following colors:

      1) Penco: Marine Blue 806
      2) Republic: Country Blue 44

   b. Locker Door: Match one of the following colors:

      1) Penco: Champagne 073
      2) Republic: Alabaster 81

**2.3 FABRICATION**

A. General: Fabricate metal lockers square, rigid, and without warp; with metal faces flat and free of dents or distortion. Make exposed metal edges free of sharp edges and burrs, and safe to touch.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet.
2. Provide fasteners, filler plates, supports, clips, and closures as required for a complete installation.

B. Unit Principle: Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments.

C. Knocked-Down Construction: Fabricate metal lockers for nominal assembly at Project site using nuts, bolts, screws, or rivets. Factory weld frame members together to form a rigid, one-piece assembly.

D. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

E. Identification Plates: Manufacturer's standard etched, embossed, or stamped aluminum plates; with numbers and letters at least 3/8 inch high.

F. Continuous Base: Formed into channel or Z profile for stiffness, and fabricated in lengths as long as practicable to enclose base and base ends of metal lockers; finished to match lockers.

G. Continuous Sloping Tops: Fabricated in lengths as long as practicable, without visible fasteners at splice locations; finished to match lockers.

1. Sloped top corner fillers, mitered.

H. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip joint filler angle formed to receive filler panel.

I. Boxed End Panels: Fabricated with 1-inch- wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

**2.4 STEEL SHEET FINISHES**

A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Factory finish steel surfaces and accessories except stainless-steel and chrome-plated surfaces.

C. Surface Preparation: Clean surfaces of dirt, oil, grease, mill scale, rust, and other contaminants that could impair paint bond. Use manufacturer's standard methods.

D. Locker Finish: Manufacturer's standard as follows:

1. Baked-Enamel Finish: Immediately after cleaning, pretreating, and phosphatizing, apply manufacturer's standard thermosetting baked-enamel finish. Comply with paint manufacturer's written instructions for application, baking, and minimum dry film thickness.
2. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard baked-polymer thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine walls and floors for compliance with requirements for installation tolerances and other conditions affecting performance of work.

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

**3.2 INSTALLATION**

A. General: Install level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion, using concealed fasteners.
2. Anchor single rows of metal lockers to walls near top of lockers and to floor or walls near bottom of lockers.
3. Anchor back-to-back metal lockers to existing bases.

B. Knocked-Down Metal Lockers: Assemble knocked-down metal lockers with standard fasteners, with no exposed fasteners on door faces or face frames.

C. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification plates.

    a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.
    b. Coordinate identification plate numbering with Owner

4. Attach filler panels with concealed fasteners. Locate fillers panels where indicated on Drawings.
5. Attach sloping top units to metal lockers, with closures at exposed ends.
6. Attach boxed end panels with concealed fasteners to conceal exposed ends of nonrecessed metal lockers.
7. No sharp or jagged edges will be permitted.

**3.3 ADJUSTING, CLEANING, AND PROTECTION**

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding. Verify that integral locking devices operate properly.

B. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit metal locker use during construction.

C. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by metal locker manufacturer.

**END OF SECTION 10505**

# SECTION 10801 - 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 1 Specification Sections, apply to this Section.

### 1.2 SUMMARY

A. This Section includes the following toilet and bath accessory items:

1. Sanitary napkin disposal unit.
2. Grab bars.
3. Stainless steel framed mirror units.

B. Owner-Furnished, Owner-Installed Material:

1. Toilet tissue dispenser.
2. Paper towel dispenser.
3. Electric hand dryers.
4. Soap dispenser.

C. Related Sections include the following:

1. Section 08830 "Mirrors" for frameless mirrors.

### 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. 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.

C. 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.

**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. Galvanized Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

D. Galvanized Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

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. Sanitary-Napkin Disposal Unit:

1. Mounting: Surface mounted.
2. Door or Cover: Self-closing disposal-opening cover and locking bottom panel.
3. Receptacle: Removable.
4. Material and Finish: Stainless steel, No. 4 finish (satin).
5. Products:

a. ASI No. 0473A.
b. Bobrick No. B-254.

c. Bradley No. 4722-15.

B. Grab Bars:

1. Mounting: Flanges with concealed fasteners.
2. Material: Stainless steel, 0.05 inch thick.

a. Finish: Smooth, No. 4, satin finish.

3. Outside Diameter: 1-1/2 inches.
4. Clearance: 1-1/2-inch clearance between wall surface and inside face of bar.
5. Configuration and Length: As indicated on Drawings.
6. Manufacturers:

a. ASI.
b. Bobrick.
c. Bradley.

C. Mirror Unit:

1. Frame: Stainless-steel angle, 0.05 inch thick.

a. Corners: Welded and ground smooth.

2. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.

a. One-piece, galvanized steel, wall-hanger device with spring-action locking mechanism to hold mirror unit in position with no exposed screws or bolts.
b. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.

3. Size: As indicated on Drawings.
4. Products:

a. ASI No. 0620.
b. Bobrick No. B-165.
c. Bradley No. 780.

D. Toilet Paper Dispenser: Owner-furnished, owner-installed.

E. Paper Towel Dispenser: Owner-furnished, owner-installed.

F. Electric hand dryers: Owner-furnished, owner-installed.

G. Liquid-Soap Dispenser: Owner-furnished, owner-installed.

## 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.

B. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide minimum of six keys to Owner's representative.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf, when tested according to 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 10801**

# SECTION 12304 – MODULAR PLASTIC LAMINATE CLAD CASEWORK

## 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. Prefabricated modular plastic laminate clad casework components of base cabinets, wall cabinets, tall cabinets, and shelf units. Includes the following:

    a. Standard and custom cabinet sizes.

2. Solid-surfacing-material countertops and window sills.

B. Related Sections include the following:

1. Section 06100 "Rough Carpentry" for wood blocking for anchoring plastic laminate clad casework.
2. Section 09260 "Gypsum Board Assemblies" for reinforcements in gypsum board partitions for anchoring institutional casework.
3. Section 09653 "Resilient Wall Base and Accessories" for resilient base applied to casework.

### 1.3 DEFINITIONS

A. Identification: Comply with AWI Section 1600 and as follows:

1. Exposed Parts: Surfaces visible when:

    a. Drawer fronts and doors are closed.
    b. Cabinets and shelving are open-type or behind clear glass doors.
    c. Bottoms of cabinets are seen 42" or more above finish floor.
    d. Tops of cabinets are seen below 78" above finish floor, or are visible from an upper floor or staircase after installation.
    e. Portions of cabinets are visible when fixed appliances are installed.

2. Semi-Exposed Parts: Surfaces visible when:

    a. Drawer/Doors are in open position.
    b. Bottoms of cabinets are between 30" and up to 42" above finish floor.

3. Concealed Surfaces: Surfaces are concealed when:

    a. Surfaces are not visible after installation.
    b. Bottoms of cabinets are less than 30" above finish floor.

c. Tops of cabinets are over 78" above finish floor and are not visible from an upper level.
d. Stretchers, blocking and/or components are concealed by drawers.

**1.4 SYSTEM DESCRIPTION**

A. Design Requirements: Casework has been designed to meet functional requirements of each area, therefore, door and drawer arrangements, design of casework layouts and work surface materials must not be changed.

**1.5 SUBMITTALS**

A. Product Data: For each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for modular plastic laminate clad casework. Include plans, elevations, sections, details, and attachments to other Work.

C. Samples for Verification: 6-inch- square Samples for each type of finish, including top and edge materials.

**1.6 QUALITY ASSURANCE**

A. Installer Qualifications: An authorized representative of modular plastic laminate clad casework manufacturer for installation and maintenance of units required for this Project.

B. Source Limitations: Obtain plastic laminate clad casework through one source from a single manufacturer.

C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards," Section 1600 Modular Cabinets."

**1.7 DELIVERY, STORAGE, AND HANDLING**

A. Deliver casework only after painting, utility roughing-in, and similar operations that could damage, soil, or deteriorate casework have been completed in installation areas. If casework must be stored in other than installation areas, store only in areas where environmental conditions meet requirements specified in "Project Conditions" Article.

B. Keep finished surfaces covered with polyethylene film or other protective covering during handling and installation.

**1.8 PROJECT CONDITIONS**

A. Environmental Limitations: Do not deliver or install casework until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where casework is indicated to fit to other construction, verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating casework without field measurements. Coordinate construction to ensure that actual dimensions correspond to established dimensions.

**1.9 COORDINATION**

A. Coordinate layout and installation of metal framing and reinforcements in gypsum board assemblies for support of modular plastic laminate casework.

**1.10 WARRANTY**

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of modular plastic laminate clad casework that fail in materials or workmanship within specified warranty period. Failures include, but are not limited to, the following:

1. Delamination of components or other failures of glue bond.
2. Warping of components.
3. Failure of operating hardware.
4. Deterioration of finishes.

B. Warranty Period: three years from date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

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

1. Stevens Cabinet Co., Inc., (217) 857-6411.
2. Case Systems Inc.; (989) 496-9510.
3. Strata Design, Inc.; (231) 929-2140.
4. TMI Systems Design Corp.; (800) 456-6716.

**2.2 MATERIALS**

A. Core Materials:

1. Particleboard: Industrial grade, ANSI A208.1, Grade M-2, minimum 45 lb. density.
2. Medium-Density Fiberboard: ANSI A208.2, Grade MD, minimum 48 lb. density.

B. Casework Surface Materials:

1. Plastic Laminate: High-pressure decorative laminate complying with NEMA LD 3.

2. Exposed Cabinet Exteriors:

    a. Permanently thermofused melamine laminate, fused to core using a minimum average pressure of 320 psi and average temperature of 320 degF and shall comply with NEMA LD3, VGS .028 inch and ALA 1996 specification standards.

3. Door and drawer fronts shall be surfaced with high pressure laminate meeting NEMA LD-3, Type VGS, .028 inch thick,

    a. Cabinet exterior colors shall be as scheduled in Section 09060 "Room Finish Schedule."
    b. Interiors face of door and drawer fronts shall be high pressure laminate NEMA LD-3, Type CL-20, .020 inch thick for balanced construction, manufacturer's standard white color. Almond color is not acceptable.

4. Exposed interior components, including both faces of shelves and interior faces of cabinets and backs shall match cabinet exterior color.
5. Semi-exposed surfaces, including drawer box components shall be thermofused melamine plastic laminate.
6. Unexposed cabinet ends shall have balanced construction with thermofused melamine plastic laminate surfaces.

    a. Interior backs shall be standard white color surface.

C. Edgings:

1. Exposed exterior cabinet members shall be edged with high impact rigid PVC extrusion, 0.020 inch thick, satin finish, with a UV cured top coat. Color shall be extruded throughout thickness of material.

    a. Apply edgings with waterproof hot melt adhesive.
    b. Color shall match cabinet exterior.

2. Tops, bottoms and edges of door and drawer fronts shall be edged with a high impact rigid PVC extrusion, 3 mm thick, satin finish, with a UV cured topcoat. Edgings shall be chip and crack resistant.

    a. Apply edgings with waterproof hot melt adhesive.
    b. Color shall match cabinet exterior.

3. Interior panel components shall be edged with high impact rigid PVC extrusion, 0.020 inch thick, satin finish, with a UV cured top coat. Color shall be extruded throughout thickness of material.

    a. Color shall be white to match cabinet interior.

4. Adjustable shelves shall be edged with a high impact rigid PVC extrusion, 3 mm thick, satin finish, with a UV cured topcoat. Edgings shall be chip and crack resistant. Apply edging to all front and back edges of adjustable shelves. Apply high impact rigid PVC extrusion, 0.020 inch thick, satin finish, with a UV cured top coat on side edges.

    a. Apply edgings with waterproof hot melt adhesive.

b. Color shall match cabinet interior for semi-exposed shelves.
c. Color shall match cabinet exterior for exposed shelves.

D. Metal Parts: Countertop support brackets, legs and miscellaneous metal parts shall be furniture steel, welded, degreased, cleaned, treated and powder painted.

E. Solid-Surfacing Material:

1. Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with ISSFA-2.

a. Manufacturers: Subject to compliance with requirements, provide the following:

1) Corian; E. I. du Pont de Nemours and Company.

b. Type: Standard type.
c. Thickness: 1/2 inch.
d. Colors and Patterns: As indicated in Section 09060 "Room Finish Schedule."

2. Solid Surfacing Joint Adhesive: Manufacturer's standard one or two-part adhesive kit to create inconspicuous, non-porous joints.
3. Solid Surfacing Sealant: Manufacturer's standard mildew-resistant, FDA-compliant, NSF 51 compliant (food zone-any type), UL-listed silicone sealant in color to match solid surfacing material.

**2.3 DESIGN, COLOR, AND FINISH**

A. Design: Provide plastic laminate clad casework of the following design:

1. Flush overlay.

B. Melamine-Faced Particleboard Colors: Match plastic laminate colors for exposed melamine-faced particleboard, provide white of semi-exposed of concealed melamine-faced particleboard.

C. Plastic-Laminate Colors: As indicated by manufacturer's designations in Section 09060 "Room Finish Schedule."

**2.4 CASEWORK HARDWARE**

A. Hardware, General: Provide manufacturer's standard satin-finish, commercial-quality, heavy-duty hardware complying with requirements indicated.

1. Use threaded metal or plastic inserts with machine screws for fastening to particleboard except where hardware is through-bolted from back side.

B. Hinges: Five-knuckle, 2-3/4 inch overlay type with hospital tip, stainless steel, institutional hinges with 270 degree opening, ANSI/BHMA A156.9 Grade 1.

1. Doors less than 48" in height shall have 2 hinges per door.
2. Doors 48" to 63" in height shall have 3 hinges per door.
3. All doors greater than 63" in height shall have four hinges.

C. Pulls: Solid aluminum wire pulls, 4 inch center to center of posts typical, except for tall cabinets provide 8-1/6 inch center to center of posts, fastened from back with two screws.

D. Drawer Slides: Epoxy coated with nylon rollers, 100 pounds load rating at full extension and a built-in, positive stop both directions, self-closing from last 1 inch of travel.

1. File Drawer Slides: 150 lbf., full extension type.
2. Pencil Drawer Slides: 45 lbf.

E. Drawer and Cupboard Locks: Inmterchangable core, cylindrical (cam) type, 5-pin tumbler, brass with chrome-plated finish, complying with BHMA A156.11, Grade 1.

1. Provide a minimum of two keys per lock and six master keys.

a. Key all locks within a room alike; key all rooms differently.

2. Provide locks on all doors and drawers.

F. Adjustable Shelf Supports: Injection molded nylon, friction fit into cabinet end panels and vertical dividers, readily adjustable on 32mm (approximately 1-1/4 inch) centers. Each shelf support shall have two (2) integral support pins, 5mm diameter, to interface predrilled holes, and to prevent accidental rotation of support. The supports shall be automatically adaptable to 3/4 inch or 1 inch thick shelving and shall provide non-tip feature for shelving. Supports are designed to readily permit field fixing of shelf if desired.

## 2.5 SOLID SURFACING COUNTERTOPS AND WINDOW SILLS

A. Solid Surfacing Countertops: Comply with AWS Section 11 – Countertops.

1. Grade: Premium.
2. Finish: Polished.

B. Fabricate tops in one piece, unless size dictates multiple pieces. Comply with solid-surfacing material manufacturer's written recommendations for adhesives, sealers, fabrication, and finishing.

1. Fabricate countertops in sizes and shapes required to comply with requirements indicated on Drawings.
2. Fabricate tops with shop-applied edges of materials and configuration indicated.
3. Fabricate tops with loose backsplashes for field application.
4. Drill holes in countertops for plumbing fittings in shop.

C. Fabricate work to produce shapes with a uniform profile throughout entire unit length, with precisely formed arris slightly eased to prevent snipping, and with matching profile at joints between units.

D. Inspect finished units at fabrication plant for compliance with requirements for appearance, material, and fabrication. Replace defective units.

## 2.6 CABINET FABRICATION

A. Modular Plastic Laminate Casework Grade: Provide Premium grade complying with the referenced AWI quality standard.

B. Fabricate plastic laminate clad casework to dimensions, profiles, and details shown.

C. Cabinet Construction: Cabinet parts shall be accurately machined and precision bored for premium quality joinery construction, utilizing automatic machinery to ensure consistent sizing on modular cabinets. Cabinets shall be assembled under controlled case clamp conditions, assuring final cabinet squareness and proper joint compressions.

D. Cabinet Joinery: Tops and bottoms shall be jointed to cabinet ends using a minimum of six (6) dowels at each joint for twenty-four (24) inch deep cabinets and a minimum of four (4) dowels at each joint for twelve (12) inch deep cabinets. All dowels are to be industrial grade hardwood laterally fluted, with chamfered ends and a minimum diameter of ten (10) millimeters. Internal cabinet components such as fixed horizontals, rails and verticals are to be doweled in place. Dowels are to be securely glued and cabinets clamped under pressure during assembly to assure secure joints and cabinet squareness.

1. Mechanical fasteners specifically engineered for joining particleboard casework components will be acceptable.

E. Cabinet Ends: Shall be 3/4 inch thick panels of balanced construction and precision bored for dowel pins installed in horizontal cabinet members.

1. Base and tall units shall have one piece end panels continuous to floor.

F. Base Cabinet Bottoms: Shall be 3/4 inch thick panels of balanced construction. Panels shall be precision bored to receive fluted dowel pins.

G. Cabinet Tops (Sub-Top): Shall be 3/4 inch thick panels of balanced construction. Base cabinets shall have a full depth 3/4 inch thick sub-top panel or rails as standard with manufacturer. Panels or rails shall be precision bored to receive fluted dowel pins.

H. Wall Cabinet Bottoms and Tops: Shall be full 1 inch thick of balanced construction, with fluted dowel pin construction.

I. Base Construction: Provide one of the following manufacturer's standard base and toe kick construction for all base and tall cabinets.

1. Construct cabinets with integral subbases with recessed 4 inch high by 3 inch deep toe kick. Toe base fronts shall be field applied in continuous lengths.
2. Provide laminate clad exterior grade plywood ladder type base, field installed.
3. Provide particle board or exterior grade plywood individual bases applied to base and tall cabinets. Base shall be let in from sides and back to allow cabinets to be installed tightly together and tight against a wall and to conceal to edge of applied resilient base.
4. Two (2) toe kick panels shall be set back from cabinet front and back edges, doweled into cabinet ends. Toe kick panels shall be designed to accept resilient base.
5. Resilient base is Work of Section 09653 "Resilient Base and Accessories".

J. Back Panels: Fabricate back panels by one of the following methods:

1. Panel shall be 1/4" thick of balanced melamine construction, inset 5/8" from rear of cabinet. Backs shall be continuously trapped in grooves in cabinet sub-top, bottom and ends and hot melt glued or mechanically fastened. Provide 1/2 inch mounting or hanger strips.
2. Apply 1/2 inch thick minimum balanced melamine construction backs with minimum #8 low root, high thread (not Drywall) screws spaced maximum 8 inches on center along top and bottom edge. Anchor strips are not required for backs 1/2 inch or thicker so attached.

K. Drawers: Full box design with a separate front. Drawer sides and ends shall be constructed of minimum 5/8" medium density fiberboard with white colored melamine laminate and matching PVC top edges. Bottoms shall be 1/4" thick with white melamine facing.

1. Corner joints shall be interlocking dowel pin design.
2. Bottoms shall be constructed by one of the following methods:

a. Trapped in grooves on all four sides, glued and shall have additional mechanical fasteners
b. Screwed in placed to drawer frame.

L. Frame rails between drawers shall be 3/4 inch thick by 3-1/2 inch wide, dowel pinned into cabinet ends.

1. The leading edge shall have PVC edging color matched to exposed laminate.

M. Shelving: All shelves shall be 1 inch thick. All front and back edges of shelf shall be finished with 3mm PVC extrusion, color to match shelf surface and cabinet interior. Side edges of shelf shall be finished with 0.020 inch thick PVC extrusion.

N. Solid Hinged Doors: Shall be 3/4 inch thick material of balanced construction as described elsewhere in this Section.

O. Filler Strips: Provide as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets.

P. Resilient Base: Resilient base is specified as work of Section 09653 "Resilient Base and accessories."

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine areas for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of institutional casework.

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

**3.2 CASEWORK INSTALLATION**

A. Install casework with factory-trained supervision authorized by manufacturer and approved by the Architect. Erect casework, plumb, level, true and straight with no distortions. Shim as required. Where laminate clad casework abuts other finished work, scribe and apply filler strips for accurate fit with fasteners concealed where practicable.

1. Provide filler strips of equal size balanced at each end of run of cabinets.

B. Install plumb, level, and true; shim as required, using concealed shims. Where institutional casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

C. Cut openings to receive hardware, appliances, plumbing fixtures, electrical work and similar items. Locate openings accurately and use templates or rough-in diagrams to produce accurately sized and shaped openings.

D. Base Cabinets: Set cabinets straight, level, and plumb. Adjust subtops within 1/16 inch of a single plane. Fasten cabinets to partition framing, wood blocking, or reinforcements in partitions with fasteners spaced 24 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform. Align similar adjoining doors and drawers to a tolerance of 1/16 inch.

1. Where base cabinets are not installed adjacent to walls, fasten to floor at toe space with fasteners spaced 24 inches o.c. Secure sides of cabinets to floor, where they do not adjoin other cabinets, with not less than two fasteners.

E. Wall Cabinets: Hang cabinets straight, level, and plumb. Adjust fronts and bottoms within 1/16 inch of a single plane. Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Align similar adjoining doors to a tolerance of 1/16 inch.

1. Fasten through back, near top and bottom, at ends, and not more than 16 inches o.c.

F. Install hardware uniformly and precisely. Set hinges snug and flat in mortises, unless otherwise indicated. Adjust and align hardware so moving parts operate freely and contact points meet accurately. Allow for final adjustment after installation.

G. Adjust casework and hardware so doors and drawers operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

**3.3 INSTALLATION OF SOLID SURFACING TOPS AND WINDOW SILLS**

A. Solid Surfacing Material Countertops:

1. Form field joints using manufacturer's recommended adhesive, with joints inconspicuous in finished work.

a. Exposed joint/seams shall not be allowed.
b. Cut and finish component edges with clean, sharp returns.
c. Align adjacent countertops and form seams to comply with manufacturer's written instructions using adhesive in color to match countertops.
d. Carefully dress joints smooth, remove surface scratches and clean entire surface.

2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
3. Install applied backsplash and sidesplashes to top with manufacturer's recommended joint adhesive and to wall with manufacturer's recommended silicone sealant.
4. Rout top and backsplash and install splash guard with manufacturer's recommended joint adhesive.
5. Calk space between backsplash and wall with manufacturer's recommended silicone sealant.

**3.4 CLEANING AND PROTECTING**

A. Repair or remove and replace defective work as directed on completion of installation.

B. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

C. Protection: Provide 6-mil plastic or other suitable water-resistant covering over countertop surfaces. Tape to underside of countertop at a minimum of 48 inches o.c. Remove protection at Substantial Completion.

**END OF SECTION 12304**

# SECTION 12560– INSTITUTIONAL FURNITURE

## 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. Steel plan (flat) files.

### 1.3 SUBMITTALS

A. Product Data: Include rated capacities, construction details, material descriptions, dimensions of individual components and profiles, and finishes for metal storage shelving.

### 1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver steel plan (flat) files palleted, wrapped, or crated to provide protection during transit and Project-site storage.

### 1.5 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install steel plan (flat) files until spaces are enclosed and weatherproof, wet work in spaces is completed and dry, and ambient temperature is being maintained at the levels indicated for Project when occupied for its intended use.

## PART 2 - PRODUCTS

### 2.1 STEEL PLAN (FLAT FILES)

A. Steel Plan (Flat) Files: Interlocking steel plan files designed for ease of stacking. Drawers shall have metal front plan depressor and rear hood with vinyl dust cover to keep document flat. Equip plan files with the following:

1. Overall Plan File Size/Unit: 40-3/4 inches wide by 15-3/8 inches high by 28-3/8 inches deep
2. Number of Drawers/Unit: Five.
3. Inside Drawer Size: 37inches wide by 2 inches high by 253/4 inches deep.
4. Flush Base. 4 inch high
5. Color: Gray.
6. Product:

a. Model no. 5J15; Mayline Group

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine areas for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Examine floors for suitable conditions where steel plan (flat) files will be installed.

**3.2 PREPARATION**

A. Vacuum finished floor and wet mop resilient flooring over which steel plan (flat) files is to be installed.

**3.3 INSTALLATION**

A. Install metal plan (flat) files level, plumb, square, rigid, and true.

**3.4 ADJUSTING AND CLEANING**

A. On completion of installation, clean exposed surfaces as recommended by manufacturer.

B. Touch up marred finishes or replace steel plan (flat) files that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by steel plan (flat) files manufacturer.

C. Replace steel plan (flat) files that have been damaged or has deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

**END OF SECTION 11050**

# SECTION 15010 - MECHANICAL GENERAL REQUIREMENTS

## 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 1 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. Sleeves
3. Sealing of openings
4. Access doors
5. Touch-up painting

### 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 of the following recognized authorities:

1. AABC - Associated Air Balance Council
2. ANSI - American National Standards Institute
3. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
4. ASTM - American Society for Testing Materials
5. NEC - National Electrical Code
6. NFPA - National Fire Protection Association
7. NEMA - National Electrical Manufacturer's Association
8. SMACNA - Sheet Metal and Air Conditioning Contractors National Association
9. UL - Underwriters' Laboratories, Inc.

**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 15 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 1.

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 1 for submittals and quantities.

1. Submit shop drawings and product data for all equipment, materials, valves, plumbing and heating specialties, refrigeration 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. Submit shop drawing with all pertinent data and with identification mark number or symbol numbers as specified or scheduled on the Mechanical Drawings.

F. 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.

G. 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".

H. 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.

I. Partial submittals for equipment will not be permitted. Where partial submittals are transmitted to the Architect/Engineer, they will be returned "Rejected".

J. Plumbing fixture submittals shall be submitted as one (1) package including all fixtures intended to be used for this Project.

K. 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 Contractor's 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, and detail references, or as noted on the mechanical drawings.

L. Submit manufacturer's submittals on all major mechanical systems and/or equipment, including:

1. Fan Coil Units
2. Radiators
3. Modular Indoor Air Handling Unit
4. Power Ventilators
5. Fire Suppression
6. Flow Gauges
7. Valves
8. Temperature Controls
9. Insulation
10. Chilled Water Coils
11. Plumbing Fixtures

M. 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 1.

**1.6 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).

## 1.7 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. Protect equipment outlets, pipe and duct openings with temporary plugs or caps.
5. 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.

## 1.8 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.

## 1.9 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.

## 1.10 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 1 Sections.

## 1.11 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 them over to the Owner and obtain itemized receipt. This receipt shall be attached to the "Final Application" for payment.

B. Retain operating instructions, service instructions, parts lists, etc., which are shipped with electrical 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.

C. Furnish three (3) sets of bound operating instructions to the Architect/Engineer. Each set shall include:

1. One (1) copy of all shop drawings
2. Operating and maintenance instructions and manuals
3. As-built drawings

**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 SEALING OF OPENINGS (FIRE STOPPING)**

A. Seal openings around pipes in sleeves and around duct openings through walls, floors 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 07841 "Through-Penetration Firestop Systems" for additional requirements.

1. Products:

a. 3M
b. Hilti
c. Tremco
d. Manville

**2.3 SLEEVES**

A. Provide sleeves where pipes pass through floors and walls.

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 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 07841 "Through-Penetration Firestop Systems".

**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 tile work 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, 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 b e 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. The existing building will be occupied during construction. Maintain mechanical services and provide necessary temporary connections and their removal at no additional expense.

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 1 for requirements for cutting, patching and refinishing work necessary for the installation of Mechanical Work.

B. Direct miscellaneous cutting and patching of the existing building construction for the installation of the Mechanical 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 or hammer and drill points will not be permitted. The openings shall not be cut larger than necessary for the installation of the mechanical 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 may be directed by the Architect/Engineer.

F. Cooperate with the other Contractors so that all cutting and repairing in any given area will be done simultaneously.

G. Mechanical work which may interfere with changes in conduit or other electrical equipment, that may be uncovered by the cutting of new openings in present building, shall be removed at the direction of the Architect/Engineer.

**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 which 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 SUPPORTS**

A. Furnish 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 the structure 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.

**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 which, 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 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.

## 3.13 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.

## 3.14 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 15010**

# SECTION 15050 - 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 15 Sections.

1. Piping materials and installation instructions common to most piping systems
2. Escutcheons
3. Dielectric fittings
4. Flexible connectors
5. Mechanical sleeve seals
6. Equipment nameplate data requirements
7. Labeling and identifying mechanical systems and equipment is specified in Section 15075 "Mechanical Identification"
8. Non-shrink grout for equipment installations
9. Field-fabricated metal and wood equipment supports
10. Installation requirements common to equipment specification sections
11. Mechanical demolition
12. Cutting and patching
13. Touchup painting and finishing

B. Pipe and pipe fitting materials are specified in Division 15 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.

### 1.4 SEQUENCING AND SCHEDULING

A. Coordinate mechanical equipment installation with other building components.

B. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.

C. Coordinate requirements for access panels and doors if mechanical items requiring access are concealed behind finished surfaces. Access panels and doors are specified in Division 8 Section "Access Doors."

D. 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.

**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. Hart Industries International, Inc.
   c. Watts Industries, Inc.; Water Products Division
   d. 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

6. Metal, Flexible Connectors:

   a. Flexicraft Industries
   b. Grinnell Corporation; Grinnell Supply Sales Company
   c. Mercer Rubber Company
   d. Metraflex Company
   e. Uniflex, Inc.

## 2.2 PIPE AND PIPE FITTINGS

A. Refer to individual Division 15 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 15 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.

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 HA: Tin-antimony-silver-copper zinc, with 0.10 percent maximum lead content.
2. Alloy HB: Tin-antimony-silver-copper nickel, with 0.10 percent maximum lead content.

E. Brazing Filler Metals: AWS A5.8.

1. BCuP Series: Copper-phosphorus alloys.
2. 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.

## 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 FLEXIBLE CONNECTORS

A. General: Fabricated from materials suitable for system fluid and that will provide flexible pipe connections. Include 125 psig minimum working-pressure rating, unless higher working pressure is indicated, and ends according to the following:

1. 2-Inch NPS and Smaller: Threaded.
2. 2-1/2-Inch NPS and Larger: Flanged.

B. Stainless-Steel-Hose/Steel Pipe, Flexible Connectors: Corrugated, stainless-steel, inner tubing covered with stainless-steel wire braid. Include steel nipples or flanges, welded to hose.

## 2.6 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.

## 2.7 IDENTIFYING DEVICES AND LABELS

A. Refer to Section 15075 “Mechanical Identification” for requirements.

**PART 3 - EXECUTION**

**3.1 PIPING SYSTEMS – COMMON REQUIREMENTS**

A. General: Install piping as described below, unless piping Sections specify otherwise. Individual Division 15 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 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 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. Uninsulated Piping Wall Escutcheons: Cast brass or stamped steel, with set screw.
2. Uninsulated Piping Floor Plates in Utility Areas: Cast-iron floor plates.
3. Insulated Piping: Cast brass or stamped steel; with concealed hinge, spring clips, and chrome-plated finish.
4. 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. Install sleeves for pipes passing through concrete and masonry walls, and concrete floor and roof slabs.

P. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

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. 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 Division 7 Section "Sheet Metal Flashing and Trim" for flashing.

1) Seal space outside of sleeve fittings with non-shrink, nonmetallic grout.

4. Use Type S, Grade NS, Class 25, Use O, neutral-curing silicone sealant, unless otherwise indicated.

Q. 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 07841 "Through-Penetration Firestop Systems" for materials.

R. Verify final equipment locations for roughing-in.

S. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

T. 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.
8. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces by wiping with clean cloth or paper towels. Join pipe and fittings according to the following:

a. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
b. ABS Piping: ASTM D 2235 and ASTM D 2661.
c. PVC Non-pressure Piping: ASTM D 2855.
d. PVC to ABS Non-pressure Transition Fittings: Procedure and solvent cement according to ASTM D 3138.

U. Piping Connections: Make connections according to the following, unless otherwise indicated:

1. Install unions, in piping 2 inch NPS and smaller, adjacent to each valve and 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.

## 3.2 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.

## 3.3 PAINTING AND FINISHING

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

## 3.4 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."

## 3.5 DEMOLITION

A. Disconnect, demolish, and remove Work specified in Division 15 Sections.

B. If pipe, ductwork, insulation, or equipment to remain is damaged or disturbed, remove damaged portions and install new products of equal capacity and quality.

C. Accessible Work: Remove indicated exposed pipe and ductwork in its entirety.

D. Removal: Remove indicated equipment from Project site.

E. Temporary Disconnection: Remove, store, clean, reinstall, reconnect, and make operational equipment indicated for relocation.

## 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.

**END OF SECTION 15050**

# SECTION 15060 - HANGERS AND SUPPORTS

## 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 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.

B. Design heavy-duty steel trapezes 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. 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."

## 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.

## 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: 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.

## 2.3 MISCELLANEOUS MATERIALS

A. Powder-Actuated Drive-Pin Fasteners: Not allowed.

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.

## 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.

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 20.
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20, 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.
3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
5. Steel Weldless Eye Nuts (MSS Type 17): 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. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
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. Malleable Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
5. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
6. 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. Thermal-Hanger Shield Inserts: For supporting insulated pipe, 360-degree insert of high-density, 100 psi minimum compressive-strength, water-repellent-treated calcium silicate or cellular-glass pipe insulation, same thickness as adjoining insulation with vapor barrier and encased in 360-degree sheet metal shield.

## 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 hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

E. 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.

F. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

G. 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.

H. 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.

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. 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.

4. 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.

**END OF SECTION 15060**

# SECTION 15075 - 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 nameplates
2. Equipment markers
3. Equipment signs
4. Access panel and door markers
5. Pipe markers
6. Stencils
7. Valve tags
8. 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.

### 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 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 semi-rigid plastic formed to cover full circumference of pipe and to attach to pipe without adhesive.

C. Self-Adhesive Pipe Markers: Plastic with pressure-sensitive, permanent-type, self-adhesive back.

## 2.2 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 wire-link or beaded chain; or S-hook.

## 2.3 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 15 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. Locate nameplates where accessible and visible. Include nameplates for the following general categories of equipment:

1. Pumps and similar motor-driven units
2. Air handling units

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.

## 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, 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.

B. Locate pipe markers and color bands where piping is exposed in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior non-concealed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and non-accessible enclosures.
4. At access doors and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced markers.

## 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, shape, and color scheme and with captions similar to those indicated in the following:

1. Valve-Tag Size and Shape:

a. Cold Water: 1-1/2 inches, round.
b. Hot Water: 1-1/2 inches, round.

2. Valve-Tag Color:

   a. Cold Water: Green.
   b. Hot Water: Yellow.
   c. Dual Temperature Heating Hot/Chilled Water: Green.

3. Letter Color:

   a. Cold Water: White.
   b. Hot Water: Black.
   c. Dual Temperature Heating Hot/Chilled Water: White.

**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 15075**

# SECTION 15081 - DUCT INSULATION

## 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 semi-rigid and flexible duct, plenum, and breeching insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Section 07841 "Through-Penetration Firestop Systems" for firestopping materials and requirements for penetrations through fire and smoke barriers.
2. Section 15083 "Pipe Insulation" for insulation for piping systems.
3. Section 15815 "Metal Ducts" for duct liner.

### 1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

B. Shop Drawings: Show fabrication and installation details for the following:

1. Removable insulation sections at access panels.
2. Application of field-applied jackets.
3. Applications at linkages for control devices.

C. 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.

D. 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 clearance requirements with duct Installer for insulation application.

**1.7 SCHEDULING**

A. Schedule insulation application after testing duct systems. Insulation application may begin on segments of ducts 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. CertainTeed Manson
b. Knauf FiberGlass GmbH
c. Owens-Corning Fiberglas Corporation
d. Schuller International, Inc.

**2.2 INSULATION MATERIALS**

A. All insulation shall comply with ASHRAE90.1 or the latest edition of the Michigan Energy Code.

B. Mineral-Fiber Blanket Thermal Insulation: Glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II, without facing and with all-service jacket manufactured from kraft paper, reinforcing scrim, aluminum foil, and vinyl film.

**2.3 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. Weld-Attached Anchor Pins and Washers: Copper-coated steel pin for capacitor-discharge welding and galvanized speed washer. Pin length sufficient for insulation thickness indicated.

1. Welded Pin Holding Capacity: 100 lb for direct pull perpendicular to the attached surface.

C. Adhesive-Attached Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

1. Adhesive: Recommended by the anchor pin manufacturer as appropriate for surface temperatures of ducts, plenums, and breechings; and to achieve a holding capacity of 100 lb for direct pull perpendicular to the adhered surface.

D. Self-Adhesive Anchor Pins and Speed Washers: Galvanized steel plate, pin, and washer manufactured for attachment to duct and plenum with adhesive. Pin length sufficient for insulation thickness indicated.

**2.4 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 surfaces to receive insulation. 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; and free of voids throughout the length of ducts and fittings.

B. Refer to schedules at the end of this Section for materials, forms, jackets, and thicknesses required for each duct 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 multiple layers of insulation with longitudinal and end seams staggered.

E. Seal joints and seams with vapor-retarder mastic on insulation indicated to receive a vapor retarder.

F. Keep insulation materials dry during application and finishing.

G. Apply insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by the insulation material manufacturer.

H. Apply insulation with the least number of joints practical.

I. Apply insulation over fittings and specialties, with continuous thermal and vapor-retarder integrity, unless otherwise indicated.

J. Hangers and Anchors: Where vapor retarder is indicated, seal penetrations in insulation at hangers, supports, anchors, and other projections with vapor-retarder mastic. Apply insulation continuously through hangers and around anchor attachments.

K. Insulation Terminations: For insulation application where vapor retarders are indicated, seal ends with a compound recommended by the insulation material manufacturer to maintain vapor retarder.

L. Apply insulation with integral jackets as follows:

1. Pull jacket tight and smooth.
2. Joints and Seams: Cover with tape and vapor retarder as recommended by insulation material manufacturer to maintain vapor seal.
3. Vapor-Retarder Mastics: Where vapor retarders are indicated, apply mastic on seams and joints and at ends adjacent to duct flanges and fittings.

M. Cut insulation according to manufacturer's written instructions to prevent compressing insulation to less than 75 percent of its nominal thickness.

N. Install vapor-retarder mastic on ducts and plenums scheduled to receive vapor retarders.

1. Ducts with Vapor Retarders: Overlap insulation facing at seams and seal with vapor-retarder mastic and pressure-sensitive tape having same facing as insulation. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-retarder seal.
2. Ducts without Vapor Retarders: Overlap insulation facing at seams and secure with outward clinching staples and pressure-sensitive tape having same facing as insulation.

O. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and partitions, except fire-rated walls and partitions.

P. Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire/smoke damper sleeves for fire-rated wall and partition penetrations.

**3.4 MINERAL-FIBER INSULATION APPLICATION**

A. Blanket Applications for Ducts and Plenums: Secure blanket insulation with adhesive and anchor pins and speed washers.

1. Apply adhesives according to manufacturer's recommended coverage rates per square foot, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install anchor pins and speed washers on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches and smaller, along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.

b. On duct sides with dimensions larger than 18 inches. Space 16 inches o.c. each way, and 3 inches maximum from insulation joints. Apply additional pins and clips to hold insulation tightly against surface at cross bracing.
c. Anchor pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not overcompress insulation during installation.

4. Impale insulation over anchors and attach speed washers.
5. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
6. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation segment with 1/2-inch staples, 1 inch o.c., and cover with pressure-sensitive tape having same facing as insulation.
7. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. Secure with steel band at end joints and spaced a maximum of 18 inches o.c.
8. Apply insulation on rectangular duct elbows and transitions with a full insulation segment for each surface. Apply insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
9. Insulate duct stiffeners, hangers, and flanges that protrude beyond the insulation surface with 6-inch- wide strips of the same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with anchor pins spaced 6 inches o.c.
10. Apply vapor-retarder mastic to open joints, breaks, and punctures for insulation indicated to receive vapor retarder.

**3.5 FINISHES**

A. Glass-Cloth Jacketed Insulation: Paint insulation finished with glass-cloth jacket as specified in Section 09912 "Painting (Professional Line Products)".

**3.6 DUCT SYSTEM APPLICATIONS**

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

B. Materials and thicknesses for systems listed below are specified in schedules at the end of this Section.

C. Insulate the following plenums and duct systems:

1. Indoor concealed supply ductwork.

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

1. Metal ducts with duct liner.
2. Factory-insulated flexible ducts.
3. Factory-insulated plenums, casings and filter boxes and sections.
4. Flexible connectors.
5. Vibration-control devices.
6. Testing agency labels and stamps.
7. Nameplates and data plates.
8. Access panels and doors in air-distribution systems.

**3.7 INDOOR DUCT AND PLENUM APPLICATION SCHEDULE**

A. Service: Round, supply-air ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 1".
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

B. Service: Rectangular, supply-air ducts, concealed.

1. Material: Mineral-fiber blanket.
2. Thickness: 2".
3. Number of Layers: One.
4. Field-Applied Jacket: Foil and paper.
5. Vapor Retarder Required: Yes.

**END OF SECTION 15081**

# SECTION 15083 - PIPE INSULATION

## 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 preformed, rigid and flexible pipe insulation; insulating cements; field-applied jackets; accessories and attachments; and sealing compounds.

B. Related Sections include the following:

1. Section 15082 "Equipment Insulation" for insulation materials and application for pumps, hydronic specialties, and other equipment.
2. Section 15060 "Hangers and Supports" for pipe insulation shields and protection saddles.

### 1.3 SUBMITTALS

A. Product Data: Identify thermal conductivity, thickness, and jackets (both factory and field applied, if any), for each type of product indicated.

### 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.

### 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.

B. Store insulation in a dry location prior to installation.

### 1.6 COORDINATION

A. Coordinate size and location of supports, hangers, and insulation shields specified in Section 15060 "Hangers and Supports."

B. Coordinate clearance requirements with piping Installer for insulation application.

C. Coordinate installation and testing of steam or electric heat tracing.

**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. CertainTeed Manson
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.

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. 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.

**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.

**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 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.

O. Interior Wall and Partition Penetrations: Apply insulation continuously through walls and floors.

P. 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 Division 7 Section "Firestopping."

Q. 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 FIBERGLASS INSULATION APPLICATION

A. Apply insulation to straight pipes and tubes as follows:

1. Secure each layer of preformed pipe insulation to pipe with wire.

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 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. Cover fittings with standard PVC fitting covers.

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.

## 3.5 FIELD-APPLIED JACKET APPLICATION

A. Apply PVC jacket where indicated, with 1 inch overlap at longitudinal seams and end joints. Seal with manufacturer's recommended adhesive.

## 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

## 3.7 FIELD QUALITY CONTROL

A. Inspection: Owner and/or Architect/Engineer will perform 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.

## 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 Water.

1. Operating Temperature: 60 to 140 deg F.
2. Insulation Material: Fiberglass.
3. Insulation Thickness: Apply the following insulation thicknesses:

    a. Copper Pipe, 3/4" to 1": 3/4".
    b. Copper Pipe, 1-1/4" to 2": 1".
    c. Copper Pipe, 2-1/2" to 4": 1".

4. Vapor Retarder Required: Yes.
5. Finish: None.

B. Service: Heating hot water supply and return.

1. Operating Temperature: 40 to 200 deg F.
2. Insulation Material: Fiberglass.
3. Insulation Thickness: Apply the following insulation thicknesses:

    a. Copper Pipe, 3/4" to 1": 1".
    b. Copper Pipe, 1-1/4" to 2": 1".
    c. Steel Pipe, 3-1/2" to 4": 1-1/2".
    d. Steel Pipe, 5" to 12": 1-1/2".

4. Vapor Retarder Required: Yes.
5. Finish: None.

**END OF SECTION 15083**

# SECTION 15110 - 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 SCOPE OF WORK

A. Provide valves as scheduled and specified for the following systems:

1. Heating Hot Water.
2. Domestic Water

### 1.3 SUMMARY

A. Section Includes:

1. Bronze ball valves
2. Drain valves
3. Manual Balancing Valve (flow meters)

B. Related Sections:

1. Division 15HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 15 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

### 1.4 DEFINITIONS

A. CWP: Cold working pressure.
B. EPDM: Ethylene propylene copolymer rubber.
C. NBR: Acrylonitrile-butadiene, Buna-N, or nitrile rubber.
D. NRS: Nonrising stem.
E. OS&Y: Outside screw and yoke.
F. RS: Rising stem.
G. SWP: Steam working pressure.

### 1.5 QUALITY ASSURANCE

A. Manufacturers Standardization Society of the Valve and Fittings Industry (MSS) Compliance: Comply with the applicable MSS Standard Practices referenced.

B. ASME Compliance:

1. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
2. ASME B31.1 for power piping valves.
3. ASME B31.9 for building services piping valves.

### 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, and weld ends.
3. Set ball valves open to minimize exposure of functional surfaces.
4. 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 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 4 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
2. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.

G. Valve Bypass and Drain Connections: MSS SP-45.

**2.2 VALVE APPLICATION SCHEDULE**

A. Heating Hot Water and Domestic Water Systems:

1. Isolation through 3": Ball Valve
2. Circuit Setter: Manual Balancing Valve (flow meters).

**2.3 GENERAL VALVE REQUIREMENTS**

A. All valves shall have seats, stem seals and disc materials compatible with intended fluid, temperature, pressure and service.

B. Manually operated valves 4" and larger installed 10 feet A.F.F., or higher, shall have chain wheel operators. Chain shall reach to within 7'-0" of floor or within two feet of accessible ceiling.

C. Globe valves shall be repackable under pressure whether open or closed.

D. Unless noted otherwise, valves shall be rated for a minimum of 125# WSP (working steam pressure)/ 250# WOG (cold water, oil, gas).

E. Unless noted otherwise, all butterfly valves shall be full lug construction, suitable for bi-directional dead end service, and have open position memory stop. Manually operated butterfly valves 4" and larger shall have enclosed worm gear operators with position indicators.

F. Provide extended valve stems for insulated piping.

G. Where the valves are installed outdoors, all components including the gear operated wheel operators shall be weatherproofed.

H. Unless noted otherwise, valves through 3" shall have screwed connections for copper piping; valves 4" and larger shall be flanged.

I. Unless noted otherwise, valves shall be same size as piping.

**2.4 BRONZE BALL VALVE**

A. Two piece, full port, bronze body, stainless steel ball and stem, Teflon seat, plastic coated lever handle, balancing stops and locking devices where noted on the drawings.

1. Manufacturers:

a. Jomar T-100-SS and S-100-SS
b. Jamesbury series 300
c. Grinnell (Anvil) 3700-6 and 3700SJ-6
d. Watts series B-6000
e. Nibco
f. Pegler
g. Crane
h. Milwaukee
i. American Valve
j. Apollo
k. Hammond

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

**2.5 DRAIN VALVE**

A. General Service: Ball valve with 3/4 inch hose thread and cap.

1. Manufacturers:

a. Jomar T-100-SS and S-100-SS
b. Jamesbury series 300
c. Grinnell (Anvil) 3700-6 and 3700SJ-6
d. Watts series B-6000
e. Nibco
f. Pegler
g. Crane
h. Milwaukee
i. American Valve
j. Apollo
k. Hammond

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze.
i. Ball: Chrome-plated brass.
j. Port: Full.

**2.6 MANUAL BALANCING VALVE (FLOW METER)**

A. Manual Balancing Valve (flow meters) Requirements: ports for measuring flow, memory stop, bubble tight shut-off, valve Cv characteristics suitable for throttling. Size valve to produce readable design flow and maximum full open pressure drop of 3 feet.

B. Through 3": bronze body, brass ball, calibrated.

C. Provide gauge kit for projects requiring over 20 balancing valves. Gauge kits shall be capable of directly reading GPM, or shall include conversion chart from Cv and pressure.

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. 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.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

**3.2 VALVE INSTALLATION**

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves such that operator is completely operable, and the valve position indicator is visible from the floor.

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 check valves for proper direction of flow and as follows:

1. Swing Check Valves: In horizontal position with hinge pin level.

**3.3 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.

**3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS**

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball or butterfly valves.

B. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends.
2. For Copper Tubing, NPS 2-1/2 to NPS 4: Flanged ends.
3. For Steel Piping, NPS 6 and Larger: Flanged ends.

**END OF SECTION 15110**

# SECTION 15140 – 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 1 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.

B. Related Sections include the following:

1. Section 15122 "Meters and Gages" for thermometers, pressure gages, and fittings.
2. Section 15430 "Plumbing Specialties" for water distribution piping specialties.

### 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. Water Distribution Piping: 125 psig.

### 1.4 SUBMITTALS

A. Product Data: For pipe, tube, fittings, and couplings.

### 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. Transition Couplings for Aboveground Pressure Piping: Coupling or other manufactured fitting the same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

### 2.2 STEEL PIPING

A. Steel Pipe: ASTM A 53, Type E or S, Grade A or B, Schedule 40, galvanized. Include ends matching joining method.

1. Steel Pipe Nipples: ASTM A 733, made of ASTM A 53 or ASTM A 106, Schedule 40, galvanized, seamless steel pipe. Include ends matching joining method.

2. Malleable-Iron Unions: ASME B16.39, Class 150, hexagonal-stock body with ball-and-socket, metal-to-metal, bronze seating surface, and female threaded ends.
3. Gray-Iron, Threaded Fittings: ASME B16.4, Class 125, galvanized, standard pattern.

**2.3 COPPER TUBING**

A. Soft Copper Tube: ASTM B 88, Types K and L, water tube, annealed 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. 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.

**2.4 VALVES**

A. Refer to Section 15110 "Valves" for bronze and cast-iron, general-duty valves.

**PART 3 - EXECUTION**

**3.1 PIPING APPLICATIONS**

A. 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 to 4: 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 butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
2. Throttling Duty: Use bronze ball or globe valves for piping NPS 2 and smaller. Use butterfly valves with flanged ends for piping NPS 2-1/2 and larger.
3. Hot-Water-Piping, Balancing Duty: Calibrated balancing valves.
4. Drain Duty: Hose-end drain valves.

**3.3 PIPING INSTALLATION**

A. Refer to Section 15050 "Basic Mechanical Materials and Methods" for basic piping installation.

B. Fill water piping. Check components to determine that they are not air bound and that piping is full of water.

C. Check plumbing equipment and verify proper settings, adjustments, and operation. Do not operate water heaters before filling with water.

**3.4 JOINT CONSTRUCTION**

A. Refer to Section 15050 "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 shutoff valve on each water supply to equipment and on each water supply to plumbing fixtures without supply stops. Use ball or gate valves for piping NPS 2 and smaller. Use butterfly or gate valves for piping NPS 2-1/2 and larger.

**3.6 HANGER AND SUPPORT INSTALLATION**

A. Refer to Section 15060 "Hangers and Supports" for pipe hanger and support devices.

**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.

**3.8 FIELD QUALITY CONTROL**

A. 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 CLEANING**

A. Clean and disinfect potable and non-potable 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.

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 15140**

# SECTION 15150 - 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 1 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.

B. Related Sections include the following:

1. Section 15430 "Plumbing Specialties" for soil, waste, and vent piping systems specialties.

### 1.3 DEFINITIONS

A. The following are industry abbreviations for plastic piping materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. EPDM: Ethylene-propylene-diene terpolymer.
3. NBR: Acrylonitrile-butadiene rubber.
4. PE: Polyethylene plastic.
5. PVC: Polyvinyl chloride plastic.

### 1.4 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.

### 1.5 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.

### 1.6 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 Non-pressure 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.

C. Transition Couplings for Underground Pressure Piping: AWWA C219 metal, sleeve-type coupling or other manufactured fitting same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

**2.2 CAST-IRON SOIL PIPING**

A. Manufacturers:

a. Tyler
b. Charlotte
c. AB & I
d. U.S.A. made

B. Hubless Pipe and Fittings: ASTM A 888 and 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 301, Stainless-Steel Couplings: ASTM A 666, Type 301, 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.

2. Solvent Fittings: ASME B16.45 or ASSE 1043, hubless, aerator and deaerator.

**2.3 COPPER TUBING**

A. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.

B. Hard Copper Tube: ASTM B 88, Types L and M, 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.
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.

## PART 3 - EXECUTION

### 3.1 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 any of 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: Heavy-duty, Type 301, stainless steel.
   b. Couplings: Heavy-duty, FM approved.
   c. Couplings: Compact, stainless steel.

2. NPS 1-1/4 and NPS 1-1/2: Copper DWV tube, copper drainage fittings, and soldered joints.
3. NPS 2 to NPS 4: Hubless, cast-iron soil piping and one of the following:

   a. Couplings: Heavy-duty, Type 301, stainless steel.
   b. Couplings: Heavy-duty, FM approved.
   c. Couplings: Compact, stainless steel.

### 3.2 PIPING INSTALLATION

A. Refer to Section 15050 "Basic Mechanical Materials and Methods" for basic piping installation.

B. 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."

1. Encase underground piping with PE film according to ASTM A 674 or AWWA C105.

C. 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.

D. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 1 percent downward in direction of flow for piping NPS 4 and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

E. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

F. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

**3.3 JOINT CONSTRUCTION**

A. Refer to Section 15050 "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. Gasketed Joints: Make with rubber gasket matching class of pipe and fittings.
2. 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.

D. Grooved Joints: Assemble joint with keyed coupling, gasket, lubricant, and bolts according to coupling and fitting manufacturer's written instructions.

**3.4 HANGER AND SUPPORT INSTALLATION**

A. Refer to Section 15060 "Hangers and Supports" for pipe hanger and support devices.

**3.5 CONNECTIONS**

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

C. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code. Refer to Section 15410 "Plumbing Fixtures".
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code. Refer to Section 15430 "Plumbing Specialties."
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.

**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 15150**

# SECTION 15181 - HYDRONIC PIPING

## 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 piping, special-duty valves, and hydronic specialties for hot-water heating, chilled-water cooling, and condenser water systems; makeup water for these systems; blowdown drain lines; and condensate drain piping.

B. Related Sections include the following:

1. Section 15050 "Basic Mechanical Materials and Methods" for general piping materials and installation requirements.
2. Section 15060 "Hangers and Supports" for pipe supports, product descriptions, and installation requirements. Hanger and support spacing is specified in this Section.
3. Section 15110 "Valves" for general-duty globe, ball, butterfly, and check valves.
4. Section 15122 "Meters and Gages" for thermometers, flow meters, and pressure gages.
5. Section 15075 "Mechanical Identification" for labeling and identifying hydronic piping.
6. Section 15900 "HVAC Instrumentation and Controls" for temperature-control valves and sensors.

### 1.3 SUBMITTALS

A. Product Data: For each type of special-duty valve and automatic flow-control valve indicated.

B. Shop Drawings: Detail fabrication of pipe anchors and special pipe supports. Detail location of anchors, alignment guides, and expansion joints and loops.

C. Field Test Reports: Written reports of tests specified in Part 3 of this Section. Include the following:

1. Test procedures used
2. Test results that comply with requirements
3. Failed test results and corrective action taken to achieve requirements

D. Maintenance Data: For hydronic specialties and special-duty valves to include in maintenance manuals specified in Division 1.

### 1.4 QUALITY ASSURANCE

A. Welding: Qualify processes and operators according to the ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."

B. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with the ASME Boiler and Pressure Vessel Code, Section VIII, Division 1.

## 1.5 COORDINATION

A. Coordinate layout and installation of hydronic piping and suspension system components with other construction, including light fixtures, HVAC equipment, fire-suppression-system components, and partition assemblies.

B. Coordinate pipe sleeve installations for foundation wall penetrations.

C. Coordinate pipe fitting pressure classes with products specified in related Sections.

D. Coordinate installation of pipe sleeves for penetrations through exterior walls and floor assemblies. Coordinate with requirements for firestopping specified in Section 07841 "Through-Penetration Firestop Systems" for fire and smoke wall and floor assemblies.

## 1.6 EXTRA MATERIALS

A. Water Treatment Chemicals: Furnish sufficient chemicals for initial system startup and for preventive maintenance for one year from date of Substantial Completion.

# PART 2 - PRODUCTS

## 2.1 MANUFACTURERS

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

1. Calibrated Balancing Valves:

a. Armstrong Pumps, Inc.
b. Griswold Controls
c. ITT Bell & Gossett; ITT Fluid Technology Corporation
d. Taco, Inc.

## 2.2 PIPING MATERIALS

A. General: Refer to Part 3 "Piping Applications" Article for applications of pipe and fitting materials.

## 2.3 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L.

B. Wrought-Copper Fittings: ASME B16.22.

C. Wrought-Copper Unions: ASME B16.22.

D. Brazing Filler Metals: AWS A5.8, Classification BAg-1 (silver).

## 2.4 STEEL PIPE AND FITTINGS

A. Steel Pipe, NPS 2 and Smaller: ASTM A 53, Type S (seamless) or Type F (furnace-butt welded), Grade A, Schedule 40, black steel, plain ends.

B. Steel Pipe, NPS 2-1/2 through NPS 12: ASTM A 53, Type E (electric-resistance welded), Grade A, Schedule 40, black steel, plain ends.

C. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250.

D. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300.

E. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300.

F. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced.

G. Wrought-Steel Fittings: ASTM A 234/A 234M, wall thickness to match adjoining pipe.

H. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

I. Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150 psig minimum working pressure and 250 deg F maximum operating temperature. Connectors shall have flanged or threaded-end connections to match equipment connected and shall be capable of 3/4 inch misalignment.

J. Welding Materials: Comply with Section II, Part C, of the ASME Boiler and Pressure Vessel Code for welding materials appropriate for wall thickness and for chemical analysis of pipe being welded.

K. Gasket Material: Thickness, material, and type suitable for fluid to be handled; and design temperatures and pressures.

## 2.5 VALVES

A. Ball valves are specified in Section 15110 "Valves."

B. Refer to Part 3 "Valve Applications" Article for applications of each valve.

C. Calibrated Balancing Valves, NPS 2 and Smaller: Bronze body, ball type, 125 psig working pressure, 250 deg F maximum operating temperature, and having threaded ends. Valves shall have calibrated orifice or venturi, connections for portable differential pressure meter with integral seals, and be equipped with a memory stop to retain set position.

## 2.6 HYDRONIC SPECIALTIES

A. Manual Air Vent: Bronze body and nonferrous internal parts; 150 psig working pressure; 225 deg F operating temperature; manually operated with screwdriver or thumbscrew; with NPS 1/8 discharge connection and NPS 1/2 inlet connection.

B. Automatic Air Vent: Designed to vent automatically with float principle; bronze body and nonferrous internal parts; 150 psig working pressure; 240 deg F operating temperature; with NPS 1/4 discharge connection and NPS 1/2 inlet connection.

C. Y-Pattern Strainers: 125 psig working pressure; cast-iron body (ASTM A 126, Class B), flanged ends for NPS 2-1/2 and larger, threaded connections for NPS 2 and smaller, bolted cover, perforated stainless-steel basket, and bottom drain connection.

D. Flexible Connectors: Stainless-steel bellows with woven, flexible, bronze, wire-reinforcing protective jacket; 150 psig minimum working pressure and 250 deg F maximum operating temperature. Connectors shall have flanged- or threaded-end connections to match equipment connected and shall be capable of 3/4 inch misalignment.

## PART 3 - EXECUTION

### 3.1 PIPING APPLICATIONS

A. Dual Temperature Heating Hot/Chilled Water, NPS 2-1/2 and Smaller: Aboveground, use Type L drawn-temper copper tubing with soldered joints or Schedule 40 steel pipe with threaded joints. Belowground or within slabs, use Type K annealed-temper copper tubing with soldered joints. Use the fewest possible joints belowground and within floor slabs.

B. Dual Temperature Heating Hot/Chilled Water, NPS 3 and Larger: Schedule 40 steel pipe with welded and flanged joints or grooved mechanical-joint couplings.

C. Condensate Drain Lines: Type L drawn-temper copper tubing with soldered joints or Schedule 40.

### 3.2 VALVE APPLICATIONS

A. General-Duty Valve Applications: Unless otherwise indicated, use the following valve types:

1. Shutoff Duty: Ball valve.

B. Install shutoff duty valves at each branch connection to supply mains, at supply connection to each piece of equipment, unless only one piece of equipment is connected in the branch line. Install throttling duty valves at each branch connection to return mains, at return connections to each piece of equipment, and elsewhere as indicated.

C. Install calibrated balancing valves in the return water line of each heating or cooling element and elsewhere as required to facilitate system balancing.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

### 3.3 PIPING INSTALLATIONS

A. Refer to Section 15050 "Basic Mechanical Materials and Methods" for basic piping installation requirements.

### 3.4 HANGERS AND SUPPORTS

A. Hanger, support, and anchor devices are specified in Section 15060 "Hangers and Supports."

### 3.5 PIPE JOINT CONSTRUCTION

A. Refer to Section 15050 "Basic Mechanical Materials and Methods" for joint construction requirements for soldered and brazed joints in copper tubing; threaded, welded, and flanged joints in steel piping.

## 3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install automatic air vents in mechanical equipment rooms only at high points of system piping, at heat-transfer coils, and elsewhere as required for system air venting.

## 3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Size for supply and return piping connections shall be same as for equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If multiple, parallel control valves are installed, only one bypass is required.

D. Install ports for pressure and temperature gages at coil inlet connections.

## 3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Flush system with clean water. Clean strainers.
3. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release trapped air. Use drains installed at low points for complete draining of liquid.
3. Check expansion tanks to determine that they are not air bound and that system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the design pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed either 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A of ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

## 3.9 ADJUSTING

A. Mark calibrated nameplates of pump discharge valves after hydronic system balancing has been completed, to permanently indicate final balanced position.

B. Perform these adjustments before operating the system:

1. Open valves to fully open position. Close coil bypass valves.
2. Check pump for proper direction of rotation.
3. Check air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
4. Set temperature controls so all coils are calling for full flow.
5. Lubricate motors and bearings.

## 3.10 CLEANING

A. Flush hydronic piping systems with clean water. Remove and clean or replace strainer screens. After cleaning and flushing hydronic piping systems, but before balancing, remove disposable fine-mesh strainers in pump suction diffusers.

**END OF SECTION 15181**

# SECTION 15410 - PLUMBING FIXTURES

## 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 plumbing fixtures and related components.

1. Fixture Supports
2. Water Tempering Valves
3. Protective Shielding Guards
4. Lavatory Faucets
5. Lavatories
6. Sink Faucets
7. Sinks
8. Water Closet Flushometers
9. Toilet Seats
10. Water Closets
11. Urinal Flushometers
12. Urinals

B. Related Sections include the following:

1. Section 15430 "Plumbing Specialties" for backflow preventers, plaster traps, garbage disposals and specialty fixtures not in this Section.

### 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. Water Closet, Flushometer Tank Trim: ASSE 1037.
6. 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. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
4. Faucet Hose: ASTM D 3901.
5. Faucets: ASME A112.18.1M.
6. Hose-Connection Vacuum Breakers: ASSE 1011.
7. Hose-Coupling Threads: ASME B1.20.7.
8. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
9. NSF Materials: NSF 61.
10. Pipe Threads: ASME B1.20.1.
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.

**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 Water-Closet Support WCS-1: Water-closet combination carrier designed for accessible mounting height. Include single or double, vertical or horizontal, hubless waste fitting as required for piping arrangement; faceplates; couplings with gaskets; feet; and fixture bolts and hardware matching fixture. Include additional extension coupling, faceplate, and feet for installation in wide pipe space.

1. Manufacturers:

a. Zurn Z-1203/1204 Series
b. J. R. Smith 200 Series
c. Josam
d. Tyler Pipe, Wade Division
e. MI-Fab

B. Urinal Support, URS-1: Urinal carrier high extension, cast iron and steel frame type with tubular legs for well and floor attachment, threaded fixture studs for fixture hanger and bearing studs.

1. Manufacturers:

a. Zurn Z-1222
b. Josam
c. J. R. Smith 637 with Option M31 for Accessible Fixture Supports
d. Tyler Pipe, Wade Division
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. Protective Shielding Guard must meet ASTM E 84 (Flame and Smoke).

1. Manufacturers:

a. True Bro "Lav-Guard"
b. Sanitary Dash
c. Skal-Gard
d. Plumberex

## 2.5 LAVATORY FAUCETS

A. Lavatory Faucet, LF-1: Single lever with hot and cold water indicators. Coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor, without pop-up drain.

1. Manufacturers:

   a. Delta
   b. American Standard
   c. Kohler "Coralais K-15199

2. Maximum Flow Rate: .35 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: Lever.
9. Spout: Rigid.
10. Spout Outlet: Aerator.
11. Drain: Grid

## 2.6 LAVATORIES

A. Lavatories, LAV-1: Wall hanging, vitreous china fixture.

1. Manufacturers:

   a. Kohler Company "Greenwich" K-2023
   b. American Standard, Inc.
   c. Crane Plumbing/Fiat Products
   d. Eljer Plumbingware
   e. Zurn

2. Type: With back.
3. Size: 20" x 18" rectangular.
4. Faucet Hole Punching: Three, 4-inch centers, holes.
5. Faucet Hole Location: Top.
6. Color: White.
7. Faucet: LF-1.
8. Supplies: NPS 3/8 chrome-plated copper with stops.
9. Drain: Grid.
10. Drain Piping: NPS 1-1/4 chrome-plated cast-brass trap; NPS 1-1/4 tubular brass waste to wall and wall escutcheon.

**2.7 SINK FAUCETS**

A. Sink Faucet, SF-1: Gooseneck with hot and cold water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.

1. Manufacturers:

   a. Just Manufacturing Company, model J-1174-KS-W6
   b. Sloan
   c. Delta

2. Maximum Flow Rate: 2.2 gpm, unless otherwise indicated.
3. Body Material: Cast brass.
4. Finish: Polished chrome plate.
5. Mixing Valve: Two-lever handle.
6. Centers: 8 inches.
7. Mounting: Concealed, ledge mount.
8. Handles: Wrist blade, 4 inches.
9. Inlets: NPS 1/2.
10. Spout: Swivel 7-3/8" gooseneck.
11. Spout Outlet: Aerator.

B. Sink Faucet, SF-2: Gooseneck with hot and cold water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.

1. Manufacturers:

   a. Just Manufacturing Company, model JSFVR-5
   b. Sloan
   c. Delta

2. Maximum Flow Rate: 2.0 gpm, unless otherwise indicated.
3. Body Material: Cast brass.
4. Finish: Polished chrome plate.
5. Mixing Valve: Single-lever handle.
6. Mounting: Concealed, ledge mount.
7. Handles: Wrist blade, 4 inches.
8. Inlets: NPS 1/2.
9. Spout: Fixed 9-3/4" gooseneck.
10. Spout Outlet: Aerator.

C. Sink Faucet, SF-3: Gooseneck with hot and cold water indicators; coordinate faucet inlets with supplies and fixture holes and outlet with spout and fixture receptor.

1. Manufacturers:

   a. Just Manufacturing Company, model J-1174-KS-W6
   b. Sloan
   c. Delta

2. Maximum Flow Rate: 2.2 gpm, unless otherwise indicated.
3. Body Material: Cast brass.
4. Finish: Polished chrome plate.
5. Mixing Valve: Two-lever handle.
6. Centers: 8 inches.

7. Mounting: Concealed, ledge mount.
8. Handles: Wrist blade, 4 inches.
9. Inlets: NPS 1/2.
10. Spout: Swivel 7-3/8" gooseneck.
11. Spout Outlet: Aerator.
12. Drain: Grid.

**2.8 SINKS**

A. Sinks, SK-1: Counter-mounting, self-rimming fixture. Fixture shall be installed to comply with all ADA requirements.

1. Manufacturers:

   a. Kohler Company
   b. American Standard, Inc.
   c. Just Manufacturing model SL-2125

2. Type: With back.
3. Size: 21" x 25" x 7" deep.
4. Faucet Hole Punching: Three, 4-inch centers, hole(s).
5. Faucet Hole Location: Top.
6. Color: Stainless steel.
7. Faucet: SF-1.
8. Supplies: NPS 3/8 chrome-plated copper with stops.
9. Drain: Stainless steel drain with removable grid strainer.
10. Drain Piping: 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. Provide additional drain connection in the tail pipe to accept a drain line from the fan coil unit condensate drain line.
11. Fixture Support: Counter-mounting.
12. Mixing Valve: Water mixing valve.

B. Sinks, SK-2: Counter-mounting, self-rimming fixture, stainless steel fixture. Fixture shall be installed to comply with all ADA requirements.

1. Manufacturers:

   a. Kohler Company
   b. American Standard, Inc.
   c. Just Manufacturing model CRAF-ADA-1923

2. Type: With back.
3. Size: 19" x 23" x 4-1/2" deep.
4. Faucet Hole Punching: One, left side.
5. Faucet Hole Location: Top.
6. Color: Stainless steel.
7. Faucet: SF-2.
8. Supplies: NPS 3/8 chrome-plated copper with stops.
9. Drain: J-ADA-35.
10. Drain Piping: 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. Provide additional drain connection in the tail pipe to accept a drain line from the fan coil unit condensate drain line.
11. Fixture Support: Counter-mounting.
12. Mixing Valve: Water mixing valve.
13. Bubbler: JSB-10.

C. Sinks, SK-3: Counter-mounting, self-rimming fixture, stainless steel fixture. Fixture shall be installed to comply with all ADA requirements.

1. Manufacturers:

   a. Kohler Company
   b. American Standard, Inc.
   c. Just Manufacturing model SLXD-2125

2. Type: With back.
3. Size: 21" x 25" x 12" deep.
4. Faucet Hole Punching: Three, 4 inch centers, holes.
5. Faucet Hole Location: Top.
6. Color: Stainless steel.
7. Faucet: SF-1.
8. Supplies: NPS 3/8 chrome-plated copper with stops.
9. Drain: Stainless steel drain with removable grid strainer.
10. Drain Piping: 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. Provide additional drain connection in the tail pipe to accept a drain line from the fan coil unit condensate drain line.
11. Fixture Support: Counter-mounting.
12. Mixing Valve: Water mixing valve.

## 2.9 WATER CLOSET FLUSHOMETERS

A. Flushometer, FV-1: Cast-brass body with corrosion-resistant internal components, non-hold-open feature, control stop with check valve, vacuum breaker, and copper or brass tubing, and polished chrome-plated finish on exposed parts.

1. Manufacturers:

   a. Sloan, model 111
   b. Zurn "Aqua-Flush"

2. Internal Design: Diaphragm or piston operation.
3. Style: Exposed.
4. Inlet Size: NPS 1.
5. Trip Mechanism: Oscillating, lever-handle actuator.
6. Consumption: 1.6 gallons/flush.
7. Tailpiece Size: NPS 1-1/4 or 3/4 inch and standard length to top of bowl.

## 2.10 TOILET SEATS

A. Toilet Seat, TS-1: Solid plastic, with extended back with STA-TITE commercial fastening system.

1. Manufacturers:

   a. Beneke, model 523-SS
   b. Church, model 255 SSC/295 SSC
   c. Bemis, model 1055 SSC
   d. Kohler
   e. Centoco

2. Configuration: Open front without cover.
3. Size: Elongated.
4. Class: Heavy-duty commercial.
5. Hinge Type: CC/SC, self-sustaining, check with STA-TITE commercial fastening system.
6. Color: White.

**2.11 WATER CLOSETS**

A. Water Closets, WC-1: Wall mounted, back-outlet, vitreous-china fixture designed for flushometer valve operation. Fixture shall be installed to comply with all ADA requirements.

1. Manufacturers:

   a. American Standard, Inc.: Afwall 3351.16 or 3351.128.
   b. Crane Plumbing/Fiat Products: Placidus 3446.
   c. Kohler Co. "Kingston" 4330

2. Style: Close coupled.
3. Bowl Type: Elongated with siphon-jet design. Include bolt caps matching fixture.
4. Height: Standard, barrier free accessible.
5. Design Consumption: 1.6 gal. /flush.
6. Color: White.
7. Supply: NPS 11/2 chrome-plated brass or copper with loose-key stop.
8. Flushometer: FV-1.
9. Fixture Support: WCS-1
10. Toilet Seat: TS-1

**2.12 URINAL FLUSHOMETERS**

A. Flushometer, FV-2: Cast brass body with corrosion-resistant internal components, non-hold open feature, control stop with check valve, vacuum breaker and copper or brass tubing and polished chrome-plated finish on exposed parts.

1. Manufacturers:

   a. Sloan model 186-1
   b. Delany model 451VB
   c. Zurn

2. Internal Design: Diaphragm or piston operation.
3. Style: Exposed.
4. Inlet Size: NPS 1.
5. Trip Mechanism: Oscillating, lever-handle actuator.
6. Consumption: 1.0 gallon/flush.
7. Tailpiece Size: NPS 3/4" and standard length to top of bowl.

**2.13 URINALS**

A. Urinals, UR-1 and UR-2: Wall hanging, back-outlet, vitreous-china fixture designed for flushometer valve operation. Fixture UR-2 shall be installed to comply with all ADA requirements.

1. Manufacturers:

a. American Standard, Inc.
b. Kohler Company "Bardon" model K-4960-ET
c. Sloan model SU-1006-1.0

2. Type: Washout with extended shields.
3. Strainer or Trapway: Integral cast strainer with integral trap.
4. Design Consumption: 1.0 gallon/flush.
5. Color: White.
6. Supply Spud Size: NPS 3/4.
7. Outlet Size: NPS 1-1/2.
8. Flushometer: FV-2.
9. Fixture Support: Urinal chair carrier.

**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. 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.

C. Install back-outlet, wall hanging fixtures onto waste fitting seals and attach to supports.

D. Install wall-hanging fixtures with tubular waste piping attached to supports.

E. Install counter-mounting fixtures in and attached to casework.

F. Install fixtures level and plumb according to manufacturers' written instructions and roughing-in drawings.

G. 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.

1. Exception: Use ball, gate, or globe valve if stops are not specified with fixture. Refer to Section 15110 "Valves" for general-duty valves.

H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

J. 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.

K. Install toilet seats on water closets.

L. 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.

M. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

N. 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.

O. Set service basins in leveling bed of cement grout. Refer to Section 15050 "Basic Mechanical Materials and Methods" for grout.

P. 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 AND URINALS – STANDARD AND BARRIER FREE**

A. Mounting Heights:

1. Water Closets – Barrier Free: 18" from top of toilet seat to finished floor.
2. Urinals – Standard: 24" from rim to finished floor.
3. Urinals – Barrier Free: 17" from rim to finished floor, 48" maximum from operated flush valve to finished floor.

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 | -- | 3/4 | -- |
| Water Closet | 4 | 2 | -- | 1-1/4 | -- |
| Lavatory | 1-1/2 | 1-1/2 | 1-1/4 | 1/2 | 1/2 |
| Sink | 1-1/2 | 1-1/2 | 1-1/2 | 1/2 | 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 15410**

# SECTION 15430 - PLUMBING SPECIALTIES

## 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 plumbing specialties:

1. Water tempering valves
2. Miscellaneous piping specialties
3. Flashing materials

B. Related Sections include the following:

1. Section 15122 "Meters and Gages" for water meters, thermometers, and pressure gages.

### 1.3 DEFINITIONS

A. The following are industry abbreviations for plastic piping materials:

1. ABS: Acrylonitrile-butadiene-styrene plastic.
2. PE: Polyethylene plastic.
3. PUR: Polyurethane plastic.
4. PVC: Polyvinyl chloride plastic.

### 1.4 PERFORMANCE REQUIREMENTS

A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:

1. Domestic Water Piping: 125 psig.
2. Sanitary Waste and Vent Piping: 10-foot head of water.

### 1.5 SUBMITTALS

A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:

1. Water tempering valves.
2. Water hammer arresters, air vents, and trap seal primer valves and systems.
3. Drain valves, hose bibbs, hydrants, and hose stations.

B. Maintenance Data: For plumbing specialties to include in maintenance manuals. Include the following:

1. Backflow preventers and water regulators.
2. Thermostatic water mixing valves and water tempering valves.
3. Hose stations and hydrants.

## 1.6 QUALITY ASSURANCE

A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Section 01600 "Product Requirements."

B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.

C. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.

# 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. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

## 2.2 WATER TEMPERING VALVES

A. Manufacturers:

1. Watts Industries, Inc.; Water Products Division

B. General: Manually adjustable, thermostatically controlled water tempering valve; bronze body; and adjustable temperature setting ASSE 1070.

C. System Water Tempering Valves: Piston or discs controlling both hot- and cold-water flow, capable of limited antiscald 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.

## 2.3 MISCELLANEOUS PIPING SPECIALTIES

A. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, metal-bellows type with pressurized metal cushioning chamber. Sizes indicated are based on ASSE 1010 or PDI-WH 201, Sizes A through F.

1. Manufacturers:

a. MIFAB Manufacturing, Inc.
b. Jay R. Smith Manufacturing Company
c. Josam Company
d. Zurn Industries, Inc.; Specification Drainage Operation
e. Watts Industries, Inc.

B. Water Hammer Arresters: ASSE 1010 or PDI-WH 201, piston type with pressurized metal-tube cushioning chamber. Sizes indicated are based on ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

1. Manufacturers:

a. MIFAB Manufacturing, Inc.
b. Josam Company
c. Watts Industries, Inc.
d. Zurn Industries, Inc.; Wilkins Division
e. Jay R. Smith Manufacturing Company

C. Floor-Drain Inlet Fittings: Cast iron, with threaded inlet and threaded or spigot outlet, and trap seal primer valve connection.

D. Fixed Air-Gap Fittings: Manufactured cast-iron or bronze drainage fitting with semiopen top with threads or device to secure drainage inlet piping in top and bottom spigot or threaded outlet larger than top inlet. Include design complying with ASME A112.1.2 that will provide fixed air gap between installed inlet and outlet piping.

## 2.4 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4-lb/sq. ft., 0.0625-inch thickness.
2. Vent Pipe Flashing: 3-lb/sq. ft., 0.0469-inch thickness.
3. Burning: 6-lb/sq. ft., 0.0938-inch thickness.

B. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil minimum thickness.

C. Fasteners: Metal compatible with material and substrate being fastened.

D. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

E. Solder: ASTM B 32, lead-free alloy.

F. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

## 2.5 CLEANOUTS

A. Cleanouts: Comply with ASME A112.36.2M and ASME A112.3.1.

1. Application: Floor cleanout and wall cleanout.
2. Products:

a. MIFAB Manufacturing, Inc.
b. Josam Company
c. Jay R. Smith Manufacturing Company

d. Watts Industries, Inc., Drainage Products Division
e. Zurn Industries, Inc.

1) Floor Cleanouts: Z-1400.
2) Wall Cleanouts: Z-1468.

3. Body or Ferrule Material: Floor Cleanout cast iron and wall cleanout brass.
4. Clamping Device: Required (on membrane floors).
5. Outlet Connection: Threaded.
6. Closure: Brass plug with straight threads and gasket (stainless steel in Natatorium).
7. Adjustable Housing Material: Set-screws or other device.
8. Frame and Cover Material and Finish: Stainless steel Z1469.
9. Frame and Cover Shape: Round.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

A. Refer to Section 15050 "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system.
2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install expansion joints on vertical risers, stacks, and conductors if indicated.

D. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 100 feet for all size piping.
4. Locate at base of each vertical soil and waste stack.

E. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.

F. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, center line 7-3/4" AFF for cleanouts located in concealed piping.

G. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.

H. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.

I. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

   a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
   b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
   c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.

3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.

J. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.

K. Fasten recessed-type plumbing specialties to reinforcement built into walls.

L. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.

M. Install individual shutoff valve in each water supply to plumbing specialties. Use ball valve if specific valve is not indicated. Install shutoff valves in accessible locations. Refer to Section 15110 "Valves" for general-duty ball, butterfly, check, gate, and globe valves.

N. Install air vents at piping high points. Include ball valve in inlet.

O. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.

P. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

**3.2 CONNECTIONS**

A. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

C. Connect plumbing specialties to piping specified in other Division 15 Sections.

D. Ground equipment.

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.

F. Connect plumbing specialties and devices that require power according to Division 16 Sections.

**3.3 FLASHING INSTALLATION**

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6-lb/sq. ft., 0.0938-inch thickness or thicker. Solder joints of lead sheets 4-lb/sq. ft., 0.0625-inch thickness or thinner.
2. Copper Sheets: Solder joints of copper sheets.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches, and skirt or flange extending at least 8 inches around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Section 07620 "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

**3.4 HANDICAPPED PLUMBING FIXTURE INSTALLATION**

A. Installation of handicapped plumbing fixture must comply with Michigan Department of Labor - Barrier Free Design Rules (latest edition). Quantity and mounting heights of water closets, urinals, lavatories and drinking fountains must comply with rules in effect when project is being engineered.

**3.5 LABELING AND IDENTIFYING**

A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate on or near each backflow preventer.

1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
2. Refer to Section 15075 “Mechanical Identification" for nameplates and signs.

**3.6 PROTECTION**

A. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

**3.7 DEMONSTRATION**

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain interceptors and waste shortening controller system. Refer to Section 01770 "Closeout Procedures" and Section 01820 "Demonstration and Training".

**END OF SECTION 15430**

# SECTION 15815 - METAL DUCTS

## 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 rectangular, round, and flat-oval metal ducts and plenums for heating, ventilating, and air-conditioning systems in pressure classes from minus 2- to plus 10-inch wg.

B. Related Sections include the following:

1. Section 15081 "Mechanical Insulation" for duct insulation.
2. Section 15820 "Duct Accessories" for dampers, sound-control devices, duct-mounted access doors and panels, turning vanes, and flexible ducts.
3. Section 15855 "Diffusers, Registers, and Grilles."
4. Section 15900 "HVAC Instrumentation and Controls" for automatic volume-control dampers and operators.
5. Section 15990 "Testing, Adjusting, and Balancing" for air balancing and final adjusting of manual-volume dampers.

### 1.3 DEFINITIONS

A. Thermal Conductivity and Apparent Thermal Conductivity (k-Value): As defined in ASTM C 168. In this Section, these values are the result of the formula Btu x in./h x sq. ft. x deg F or W/m x K at the temperature differences specified. Values are expressed as Btu or W.

1. Example: Apparent Thermal Conductivity (k-Value): 0.26 or 0.037.

### 1.4 SYSTEM DESCRIPTION

A. Duct system design, as indicated, has been used to select and size air-moving and -distribution equipment and other components of air system. Changes to layout or configuration of duct system must be specifically approved in writing by Architect. Accompany requests for layout modifications with calculations showing that proposed layout will provide original design results without increasing system total pressure.

### 1.5 SUBMITTALS

A. Product Data: For duct liner and sealing materials.

B. Shop Drawings: Show details of the following:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Duct layout indicating pressure classifications and sizes on plans.
3. Fittings.
4. Reinforcement and spacing.
5. Seam and joint construction.

6. Penetrations through fire-rated and other partitions.
7. Terminal unit, coil, and humidifier installations.
8. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.

C. Coordination Drawings: Reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items. Show the following:

1. Ceiling suspension assembly members.
2. Other systems installed in same space as ducts.
3. Ceiling- and wall-mounted access doors and panels required to provide access to dampers and other operating devices.
4. Coordination with ceiling-mounted items, including lighting fixtures, diffusers, grilles, speakers, sprinkler heads, access panels, and special moldings.

D. Welding Certificates: Copies of certificates indicating welding procedures and personnel comply with requirements in "Quality Assurance" Article.

E. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.

F. Record Drawings: Indicate actual routing, fitting details, reinforcement, support, and installed accessories and devices.

**1.6 QUALITY ASSURANCE**

A. Welding Standards: Qualify welding procedures and welding personnel to perform welding processes for this Project according to AWS D1.1, "Structural Welding Code--Steel," for hangers and supports; AWS D1.2, "Structural Welding Code--Aluminum," for aluminum supporting members; and AWS D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," unless otherwise indicated.

C. Comply with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems," unless otherwise indicated.

D. Comply with NFPA 96, "Ventilation Control and Fire Protection of Commercial Cooking Operations," Chapter 3, "Duct System," for range hood ducts, unless otherwise indicated.

**1.7 DELIVERY, STORAGE AND HANDLING**

A. Deliver sealant and firestopping materials to site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multi-component materials.

B. Store and handle sealant and firestopping materials according to manufacturer's written recommendations.

## PART 2 - PRODUCTS

### 2.1 SHEET METAL MATERIALS

A. Galvanized, Sheet Steel: Lock-forming quality; ASTM A 653/A 653M, G90 coating designation; mill-phosphatized finish for surfaces of ducts exposed to view.

B. Reinforcement Shapes and Plates: Galvanized steel reinforcement where installed on galvanized, sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

C. Tie Rods: Galvanized steel, 1/4 inch minimum diameter for 36 inch length or less; 3/8 inch minimum diameter for lengths longer than 36 inches.

### 2.2 DUCT LINER

A. General: Comply with NFPA 90A or NFPA 90B and NAIMA's "Fibrous Glass Duct Liner Standard."

B. Materials: ASTM C 1071 with coated surface exposed to airstream to prevent erosion of glass fibers.

1. Thickness: 1 inch.
2. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
3. Fire-Hazard Classification: Maximum flame-spread rating of 25 and smoke-developed rating of 50, when tested according to ASTM C 411.
4. Liner Adhesive: Comply with NFPA 90A or NFPA 90B and ASTM C 916.
5. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in duct.

    a. Tensile Strength: Indefinitely sustain a 50 lb. tensile, dead-load test perpendicular to duct wall.
    b. Fastener Pin Length: As required for thickness of insulation and without projecting more than 1/8 inch into airstream.

6. Adhesive for Attaching Mechanical Fasteners: Comply with fire-hazard classification of duct liner system.
7. Ductwork Requiring Lining:

    a. All exposed rectangular supply air and return air ductwork.
    b. All rectangular transfer air ducts.

### 2.3 SEALANT MATERIALS

A. Joint and Seam Sealants, General: The term "sealant" is not limited to materials of adhesive or mastic nature but includes tapes and combinations of open-weave fabric strips and mastics.

1. Joint and Seam Tape: 2 inches wide; glass-fiber fabric reinforced.
2. Tape Sealing System: Woven-fiber tape impregnated with a gypsum mineral compound and a modified acrylic/silicone activator to react exothermically with tape to form a hard, durable, airtight seal.

3. Joint and Seam Sealant: One-part, nonsag, solvent-release-curing, polymerized butyl sealant, formulated with a minimum of 75 percent solids.
4. Flanged Joint Mastics: One-part, acid-curing, silicone, elastomeric joint sealants, complying with ASTM C 920, Type S, Grade NS, Class 25, Use O.

## 2.4 HANGERS AND SUPPORTS

A. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for building materials.

1. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
2. Exception: Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.

B. Hanger Materials: Galvanized, sheet steel or round, threaded steel rod.

1. Hangers Installed in Corrosive Atmospheres: Electrogalvanized, all-thread rod or galvanized rods with threads painted after installation.
2. Straps and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for sheet steel width and thickness and for steel rod diameters.

C. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

D. Trapeze and Riser Supports: Steel shapes complying with ASTM A 36/A 36M.

1. Supports for Galvanized-Steel Ducts: Galvanized steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel support materials.
3. Supports for Aluminum Ducts: Aluminum support materials, unless materials are electrolytically separated from ductwork.

## 2.5 RECTANGULAR DUCT FABRICATION

A. General: Fabricate ducts, elbows, transitions, offsets, branch connections, and other construction with galvanized, sheet steel, according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible." Comply with requirements for metal thickness, reinforcing types and intervals, tie-rod applications, and joint types and intervals.

1. Lengths: Fabricate rectangular ducts in lengths appropriate to reinforcement and rigidity class required for pressure classification.
2. Materials: Free from visual imperfections such as pitting, seam marks, roller marks, stains, and discolorations.

B. Static-Pressure Classifications: Unless otherwise indicated, construct ducts to the following:

1. Supply Ducts: 3 inch wg.
2. Return Ducts: 2 inch wg, negative pressure.
3. Blower Ducts: 10 inch wg.

C. Cross Breaking or Cross Beading: Cross break or cross bead duct sides 19 inches and larger and 0.0359 inch thick or less, with more than 10 sq. ft. of unbraced panel area, unless ducts are lined.

## 2.6 SHOP APPLICATION OF LINER IN RECTANGULAR DUCTS

A. Adhere a single layer of indicated thickness of duct liner with 90 percent coverage of adhesive at liner contact surface area. Multiple layers of insulation to achieve indicated thickness are prohibited.

B. Apply adhesive to liner facing in direction of airflow not receiving metal nosing.

C. Butt transverse joints without gaps and coat joint with adhesive.

D. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted-edge overlapping.

E. Do not apply liners in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and standard liner product dimensions make longitudinal joints necessary.

F. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm.

G. Secure liner with mechanical fasteners 4 inches from corners and at intervals not exceeding 12 inches transversely around perimeter; at 3 inches from transverse joints and at intervals not exceeding 18 inches longitudinally.

H. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profile or are integrally formed from duct wall. Fabricate edge facings at the following locations:

1. Fan discharge.
2. Intervals of lined duct preceding unlined duct.
3. Upstream edges of transverse joints in ducts.

I. Terminate liner with duct buildouts installed in ducts to attach dampers, turning vane assemblies, and other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct wall with bolts, screws, rivets, or welds. Terminate liner at fire dampers at connection to fire-damper sleeve.

## 2.7 ROUND DUCT FABRICATION

A. Round Ducts: Fabricate supply ducts of galvanized steel according to SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Double-Wall (Insulated) Ducts: Fabricate double-wall (insulated) ducts with an outer shell and an inner liner. Dimensions indicated on internally insulated ducts are inside dimensions.

1. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
2. Outer Shell: Base outer-shell metal thickness on actual outer-shell dimensions. Fabricate outer-shell lengths 2 inches longer than inner shell and insulation, and in metal thickness specified for single-wall duct.
3. Insulation: 1-inch- thick fibrous-glass insulation, unless otherwise indicated. Terminate insulation where internally insulated duct connects to single-wall duct or uninsulated components. Terminate insulation and reduce outer duct diameter to inner liner diameter.

4. Perforated Inner Liner: Fabricate round inner liners with sheet metal having 3/32-inch-diameter perforations, with an overall open area of 23 percent. Use the following sheet metal thicknesses and seam construction:

   a. Ducts 3 to 8 Inches in Diameter: 0.019 inch with standard spiral seam construction.
   b. Ducts 9 to 42 Inches in Diameter: 0.019 inch with single-rib spiral seam construction.
   c. Ducts 44 to 60 Inches in Diameter: 0.022 inch with single-rib spiral seam construction.
   d. Ducts 62 to 88 Inches in Diameter: 0.034 inch with standard spiral seam construction.

5. Maintain concentricity of liner to outer shell by mechanical means. Retain insulation from dislocation by mechanical means.

## 2.8 ROUND SUPPLY AND BLOWER FITTING FABRICATION

A. 90-Degree Tees and Laterals and Conical Tees: Fabricate to comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," with metal thicknesses specified for longitudinal seam straight duct.

B. Diverging-Flow Fittings: Fabricate with a reduced entrance to branch taps with no excess material projecting from body onto branch tap entrance.

C. Elbows: Fabricate in die-formed, gored, pleated, or mitered construction. Fabricate bend radius of die-formed, gored, and pleated elbows one and one-half times elbow diameter. Unless elbow construction type is indicated, fabricate elbows as follows:

1. Mitered-Elbow Radius and Number of Pieces: Welded construction complying with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible," unless otherwise indicated.
2. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from minus 2- to plus 2-inch wg:

   a. Ducts 3 to 26 Inches in Diameter: 0.028 inch.
   b. Ducts 27 to 36 Inches in Diameter: 0.034 inch.
   c. Ducts 37 to 50 Inches in Diameter: 0.040 inch.
   d. Ducts 52 to 60 Inches in Diameter: 0.052 inch.
   e. Ducts 62 to 84 Inches in Diameter: 0.064 inch.

3. Round Mitered Elbows: Welded construction with the following metal thickness for pressure classes from 2- to 10-inch wg:

   a. Ducts 3 to 14 Inches in Diameter: 0.028 inch.
   b. Ducts 15 to 26 Inches in Diameter: 0.034 inch.
   c. Ducts 27 to 50 Inches in Diameter: 0.040 inch.
   d. Ducts 52 to 60 Inches in Diameter: 0.052 inch.
   e. Ducts 62 to 84 Inches in Diameter: 0.064 inch.

4. 90-Degree, Two-Piece, Mitered Elbows: Use only for supply systems, or exhaust systems for material-handling classes A and B; and only where space restrictions do not permit using 1.5 bend radius elbows. Fabricate with single-thickness turning vanes.
5. Round Elbows, 8 Inches and Smaller: Fabricate die-formed elbows for 45- and 90-degree elbows and pleated elbows for 30, 45, 60, and 90 degrees only. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with gored construction.

6. Round Elbows, 9 through 14 Inches: Fabricate gored or pleated elbows for 30, 45, 60, and 90 degrees, unless space restrictions require a mitered elbow. Fabricate nonstandard bend-angle configuration or nonstandard diameter elbows with gored construction.
7. Round Elbows, Larger Than 14 Inches, and All Flat-Oval Elbows: Fabricate gored elbows, unless space restrictions require a mitered elbow.
8. Die-Formed Elbows for Sizes through 8 Inches and All Pressures: 0.040 inch thick with two-piece welded construction.
9. Round Gored-Elbow Metal Thickness: Same as non-elbow fittings specified above.
10. Flat-Oval Elbow Metal Thickness: Same as longitudinal seam flat-oval duct specified above.
11. Pleated Elbows for Sizes through 14 Inches and Pressures through 10-Inch wg: 0.022 inch.

D. Double-Wall (Insulated) Fittings: Fabricate double-wall (insulated) fittings with an outer shell and an inner liner. Dimensions indicated on internally insulated ducts are inside dimensions.

1. Thermal Conductivity (k-Value): 0.26 at 75 deg F mean temperature.
2. Outer Shell: Base outer-shell metal thickness on actual outer-shell dimensions. Fabricate outer-shell lengths 2 inches longer than inner shell and insulation. Use the same metal thicknesses for outer duct as for uninsulated fittings.
3. Insulation: 1-inch- thick fibrous-glass insulation, unless otherwise indicated. Terminate insulation where internally insulated duct connects to single-wall duct or uninsulated components. Terminate insulation and reduce outer duct diameter to nominal single-wall size.
4. Solid Inner Liner: Fabricate round and flat-oval inner liners with solid sheet metal of thickness listed below:
5. Perforated Inner Liner: Fabricate round and flat-oval inner liners with sheet metal having 3/32-inch- diameter perforations, with an overall open area of 23 percent. Use the following sheet metal thicknesses:

    a. Ducts 3 to 34 Inches in Diameter: 0.028 inch.
    b. Ducts 35 to 58 Inches in Diameter: 0.034 inch.
    c. Ducts 60 to 88 Inches in Diameter: 0.040 inch.

6. Maintain concentricity of liner to outer shell by mechanical means. Retain insulation from dislocation by mechanical means.

**PART 3 - EXECUTION**

**3.1 DUCT INSTALLATION – GENERAL**

A. Duct installation requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts, fittings, and accessories.

B. Construct and install each duct system for the specific duct pressure classification indicated.

C. Install round and flat-oval ducts in lengths not less than 12 feet, unless interrupted by fittings.

D. Install ducts with fewest possible joints.

E. Install fabricated fittings for changes in directions, changes in size and shape, and connections.

F. Install couplings tight to duct wall surface with a minimum of projections into duct.

G. Install ducts, unless otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs.

H. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

I. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.

J. Conceal ducts from view in finished spaces. Do not encase horizontal runs in solid partitions, unless specifically indicated.

K. Coordinate layout with suspended ceiling, fire- and smoke-control dampers, lighting layouts, and similar finished work.

L. Electrical Equipment Spaces: Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

M. Non-Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same metal thickness as duct. Overlap opening on four sides by at least 1-1/2 inches.

N. Fire-Rated Partition Penetrations: Where ducts pass through interior partitions and exterior walls, install appropriately rated fire damper, sleeve, and firestopping sealant. Fire and smoke dampers are specified in Division 15 Section "Duct Accessories." Firestopping materials and installation methods are specified in Division 7 Section "Firestopping."

**3.2 DUCT LINER INSTALLATION, GENERAL**

A. Install per manufacturers recommendations.

**3.3 SEAM AND JOINT SEALING**

A. General: Seal duct seams and joints according to the duct pressure class indicated and as described in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Pressure Classification Less Than 2-Inch wg: Transverse joints.

C. Seal externally insulated ducts before insulation installation.

**3.4 HANGING AND SUPPORTING**

A. Install rigid round, rectangular, and flat-oval metal duct with support systems indicated in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

B. Support horizontal ducts within 24 inches of each elbow and within 48 inches of each branch intersection.

C. Support vertical ducts at a maximum interval of 16 feet and at each floor.

D. Install upper attachments to structures with an allowable load not exceeding one-fourth of failure (proof-test) load.

E. Install powder-actuated concrete fasteners after concrete is placed and completely cured.

**3.5 CONNECTIONS**

A. Connect equipment with flexible connectors according to Division 15 Section "Duct Accessories."

B. For branch, outlet and inlet, and terminal unit connections, comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible."

**3.6 FIELD QUALITY CONTROL**

A. Disassemble, reassemble, and seal segments of systems as required to accommodate leakage testing and as required for compliance with test requirements.

B. Conduct tests, in presence of Architect, at static pressures equal to maximum design pressure of system or section being tested. If pressure classifications are not indicated, test entire system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure. Give seven days' advance notice for testing.

C. Determine leakage from entire system or section of system by relating leakage to surface area of test section.

D. Maximum Allowable Leakage: Comply with requirements for Leakage Classification 3 for round and flat-oval ducts, Leakage Classification 12 for rectangular ducts in pressure classifications less than and equal to 2-inch wg (both positive and negative pressures), and Leakage Classification 6 for pressure classifications from 2- to 10-inch wg.

E. Remake leaking joints and retest until leakage is less than maximum allowable.

F. Leakage Test: Perform tests according to SMACNA's "HVAC Air Duct Leakage Test Manual."

**3.7 ADJUSTING**

A. Adjust volume-control dampers in ducts, outlets, and inlets to achieve design airflow.

B. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for detailed procedures.

**3.8 CLEANING**

A. After completing system installation, including outlet fittings and devices, inspect the system. Vacuum ducts before final acceptance to remove dust and debris.

**END OF SECTION 15815**

# SECTION 15820 - DUCT ACCESSORIES

## 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. Backdraft dampers
2. Volume dampers
3. Flexible ducts
4. Duct accessory hardware

B. Related Sections include the following:

1. Division 13 Section "Fire Alarm" for duct-mounting fire and smoke detectors.
2. Division 15 Section "HVAC Instrumentation and Controls" for electric and pneumatic damper actuators.

### 1.3 SUBMITTALS

A. Product Data: For the following:

1. Volume dampers
2. Flexible connectors
3. Flexible ducts

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Special fittings.
2. Manual-volume damper installations.
3. Motorized-control damper installations.
4. Fire-damper, installations, including sleeves and duct-mounting access doors.
5. Wiring Diagrams: Power, signal, and control wiring.

C. Coordination Drawings: Reflected ceiling plans, drawn to scale and coordinating penetrations and ceiling-mounting items. Show ceiling-mounting access panels and access doors required for access to duct accessories.

### 1.4 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

**1.5 EXTRA MATERIALS**

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

**2.2 SHEET METAL MATERIALS**

A. Comply with SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods, unless otherwise indicated.

B. Galvanized Sheet Steel: Lock-forming quality; complying with ASTM A 653/A 653M and having G60 coating designation; ducts shall have mill-phosphatized finish for surfaces exposed to view.

C. Stainless Steel: ASTM A 480/A 480M.

D. Aluminum Sheets: ASTM B 209, alloy 3003, temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: ASTM B 221, alloy 6063, temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

**2.3 BACKDRAFT DAMPERS**

A. Manufacturers:

1. Air Balance, Inc.
2. Greenheck
3. Penn Ventilation Company, Inc.
4. Ruskin Company

B. Description: Multiple-blade, parallel action gravity balanced, with center-pivoted blades of maximum 6-inch width, with sealed edges, assembled in rattle-free manner with 90-degree stop, steel ball bearings, and axles; adjustment device to permit setting for varying differential static pressure.

C. Frame: 0.063-inch thick extruded aluminum with welded corners and mounting flange.

D. Blades: 0.025-inch thick, roll-formed aluminum.

E. Blade Seals: Vinyl.

F. Tie Bars and Brackets: Aluminum.

G. Return Spring: Adjustable tension.

## 2.4 VOLUME DAMPERS

A. Manufacturers:

1. Air Balance, Inc.
2. McGill AirFlow Corporation.
3. Nailor Industries Inc.
4. Penn Ventilation Company, Inc.
5. Ruskin Company.
6. Greenheck.

B. General Description: Factory fabricated, with required hardware and accessories. Stiffen damper blades for stability. Include locking device to hold single-blade dampers in a fixed position without vibration. Close duct penetrations for damper components to seal duct consistent with pressure class.

1. Pressure Classes of 3-Inch wg or Higher: End bearings or other seals for ducts with axles full length of damper blades and bearings at both ends of operating shaft.

C. Standard Volume Dampers: Multiple- or single-blade, parallel- or opposed-blade design as indicated, standard leakage rating, with linkage outside airstream, and suitable for horizontal or vertical applications.

1. Steel Frames: Hat-shaped, galvanized sheet steel channels, minimum of 0.064 inch thick, with mitered and welded corners; frames with flanges where indicated for attaching to walls and flangeless frames where indicated for installing in ducts.
2. Roll-Formed Steel Blades: 0.064-inch- thick, galvanized sheet steel.
3. Aluminum Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges where indicated for attaching to walls; and flangeless frames where indicated for installing in ducts.
4. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
5. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.

## 2.5 DUCT-MOUNTING ACCESS DOORS

A. General Description: Fabricate doors airtight and suitable for duct pressure class.

B. Door: Double wall, duct mounting, and rectangular; fabricated of galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class. Include vision panel where indicated. Include 1-by-1-inch butt or piano hinge and cam latches.

1. Manufacturers:

a. Ductmate Industries, Inc.
b. Greenheck
c. McGill AirFlow Corporation
d. Nailor Industries Inc.

2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
3. Provide number of hinges and locks as follows:

   a. Less than 12 Inches Square: Secure with two sash locks.
   b. Up to 18 Inches Square: Two hinges and two sash locks.
   c. Up to 24 by 48 Inches: Three hinges and two compression latches with outside and inside handles.
   d. Sizes 24 by 48 Inches and Larger: One additional hinge.

C. Door: Double wall, duct mounting, and round; fabricated of galvanized sheet metal with insulation fill and 1-inch thickness. Include cam latches.

1. Manufacturers:

   a. Ductmate Industries, Inc.
   b. Flexmaster U.S.A., Inc.
   c. Semco, Inc.

2. Frame: Galvanized sheet steel, with spin-in notched frame.

D. Seal around frame attachment to duct and door to frame with neoprene or foam rubber.

E. Insulation: 1-inch- thick, fibrous-glass or polystyrene-foam board.

**2.6 FLEXIBLE CONNECTORS**

A. Manufacturers:

1. Ductmate Industries, Inc.
2. Duro Dyne Corporation
3. Ventfabrics, Inc.
4. Ward Industries, Inc.
5. Semco, Inc.

B. General Description: Flame-retardant or noncombustible fabrics, coatings, and adhesives complying with UL 181, Class 1.

C. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd.
2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F.

D. High-Corrosive-Environment System, Flexible Connectors: Glass fabric with chemical-resistant coating.

1. Minimum Weight: 14 oz./sq. yd.
2. Tensile Strength: 450 lbf/inch in the warp and 340 lbf/inch in the filling.
3. Service Temperature: Minus 67 to plus 500 deg F.

## 2.7 FLEXIBLE DUCTS

A. Manufacturers:

1. Flexmaster U.S.A., Inc.
2. Hart & Cooley, Inc.
3. McGill AirFlow Corporation

B. Insulated-Duct Connectors: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.

C. Flexible Duct Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action, in sizes 3 through 18 inches to suit duct size.

## 2.8 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

# PART 3 - EXECUTION

## 3.1 APPLICATION AND INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards--Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Provide duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.

D. Install volume dampers in ducts with liner; avoid damage to and erosion of duct liner.

E. Provide balancing dampers at points on supply, return, and exhaust systems where branches lead from larger ducts as required for air balancing. Install at a minimum of two duct widths from branch takeoff.

F. Provide test holes at fan inlets and outlets and elsewhere as indicated.

G. Install fire and smoke dampers, with fusible links, according to manufacturer's UL-approved written instructions.

H. Install duct access doors to allow for inspecting, adjusting, and maintaining accessories and terminal units as follows:

1. On both sides of duct coils.
2. Downstream from volume dampers, turning vanes, and equipment.
3. Adjacent to fire or smoke dampers, providing access to reset or reinstall fusible links.

I. Install the following sizes for duct-mounting, rectangular access doors:

1. Two-Hand Access: 12 by 6 inches.

J. Label access doors according to Division 15 Section "Mechanical Identification."

K. Install flexible connectors immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators.

L. For fans developing static pressures of 5-inch wg and higher, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

M. Connect terminal units to supply ducts directly or with maximum 12-inch lengths of flexible duct. Do not use flexible ducts to change directions.

N. Connect diffusers or light troffer boots to low pressure ducts directly or with maximum 60-inch lengths of flexible duct clamped or strapped in place.

O. Connect flexible ducts to metal ducts with draw bands.

P. Install duct test holes where indicated and required for testing and balancing purposes.

## 3.2 ADJUSTING

A. Adjust duct accessories for proper settings.

B. Adjust fire and smoke dampers for proper action.

C. Final positioning of manual-volume dampers is specified in Division 15 Section "Testing, Adjusting, and Balancing."

**END OF SECTION 15820**

# SECTION 15838 - POWER VENTILATORS

## 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. Belt-drive cabinet fan
2. In-line cabinet fan

### 1.3 PERFORMANCE REQUIREMENTS

A. Operating Limits: Classify according to AMCA 99.

### 1.4 SUBMITTALS

A. Product Data: Include rated capacities, furnished specialties, and accessories for each type of product indicated and include the following:

1. Certified fan performance curves with system operating conditions indicated.
2. Certified fan sound-power ratings.
3. Motor ratings and electrical characteristics, plus motor and electrical accessories.
4. Material gages and finishes, including color charts.
5. Dampers, including housings, linkages, and operators.

B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

1. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturer-installed and field-installed wiring.

C. Maintenance Data: For power ventilators to include in maintenance manuals specified in Division 1.

### 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. AMCA Compliance: Products shall comply with performance requirements and shall be licensed to use the AMCA-Certified Ratings Seal.

C. NEMA Compliance: Motors and electrical accessories shall comply with NEMA standards.

D. UL Standard: Power ventilators shall comply with UL 705.

**1.6 DELIVERY, STORAGE AND HANDLING**

A. Deliver fans as factory-assembled unit, to the extent allowable by shipping limitations, with protective crating and covering.

B. Disassemble and reassemble units, as required for moving to final location, according to manufacturer's written instructions.

C. Lift and support units with manufacturer's designated lifting or supporting points.

**1.7 COORDINATION**

A. Coordinate size and location of structural-steel support members.

B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 7 Section "Roof Accessories."

**1.8 EXTRA MATERIALS**

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Belts: One (1) set for each belt-driven unit.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

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

1. In-line cabinet fan:

a. Cook, Loren Company
b. Greenheck Fan Corporation - CSP

**2.2 IN-LINE CABINET FAN**

A. Description: Centrifugal fans designed for installing in ceiling applications.

B. Housing: Corrosion resistant galvanized steel scroll and housing lined with acoustical insulation.

C. Fan Wheel: Centrifugal wheels directly mounted on motor shaft. Fan shrouds, motor, and fan wheel shall be removable for service. Double inlet forward curved wheel.

D. Electrical Requirements: Junction box for electrical connection on housing and receptacle for motor plug-in.

1. Filter: Washable aluminum to fit between fan and grille.
2. Manufacturer's standard roof jack cap, and transition fittings.
3. Motor with thermal overloads.

4. UL/c UL-507 “electric fans”.
5. Solid state speed control – SW SSC (shipped loose).
6. Time delay switch – Model GTD.

**2.3 MOTORS**

A. Comply with requirements in Division 15 Section "Motors."

B. Enclosure Type: Guarded dripproof.

**2.4 SOURCE QUALITY CONTROL**

A. Sound-Power Level Ratings: Comply with AMCA 301, "Methods for Calculating Fan Sound Ratings from Laboratory Test Data." Factory test fans according to AMCA 300, "Reverberant Room Method for Sound Testing of Fans." Label fans with the AMCA-Certified Ratings Seal.

B. Fan Performance Ratings: Establish flow rate, pressure, power, air density, speed of rotation, and efficiency by factory tests and ratings according to AMCA 210, "Laboratory Methods of Testing Fans for Rating."

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

A. Install power ventilators level and plumb.

B. Support units using spring isolators having a static deflection of 1 inch. Vibration- and seismic-control devices are specified in Division 15 Section "Mechanical Vibration Controls and Seismic Restraints."

1. Secure vibration and seismic controls to concrete bases using anchor bolts cast in concrete base.

C. Support suspended units from structure using threaded steel rods and spring hangers. Vibration-control devices are specified in Division 15 Section "Mechanical Vibration Controls and Seismic Restraints."

1. In seismic zones, restrain support units.

D. Install units with clearances for service and maintenance.

E. Label units according to requirements specified in Division 15 Section "Mechanical Identification."

**3.2 CONNECTIONS**

A. Duct installation and connection requirements are specified in other Division 15 Sections. Drawings indicate general arrangement of ducts and duct accessories. Make final duct connections with flexible connectors. Flexible connectors are specified in Division 15 Section "Duct Accessories."

B. Install ducts adjacent to power ventilators to allow service and maintenance.

C. Ground equipment.

D. 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.

**3.3 FIELD QUALITY CONTROL**

A. Equipment Startup Checks:

1. Verify that shipping, blocking, and bracing are removed.
2. Verify that unit is secure on mountings and supporting devices and that connections to ducts and electrical components are complete. Verify that proper thermal-overload protection is installed in motors, starters, and disconnect switches.
3. Verify that cleaning and adjusting are complete.
4. Disconnect fan drive from motor, verify proper motor rotation direction, and verify fan wheel free rotation and smooth bearing operation. Reconnect fan drive system, align and adjust belts, and install belt guards.
5. Verify lubrication for bearings and other moving parts.
6. Verify that manual and automatic volume control and fire and smoke dampers in connected ductwork systems are in fully open position.
7. Disable automatic temperature-control operators.

B. Starting Procedures:

1. Energize motor and adjust fan to indicated rpm.
2. Measure and record motor voltage and amperage.

C. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation. Remove malfunctioning units, replace with new units, and retest.

D. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

E. Shut unit down and reconnect automatic temperature-control operators.

F. Refer to Division 15 Section "Testing, Adjusting, and Balancing" for testing, adjusting, and balancing procedures.

G. Replace fan and motor pulleys as required to achieve design airflow.

H. Repair or replace malfunctioning units. Retest as specified above after repairs or replacements are made.

**3.4 ADJUSTING**

A. Adjust damper linkages for proper damper operation.

B. Adjust belt tension.

C. Lubricate bearings.

## 3.5 CLEANING

A. On completion of installation, internally clean fans according to manufacturer's written instructions. Remove foreign material and construction debris. Vacuum fan wheel and cabinet.

B. After completing system installation, including outlet fitting and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finishes.

## 3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain power ventilators.

1. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
2. Review data in maintenance manuals. Refer to Division 1 Section "Closeout Procedures."
3. Review data in maintenance manuals. Refer to Division 1 Section "Operation and Maintenance Data."
4. Schedule training with Owner, through Architect, with at least seven days' advance notice.

**END OF SECTION 15838**

# SECTION 15855 - DIFFUSERS, REGISTERS AND GRILLES

## 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 ceiling- and wall-mounted diffusers, registers, and grilles.

B. Related Sections include the following:

1. Section 15820 "Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.
2. Section 15990 "Testing, Adjusting, and Balancing" for balancing diffusers, registers, and grilles.

### 1.3 DEFINITIONS

A. Diffuser: Circular, square, or rectangular air distribution outlet, generally located in the ceiling and comprised of deflecting members discharging supply air in various directions and planes and arranged to promote mixing of primary air with secondary room air.

B. Grille: A louvered or perforated covering for an opening in an air passage, which can be located in a sidewall, ceiling, or floor.

C. Register: A combination grille and damper assembly over an air opening.

### 1.4 SUBMITTALS

A. Product Data: For each model indicated, include the following:

1. Data Sheet: For each type of air outlet and inlet, and accessory furnished; indicate construction, finish, and mounting details.
2. Performance Data: Include throw and drop, static-pressure drop, and noise ratings for each type of air outlet and inlet.
3. Schedule of diffusers, registers, and grilles indicating drawing designation, room location, quantity, model number, size, and accessories furnished.
4. Assembly Drawing: For each type of air outlet and inlet; indicate materials and methods of assembly of components.

B. Coordination Drawings: Reflected ceiling plans and wall elevations drawn to scale to show locations and coordination of diffusers, registers, and grilles with other items installed in ceilings and walls.

C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for diffusers, registers, and grilles with factory-applied color finishes.

D. Samples for Verification: Of diffusers, registers, and grilles, in manufacturer's standard sizes, showing the full range of colors. Prepare Samples from the same material to be used for the Work.

### 1.5 QUALITY ASSURANCE

A. Product Options: Drawings and schedules indicate specific requirements of diffusers, registers, and grilles and are based on the specific requirements of the systems indicated. Other manufacturers' products with equal performance characteristics may be considered. Refer to Division 1 Section "Substitutions."

B. NFPA Compliance: Install diffusers, registers, and grilles according to NFPA 90A, "Standard for the Installation of Air-Conditioning and Ventilating Systems."

## PART 2 - PRODUCTS

### 2.1 MANUFACTURED UNITS

A. Diffusers, registers, and grilles are scheduled on Drawings.

### 2.2 SOURCE QUALITY CONTROL

A. Testing: Test performance according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb, according to manufacturer's written instructions, Coordination Drawings, original design, and referenced standards.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practicable. For units installed in lay-in ceiling panels, locate units in the grid. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connection to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

### 3.3 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

## 3.4 CLEANING

A. After installation of diffusers, registers, and grilles, inspect exposed finish. Clean exposed surfaces to remove burrs, dirt, and smudges. Replace diffusers, registers, and grilles that have damaged finishes.

## 3.5 DIFFUSERS, REGISTERS AND GRILLES

A. Manufacturers:

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

   a. Price
   b. Nailor Industries Inc.
   c. Titus

2. Material: Refer to Schedule.
3. Finish: Refer to Schedule.

**END OF SECTION 15855**

# SECTION 15990 - TESTING, ADJUSTING, AND BALANCING

## 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 TAB to produce design objectives for the following:

1. Air Systems:

    a. Constant-volume air systems

2. Hydronic Piping Systems:

    a. Constant-flow systems

3. Indoor-air quality measuring
4. Verifying that automatic control devices are functioning properly
5. Reporting results of activities and procedures specified in this Section

### 1.3 DEFINITIONS

A. Adjust: To regulate fluid flow rate and air patterns at the terminal equipment, such as to reduce fan speed or adjust a damper.

B. Balance: To proportion flows within the distribution system, including submains, branches, and terminals, according to indicated quantities.

C. Barrier or Boundary: Construction, either vertical or horizontal, such as walls, floors, and ceilings that are designed and constructed to restrict the movement of airflow, smoke, odors, and other pollutants.

D. Draft: A current of air, when referring to localized effect caused by one or more factors of high air velocity, low ambient temperature, or direction of airflow, whereby more heat is withdrawn from a person's skin than is normally dissipated.

E. NC: Noise criteria.

F. Procedure: An approach to and execution of a sequence of work operations to yield repeatable results.

G. RC: Room criteria.

H. Report Forms: Test data sheets for recording test data in logical order.

I. Static Head: The pressure due to the weight of the fluid above the point of measurement. In a closed system, static head is equal on both sides of the pump.

J. Suction Head: The height of fluid surface above the centerline of the pump on the suction side.

K. System Effect: A phenomenon that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.

L. System Effect Factors: Allowances used to calculate a reduction of the performance ratings of a fan when installed under conditions different from those presented when the fan was performance tested.

M. TAB: Testing, adjusting, and balancing.

N. Terminal: A point where the controlled medium, such as fluid or energy, enters or leaves the distribution system.

O. Test: A procedure to determine quantitative performance of systems or equipment.

P. Testing, Adjusting, and Balancing (TAB) Firm: The entity responsible for performing and reporting TAB procedures.

**1.4 SUBMITTALS**

A. Qualification Data: Within 30 days from Contractor's Notice to Proceed, submit 4 copies of evidence that TAB firm and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Strategies and Procedures Plan: Within 30 days from Contractor's Notice to Proceed, submit 4 copies of TAB strategies and step-by-step procedures as specified in Part 3 "Preparation" Article. Include a complete set of report forms intended for use on this Project.

C. Sample Report Forms: Submit two sets of sample TAB report forms.

D. Warranties specified in this Section.

**1.5 QUALITY ASSURANCE**

A. TAB Firm Qualifications: Engage a TAB firm certified by AABC.

B. TAB Conference: Meet with Owner's representatives on approval of TAB strategies and procedures plan to develop a mutual understanding of the details. Ensure the participation of TAB team members, equipment manufacturers' authorized service representatives, HVAC controls installers, and other support personnel. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items: Include at least the following:

   a. Submittal distribution requirements.
   b. The Contract Documents examination report.
   c. TAB plan.
   d. Work schedule and Project-site access requirements.
   e. Coordination and cooperation of trades and subcontractors.
   f. Coordination of documentation and communication flow.

C. TAB Report Forms: Use standard forms from AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems."

D. Instrumentation Type, Quantity, and Accuracy: As described in [AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems] [NEBB's "Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems," Section II, "Required Instrumentation for NEBB Certification]."

E. Instrumentation Calibration: Calibrate instruments at least every six months or more frequently if required by instrument manufacturer.

1. Keep an updated record of instrument calibration that indicates date of calibration and the name of party performing instrument calibration.

**1.6 COORDINATION**

A. Coordinate the efforts of factory-authorized service representatives for systems and equipment, HVAC controls installers, and other mechanics to operate HVAC systems and equipment to support and assist TAB activities.

B. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

C. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

**PART 2 - PRODUCTS (Not Applicable)**

**PART 3 - EXECUTION**

**3.1 EXAMINATION**

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

1. Contract Documents are defined in the General and Supplementary Conditions of Contract.
2. Verify that balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are required by the Contract Documents. Verify that quantities and locations of these balancing devices are accessible and appropriate for effective balancing and for efficient system and equipment operation.

B. Examine approved submittal data of HVAC systems and equipment.

C. Examine design data, including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

D. Examine equipment performance data including fan and pump curves. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system. Calculate system effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from those presented when the equipment was performance tested at the factory. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," Sections 7 through 10; or in SMACNA's "HVAC Systems--Duct Design," Sections 5 and 6. Compare this data with the design data and installed conditions.

E. Examine system and equipment installations to verify that they are complete and that testing, cleaning, adjusting, and commissioning specified in individual Sections have been performed.

F. Examine system and equipment test reports.

G. Examine HVAC system and equipment installations to verify that indicated balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers, are properly installed, and that their locations are accessible and appropriate for effective balancing and for efficient system and equipment operation.

H. Examine systems for functional deficiencies that cannot be corrected by adjusting and balancing.

I. Examine HVAC equipment to ensure that clean filters have been installed, bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine terminal units, such as variable-air-volume boxes, to verify that they are accessible and their controls are connected and functioning.

K. Examine plenum ceilings used for supply air to verify that they are airtight. Verify that pipe penetrations and other holes are sealed.

L. Examine strainers for clean screens and proper perforations.

M. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

N. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

O. Examine system pumps to ensure absence of entrained air in the suction piping.

P. Examine equipment for installation and for properly operating safety interlocks and controls.

Q. Examine automatic temperature system components to verify the following:

1. Dampers, valves, and other controlled devices are operated by the intended controller.
2. Dampers and valves are in the position indicated by the controller.
3. Integrity of valves and dampers for free and full operation and for tightness of fully closed and fully open positions. This includes dampers in multizone units, mixing boxes, and variable-air-volume terminals.
4. Automatic modulating and shutoff valves, including two-way valves and three-way mixing and diverting valves, are properly connected.

5. Thermostats and humidistats are located to avoid adverse effects of sunlight, drafts, and cold walls.
6. Sensors are located to sense only the intended conditions.
7. Sequence of operation for control modes is according to the Contract Documents.
8. Controller set points are set at indicated values.
9. Interlocked systems are operating.
10. Changeover from heating to cooling mode occurs according to indicated values.

R. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

**3.2 PREPARATION**

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system readiness checks. Verify the following:

1. Permanent electrical power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

**3.3 GENERAL PROCEDURES FOR TESTING AND BALANCING**

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Testing and Balancing Heating, Ventilating, and Air Conditioning Systems".

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary to allow adequate performance of procedures. After testing and balancing, close probe holes and patch insulation with new materials identical to those removed. Restore vapor barrier and finish according to insulation Specifications for this Project.

C. Mark equipment and balancing device settings with paint or other suitable, permanent identification material, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

**3.4 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS**

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. For variable-air-volume systems, develop a plan to simulate diversity.

C. Determine the best locations in main and branch ducts for accurate duct airflow measurements.

D. Check airflow patterns from the outside-air louvers and dampers and the return- and exhaust-air dampers, through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling unit components.

K. Check for proper sealing of air duct system.

**3.5 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS**

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure fan static pressures to determine actual static pressure as follows:

   a. Measure outlet static pressure as far downstream from the fan as practicable and upstream from restrictions in ducts such as elbows and transitions.
   b. Measure static pressure directly at the fan outlet or through the flexible connection.
   c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from flexible connection and downstream from duct restrictions.
   d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

2. Measure static pressure across each component that makes up an air-handling unit and other air-handling and -treating equipment.

   a. Simulate dirty filter operation and record the point at which maintenance personnel must change filters.

3. Measure static pressures entering and leaving other devices such as sound traps, heat recovery equipment, and air washers, under final balanced conditions.
4. Compare design data with installed conditions to determine variations in design static pressures versus actual static pressures. Compare actual system effect factors with calculated system effect factors to identify where variations occur. Recommend corrective action to align design and actual conditions.
5. Obtain approval from Architect for adjustment of fan speed higher or lower than indicated speed. Make required adjustments to pulley sizes, motor sizes, and electrical connections to accommodate fan-speed changes.

6. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full cooling, full heating, economizer, and any other operating modes to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure terminal outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust terminal outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

**3.6 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS**

A. Prepare test reports with pertinent design data and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check expansion tank liquid level.
3. Check makeup-water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

## 3.7 PROCEDURES FOR HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures, except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.
2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.
3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 5 percent of design.

B. Set calibrated balancing valves, if installed, at calculated presettings.

C. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

D. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

E. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

F. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

G. Measure the differential-pressure control valve settings existing at the conclusions of balancing.

## 3.8 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer, model, and serial numbers.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Test the manual bypass for the controller to prove proper operation. Record observations, including controller manufacturer, model and serial numbers, and nameplate data.

**3.9 PROCEDURES FOR HEAT-TRANSFER COILS**

A. Water Coils: Measure the following data for each coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Refrigerant Coils: Measure the following data for each coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

**3.10 PROCEDURES FOR TEMPERATURE MEASUREMENTS**

A. During TAB, report the need for adjustment in temperature regulation within the automatic temperature-control system.

B. Measure outside-air, wet- and dry-bulb temperatures.

**3.11 TOLERANCES**

A. Set HVAC system airflow and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus 5 to plus 10 percent.
2. Air Outlets and Inlets: 0 to minus 10 percent.
3. Heating-Water Flow Rate: 0 to minus 10 percent.
4. Cooling-Water Flow Rate: 0 to minus 5 percent.

**3.12 REPORTING**

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: As Work progresses, prepare reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

**3.13 FINAL REPORT**

A. General: Typewritten, or computer printout in letter-quality font, on standard bond paper, in three-ring binder, tabulated and divided into sections by tested and balanced systems.

B. Include a certification sheet in front of binder signed and sealed by the certified testing and balancing engineer.

1. Include a list of instruments used for procedures, along with proof of calibration.

C. Final Report Contents: In addition to certified field report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance, but do not include Shop Drawings and Product Data.

D. General Report Data: In addition to form titles and entries, include the following data in the final report, as applicable:

1. Title page.
2. Name and address of TAB firm.
3. Project name.
4. Project location.
5. Architect's name and address.
6. Contractor's name and address.
7. Report date.
8. Signature of TAB firm who certifies the report.
9. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
10. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

11. Nomenclature sheets for each item of equipment.
12. Data for terminal units, including manufacturer, type size, and fittings.
13. Notes to explain why certain final data in the body of reports varies from indicated values.
14. Test conditions for fans and pump performance forms including the following:

    a. Settings for outside-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

E. Air-Handling Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data: Include the following:

a. Unit identification.
b. Location.
c. Make and type.
d. Model number and unit size.
e. Manufacturer's serial number.
f. Unit arrangement and class.
g. Discharge arrangement.
h. Sheave make, size in inches, and bore.
i. Sheave dimensions, center-to-center, and amount of adjustments in inches.
j. Number of belts, make, and size.
k. Number of filters, type, and size.
l. Variable frequency drive manufacturer and model number (if applicable).

2. Motor Data:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Filter static-pressure differential in inches wg.
f. Preheat coil static-pressure differential in inches wg.
g. Cooling coil static-pressure differential in inches wg.
h. Heating coil static-pressure differential in inches wg.
i. Outside airflow in cfm.
j. Return airflow in cfm.
k. Outside-air damper position.
l. Return-air damper position.
m. Vortex damper position.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch o.c.
f. Make and model number.

g. Face area in sq. ft.
h. Tube size in NPS.
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Average face velocity in fpm.
c. Air pressure drop in inches wg.
d. Outside-air, wet- and dry-bulb temperatures in deg F.
e. Return-air, wet- and dry-bulb temperatures in deg F.
f. Entering-air, wet- and dry-bulb temperatures in deg F.
g. Leaving-air, wet- and dry-bulb temperatures in deg F.
h. Water flow rate in gpm.
i. Water pressure differential in feet of head or psig.
j. Entering-water temperature in deg F.
k. Leaving-water temperature in deg F.
l. Refrigerant expansion valve and refrigerant types.
m. Refrigerant suction pressure in psig.
n. Refrigerant suction temperature in deg F.
o. Inlet steam pressure in psig.

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches, and bore.
h. Sheave dimensions, center-to-center, and amount of adjustments in inches.

2. Motor Data:

a. Make and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches, and bore.
f. Sheave dimensions, center-to-center, and amount of adjustments in inches.
g. Number of belts, make, and size.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm.
b. Total system static pressure in inches wg.
c. Fan rpm.
d. Discharge static pressure in inches wg.
e. Suction static pressure in inches wg.

H. Round, Flat-Oval, and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling unit number.
b. Location and zone.
c. Traverse air temperature in deg F.
d. Duct static pressure in inches wg.
e. Duct size in inches.
f. Duct area in sq. ft..
g. Indicated airflow rate in cfm.
h. Indicated velocity in fpm.
i. Actual airflow rate in cfm.
j. Actual average velocity in fpm.
k. Barometric pressure in psig.

I. Air-Terminal-Device Reports:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Test apparatus used.
d. Area served.
e. Air-terminal-device make.
f. Air-terminal-device number from system diagram.
g. Air-terminal-device type and model number.
h. Air-terminal-device size.
i. Air-terminal-device effective area in sq. ft..

2. Test Data (Indicated and Actual Values):

a. Airflow rate in cfm.
b. Air velocity in fpm.
c. Preliminary airflow rate as needed in cfm.
d. Preliminary velocity as needed in fpm.
e. Final airflow rate in cfm.
f. Final velocity in fpm.
g. Space temperature in deg F.

J. System-Coil Reports: For reheat coils and water coils of terminal units, include the following:

1. Unit Data:

a. System and air-handling unit identification.
b. Location and zone.
c. Room or riser served.
d. Coil make and size.
e. Flowmeter type.

2. Test Data (Indicated and Actual Values):

   a. Airflow rate in cfm.
   b. Entering-water temperature in deg F.
   c. Leaving-water temperature in deg F.
   d. Water pressure drop in feet of head or psig.
   e. Entering-air temperature in deg F.
   f. Leaving-air temperature in deg F.

K. Instrument Calibration Reports:

1. Report Data:

   a. Instrument type and make.
   b. Serial number.
   c. Application.
   d. Dates of use.
   e. Dates of calibration.

**3.14 INSPECTIONS**

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the Final Report.
2. Randomly check the following for each system:

   a. Measure airflow of at least 10 percent of air outlets.
   b. Measure water flow of at least 5 percent of terminals.
   c. Measure room temperature at each thermostat/temperature sensor. Compare the reading to the set point.
   d. Measure sound levels at two locations.
   e. Measure space pressure of at least 10 percent of locations.
   f. Verify that balancing devices are marked with final balance position.
   g. Note deviations to the Contract Documents in the Final Report.

B. Final Inspection:

1. After initial inspection is complete and evidence by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by Owner's Representative.
2. TAB firm test and balance engineer shall conduct the inspection in the presence of Owner's Representative.
3. Owner's Representative shall randomly select measurements documented in the final report to be rechecked. The rechecking shall be limited to either 10 percent of the total measurements recorded, or the extent of measurements that can be accomplished in a normal 8-hour business day.
4. If the rechecks yield measurements that differ from the measurements documented in the final report by more than the tolerances allowed, the measurements shall be noted as "FAILED."

5. If the number of "FAILED" measurements is greater than 10 percent of the total measurements checked during the final inspection, the testing and balancing shall be considered incomplete and shall be rejected.
6. TAB firm shall recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes and resubmit the final report.
7. Request a second final inspection. If the second final inspection also fails, Owner shall contract the services of another TAB firm to complete the testing and balancing in accordance with the Contract Documents and deduct the cost of the services from the final payment.

**3.15 ADDITIONAL TESTS**

A. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional testing, inspecting, and adjusting during near-peak summer and winter conditions.

**END OF SECTION 15990**

# SECTION 16010 - ELECTRICAL GENERAL REQUIREMENTS

## 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 electrical installations. The following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 1 Sections.

1. Design requirements
2. Performance requirements
3. Substitutions
4. Permits and fees
5. Examination of drawings and premises
6. Changes involving Electrical Work
7. Submittals
8. Project record documents
9. Operation and maintenance manuals and equipment
10. Quality assurance
11. Delivery, storage and handling
12. Warranty

B. This Section includes basic requirements for materials and installations for electrical work, including but not limited to:

1. Sealing of openings
2. Sleeves
3. Expansion fittings
4. Nameplates and directories
5. Electrical demolition work
6. Temporary services
7. Cutting and patching
8. Chases and recesses
9. Equipment supports
10. Coordination with other trades
11. Assembly and connection of equipment
12. Phasing
13. Field quality control

### 1.3 REFERENCES

A. The electrical 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 of the following recognized authorities:

1. ANSI - American National Standards Institute
2. ASTM - American Society for Testing Materials

3. BICSI - Building Industry Consulting Service International
4. FCC - Federal Communication Commission
5. ICEA - Insulated Cable Engineers Association
6. IEEE - Institute of Electrical and Electronics Engineers
7. NEC - National Electrical Code
8. NETA – International Electrical Testing Association
9. NEMA - National Electrical Manufacturer's Association
10. NFPA - National Fire Protection Association
11. UL - Underwriters' Laboratories, Inc.

**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 electrical systems as specified in the Division 16 Sections 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. 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.

1. All equipment of the same or similar systems shall be by the same manufacturer.

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 site, architectural, mechanical and other trades' drawings and specifications.

1. Notify Architect/Engineer should any discrepancies occur between them 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 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 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, additional wiring of equipment, etc.) the Mechanical or respective trades involved shall compensate the electrical trades for the cost of the additional work required.

**1.5 SUBMITTALS**

A. The following is in addition to the requirements for submittals in Division 1.

B. Material List: Submit a complete list of all materials, 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. Provide equipment submittals in the form of letters of intent, product data catalog sheets or shop drawings as hereinafter specified for all materials provided on the project.

D. 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 Contractor's 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.

E. 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.

F. Partial submittals for equipment shall not be permitted. Where partial submittals are transmitted to the Architect/Engineer, they will be returned "Rejected".

G. Where the equipment submittals 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".

H. 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.

I. 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, the name of the selected manufacturer and the catalog number of the product. The aforementioned information shall be typed on the Electrical Contractor's letterhead and submitted with one (1) product data sheet for each product itemized in the Letter of Intent for record.

J. Lighting fixture submittals shall be submitted as one (1) package including all fixtures intended to be used for this Project.

K. Shop Drawings: Prepare layout 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 1 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.

L. No apparatus or equipment shall be shipped from stock or fabricated until equipment submittals for them have been reviewed and approved 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 Electrical Trades of full responsibility for the proper and correct execution of the work required.

M. Submittals shall be provided on all major electrical systems and/or equipment, including the following:

REMARKS LEGEND
In addition to the previously specified, provide the following where indicated:

1. Factory Test Report
2. Field Testing Report
3. Record Drawings
4. Mock-Up
5. Material & Equip. List/Certificate
6. Operation & Maintenance Manuals
7. Construction Schedule
8. Points List
9. Sequence of Operation
10. Certificate of Inspection
11. Installer Certificate & Master Label
12. Fire Marshal Approval
13. Tools/Spare Parts
14. Samples

| Section Number | Section Title | Shop Dwgs. | Product Data | Letter of Intent | Samples | Warranty | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| 16010 | General Requirements | | | | | X | 6, 7, 10 |
| | Layout Shop Drawings | X | | | | | 3, 5, 13 |
| | Materials List | | | X | | | 5 |
| | | | | | | | |
| 16060 | Grounding | | | | | | |
| | Grounding Cable | | | X | | | |
| | Grounding Connections/fittings | | | X | | | |
| | | | | | | | |
| 16120 | Conductors and Cables (0-600V) | | | | | | |
| | Cable | | | X | | | 1 |
| | Splicing Connectors | | | X | | | |
| | Termination Lugs | | | X | | | |
| | | | | | | | |

| Section Number | Section Title | Shop Dwgs. | Product Data | Letter of Intent | Samples | Warranty | Remarks |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| 16130 | Raceways and Boxes | | | | | | |
| | EMT Conduit and Fittings | | | X | | | |
| | Flexible Steel Conduit and Fittings | | | X | | | |
| | Outlet Boxes | | | X | | | |
| | Pull Boxes | | | X | | | |
| | | | | | | | |
| 16140 | Wiring Devices | | | | | | |
| | Wall Switches | | X | | | | 2 |
| | Receptacles | | X | | | | 2 |
| | Device Plates | | X | | | | |
| | | | | | | | |
| 16145 | Lighting Control Devices | | | | | | |
| | Occupancy Sensors | X | X | | | | 1, 2, 6 |
| | | | | | | | |
| 16190 | Supporting Devices | | | X | | | |
| | | | | | | | |
| 16195 | Electrical Identification | | | X | | | |
| | | | | | | | |
| 16511 | Interior Lighting | | | | | | 1 |
| | Emergency Battery Packs | | X | | | | |
| | | | | | | | |
| 16721 | Fire Alarm System | X | X | | | | 1, 2, 6, 9, 12 |

**1.6 PROJECT RECORD DOCUMENTS**

A. Project Record Documents: Revise layout 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 indicating "as-built" conditions for Owner's record. 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" conditions in title.
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 1.

**1.7 OPERATION AND MAINTENANCE MANUALS AND EQUIPMENT**

A. Operation and Maintenance Manuals: The manuals shall contain operating instructions, service instructions, parts lists, etc., which are shipped with electrical equipment. On completion of the work, transmit these items to the Architect/Engineer, for the Owner's use. If this information is not shipped with the equipment, obtain from the manufacturer.

B. 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 attached to the "Final Application" for payment.

C. Furnish three (3) sets of bound operation and maintenance manuals to the Architect/Engineer. Each set shall include:

1. One (1) copy of all shop drawings.
2. Operation and maintenance instructions and manuals.
3. One (1) copy of all electrical testing.
4. As-built drawings.

**1.8 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 the National Board of Fire Underwriters, the National Electric Code, and the latest accepted practices of IEEE and NEMA.

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: All materials and installations shall comply with the requirements of the State of Michigan Handicapped Barrier-Free Regulations and with the Americans with Disabilities Act (ADA).

B. Rules of Local Utility Companies:

1. Perform work in accordance with the rules of local utility companies. Before submitting the bid check with each utility supplying services to this Project. Determine from them all equipment and charges which they will require and include the cost in the bid.

C. 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.

D. Sequencing and Scheduling: 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.

**1.9 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.

**1.10 WARRANTY**

A. Warranty: Provide a one year parts and labor warranty for all equipment and installation. Comply with requirements of the General Conditions.

**PART 2 - PRODUCTS**

**2.1 SEALING OF OPENINGS**

A. Seal openings around electrical materials (Conduit, raceways, etc.) 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 07841 "Through Penetration Firestop Systems".

**2.2 SLEEVES**

A. Provide conduit sleeves where conduits and/or low-voltage cables 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 that cross building expansion joints, both in concrete slabs and where exposed.

**2.4 NAMEPLATES AND DIRECTORIES**

A. Identify panelboards, etc., with manufacturers' nameplate, shop order, where applicable on composite assemblies, and designations used on the Drawings. Nameplates shall be laminated phenolic plastic, beveled edged black with engraved white letters. Except where impractical, letters and numerals shall be a minimum of 1/4 inch high. Nameplates shall be mechanically secured. Pressure sensitive nameplates are not acceptable. Panel directories shall be typed, showing equipment served and location for each breaker or switch with a clear plastic protective cover. Provide new typed, updated panel directories at all existing panels affected by the scope of the project. Mark superseded panel directories "SUPERSEDED" with the date superseded and place superseded directory behind the new, updated directory in the door of the panelboard.

**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 conduit, wire, junction boxes, supports, etc., of demolished equipment shall be removed from the utilization equipment back to the source panel and the associated circuit breaker or fused switch shall be relabeled as "spare", unless otherwise noted. All associated wiring shall be removed back to the "sources" as noted below:

1. Power: Remove conduit and wire back to the panel. When the circuit continues on to the other existing loads remove conduit and wire back to the first junction box.
2. Telephone: Remove wiring back to communication room or other source.
3. Data system or other special wirings: Remove wiring back to communication room or other source.
4. Conduit in walls to remain: Abandon in place. Install blank coverplates.
5. Conduit accessible above ceilings and/or other location: Remove conduit.

D. Ring out circuits prior to deactivating feeders and branch circuits to insure maintaining electrical power in adjacent unrenovated area. Where removal of conduit and wire affects "downstream" circuits, refeed downstream circuits.

E. Conduit in floor slabs shall be cut 1/2 inch below the floor and patched.

F. Where applicable, existing in-place conduit may be reused for new work providing that the installation is in accordance requirements for new work found in Section 16000.

G. Where equipment or fixtures are removed, outlets shall be properly blanked-off, and conduits 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. Offer disconnected and removed fixtures and equipment to Owner for stock in undamaged condition. Deliver materials accepted by the Owner to an on-site storage area as directed by the Owner. All materials not accepted by the Owner for stock shall be legally and properly disposed of off Owner's property.

**3.2 TEMPORARY SERVICES**

A. Provide temporary lighting, power and telephone service as described in Division 1.

B. The existing building will be occupied during construction. Maintain electrical services and provide necessary temporary connections and their removal at no additional expense.

**3.3 CUTTING AND PATCHING**

A. Refer to Division 1 for requirements for cutting, patching and refinishing work necessary for the installation of Electrical Work.

B. Direct 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 or 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 may be directed by the Architect/Engineer.

F. Cooperate with the other Contractors so that all cutting and repairing in any given area will be done simultaneously.

G. Electrical work which may interfere with changes in piping, ducts or other mechanical equipment, as well as conduits and outlets that may be uncovered by the cutting of new openings in present building, 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 general trades.

**3.5 EQUIPMENT SUPPORTS**

A. Furnish supports for electrical 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, such as conduits, 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 for supporting equipment.

**3.6 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 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 and shall be as directed by the Architect/Engineer, and shall be made without additional cost to Owner.

C. The Electrical 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 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, 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 PHASING**

A. Identify general power and lighting feeder and branch circuits with a visual color code as an integral part of the outer jacket or as a printed color coding the entire length of the insulation in accordance with the NEC.

**3.9 FIELD QUALITY CONTROL**

A. Testing Conduits: 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 pullwires 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. Tests shall include but not be limited to lighting fixtures, receptacles, branch circuits, etc.
3. Perform all tests required by State, City, County and/or other agencies having jurisdiction.
4. Provide all materials, equipment, etc., and labor required for tests.

C. Cleaning:

1. 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 electrical systems clean and ready for use.
2. Final clean-up shall include washing of fixture lenses, controls, 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 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.

**END OF SECTION 16010**

# SECTION 16060 - GROUNDING

## 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 the following:

1. Grounding Conductors:

a. For General Use Above and Below Grade: Insulated.
b. In Conduit with Phase Conductors: Insulated.

2. Grounding Connections:

a. To Non-Permanently Fixed Equipment: Lugs bolted to the equipment.

### 1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Ground electrical system neutrals and non-current carrying parts of electrical equipment per the minimum requirements of the National Electrical Code, except where additional requirements are indicated or specified.

### 1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Submit letter of intent on each item. Coordinate the items, as they relate to the work, prior to submittal. Items shall include:

1. Grounding conductors
2. Grounding fittings

## PART 2 - PRODUCTS

### 2.1 GROUNDING CONDUCTORS

A. Insulated Grounding Conductors: stranded annealed copper insulated with a heat and moisture resistant polyvinyl chloride compound and meeting UL Requirements for Type THWN or XHHW, 75 degC, rated 600 volts, color-coded green. Refer to Section 16120 for manufacturers.

**2.2 GROUNDING CONNECTIONS**

A. Copper Compression Grounding

1. Manufacturer: Provide products of one of the following:

a. Anderson
b. Burndy
c. Ilsco
d. Panduit
e. Penn Union
f. Thomas & Betts

B. Grounding Fittings for Bonding a Ground Conductor to Its Own Conduit.

1. Manufacturer: Provide products of one of the following:

a. Appleton Type GIB
b. Burndy Type NE
c. Penn Union Type BD
d. O-Z Type GB
e. Thomas & Betts Type TIG or 3800 Series

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

A. Install conductors of size required by the NEC, except that where sizes are otherwise indicated, provide these sizes.

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.

D. Where metallic conduit is used for mechanical protection of a ground conductor, bond conductor to the conduit at each end.

E. Lighting branch circuits in EMT or flexible conduit and lighting fixture cord and plug assemblies shall have an equipment grounding conductor.

F. Provide an equipment grounding conductor, within the raceway along with phase conductors, for all feeders and branch circuits.

G. Provide an equipment grounding conductor within all flexible conduits.

H. 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, receptacles, etc.

**END OF SECTION 16060**

# SECTION 16120 - CONDUCTORS AND CABLES (0-600V)

## 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 the following:

1. Wire and cable systems as required, and all material and equipment, including wire cable, connectors and lugs, fittings, and wire and cable identification, as indicated or specified.

### 1.3 PERFORMANCE REQUIREMENTS

A. Furnish wire and cable on which standard factory tests established by ASTM, ANSI, IPCEA and NEMA have been performed.

### 1.4 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

B. Letter of Intent: Submit letter of intent for each type and size of wire and cable. Identify material, construction data, insulation thickness, and jacket thickness. Submit color coding schemes for branch circuit wiring. Submit cable identifications.

C. Samples: Submit samples on request of the Architect-Engineer.

D. 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.

### 1.5 REGULATORY REQUIREMENTS

A. Wire and Cable: Listed by Underwriters' Laboratories as meeting National Electrical Code requirements and be so labeled.

### 1.6 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. Furnish 600 volt wires and cables on coils and reels carrying original date perforated inspection labels of the Underwriters' Laboratories showing the number of feet and type of wire contained.

**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, IPCEA and NEMA, where applicable. Furnish copper conductors unless otherwise specified, not less than No. 12 AWG, except control conductors which may be No. 14 AWG. Furnish conductor sizes as indicated. Furnish stranded conductors for sizes No. 10 AWG and smaller, and stranded conductors for sizes No. 8 AWG and larger.

1. Manufacturer: Provide products of one of the following:

a. American Insulated Wire Corporation
b. Cablec Corporation
c. Okonite
d. Pirelli Cable Corporation
e. Southwire
f. Triangle

B. Wire for Use in Fluorescent Fixture Wiring Channels: Stranded copper, NEC Type THHN, or XHHW, rated 90 degC, 600 volts.

C. Wire for General Interior and Exterior Use: Single conductor, annealed copper, NEC Type THHN/THWN rated 90 degC in dry locations and 75 degC in wet locations, 600 volts. Minimum conductor size for exterior use shall be #8 AWG.

D. All low-voltage wiring shall be plenum rated.

**2.2 CONNECTORS FOR SPLICING COPPER CONDUCTORS**

A. Connectors for Straight Splicing Conductors Up To and Including No. 8 AWG: Solderless compression type.

1. Manufacturer: Provide one of the following:

a. Burndy "Hylink"
b. Panduit
c. Thomas & Betts "Sta-Kon"

B. 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. Buchanan
b. Ideal
c. Scotchlok

**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 Control Wiring: Solderless compression type with tinned ring tongue.

1. Manufacturer: Provide one of the following:

a. Burndy "Hylug"
b. Thomas & Betts "Sta-Kon"

**2.4 WIRE LABELS**

A. Wire Labels for Identification of Conductors.

1. Manufacturer: Provide products of one of the following:

a. Brady
b. Westline

**2.5 INSULATING TAPE**

A. General Use Tape:

1. Manufacturer: Provide one of the following:

a. Okonite Type CLF Catalog Series 602-20
b. Scotch 33 Plus

B. High Temperature Area Tape:

1. Manufacturer: Provide products of one of the following:

a. Plymouth/Bishop Insulating Products “77 Plyglas”
b. Scotch 27

**2.6 MISCELLANEOUS**

A. Lubricating Compound:

1. Manufacturer: Provide products of one of the following:

a. American Polywater Corporation
b. Ideal 77 Yellow or Wire Lube

## PART 3 - EXECUTION

### 3.1 GENERAL

A. Install all wiring in raceway systems, as indicated and as specified. Install wiring only in completed raceway systems and when systems are protected from the weather. Install conductors continuous, without splices, between equipments, 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. Continuously lubricate all cables of the larger sizes at the pull-in point of conduit systems with an approved compound compatible with conductor insulation or jacket.

D. Install conductors in such a manner that the bending radius of any wire or cable is not less than the minimum recommended by IPCEA and/or the manufacturer. Do not exceed manufacturer's recommended values for maximum pulling tension applied to any wire or cable.

E. 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.

### 3.2 COLOR CODING AND CONDUCTOR IDENTIFICATION

A. Provide single conductor cables having black insulation for power feeders and subfeeders. Do not color-code these circuits. Identify individual feeder and subfeeder conductors as to phase connection A, B, C by means of wire labels at each splice and termination.

B. Identify individual phase conductors of branch power and lighting circuits as to phase and system voltage by means of color coding in conformance with Section 210-5 of the NEC. Develop a unique color scheme for each different voltage system. Match existing schemes where such exist. 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.

C. Identify each control circuit wire at each termination by means of wire labels. Provide identification as indicated. Mark the white marking strip of all control terminal blocks with the same identification as the connecting wire in permanent black ink.

D. Match existing color-coding schemes for low-voltage wiring.

### 3.3 SPLICES AND TERMINATIONS

A. Splice and terminate conductors with connectors and lugs as specified for the specific size and type of conductor. 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. Install the connector or lug immediately after wire brushing the conductor.

C. 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.

**3.4 CABLE IDENTIFICATION**

A. Designate source and load, or feeder or cable identification on tags. Submit identification for the approval of the Architect-Engineer.

**END OF SECTION 16120**

# SECTION 16130 – RACEWAYS AND BOXES

## 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. Raceway systems as required, and all equipment and material, including conduit, fittings and boxes, as indicated or specified.

### 1.3 SUBMITTALS

A. Letter of Intent: Submit letter of intent for each item. Coordinate the items, as they relate to the work, prior to submittal. Items shall include:

1. Conduit and fittings
2. Boxes

## PART 2 - PRODUCTS

### 2.1 CONDUIT

A. Electrical Metallic Tubing: 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. ETP
c. Republic
d. Triangle

B. Flexible Steel Conduit: Per UL-1, "Flexible Steel Conduit".

1. Manufacturer: Provide products of one of the following:

a. Allied
b. ETP
c. Triangle

**2.2 CONDUIT FITTINGS**

A. Couplings and Connectors for EMT: Zinc-plated steel, compression or set screw type. Use compression type on feeders and on existing conduits for existing circuits not containing a ground conductor within the conduit. Set screw type may only be used where a ground conductor is contained within the conduit.

1. Manufacturer: Provide products of one of the following:

a. Appleton
b. ETP
c. Midwest
d. Steel City
e. Thomas & Betts

B. Conduit Unions, On Continuous Run:

1. Manufacturer: Provide products of one of the following:

a. Erickson

C. 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

**2.3 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 16140. 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 16140. 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

**2.4 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

**2.5 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. Unless otherwise specified or indicated, the use of electric metallic tubing is permitted for branch circuits above suspended ceilings, in concealed wall cavities in offices or similarly "finished areas", or in unfinished areas.

B. All low-voltage wiring shall be installed in conduit.

C. Install flexible conduit in lieu of EMT for service to individual recessed fixtures, 1/2 inch minimum size, and for final connection to equipment subject to vibration or movement.

D. 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 unless otherwise specified. Use 1/2 inch fixture stems optionally, unless otherwise indicated. Flexible conduits shall not exceed 6'-0" in length.

E. Install conduit concealed in classroom and similar finished areas, and exposed in all other areas unless otherwise indicated or specified.

F. Install exposed 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.

G. Group conduit for common support, where indicated and elsewhere as directed by the Architect-Engineer.

H. 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.

I. 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 07841 "Through-Penetration Firestop Systems".

J. 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.

K. Install expansion fittings in exposed conduit runs of greater than 100 feet in length, crossing building expansion joints, and elsewhere as indicated.

L. 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.

M. All wiring shall be installed in raceways. The use of MC cable, AC cable, or BX cable shall <u>not</u> be permitted.

N. All conduit systems and circuits shall be provided with an equipment grounding conductor.

**3.2 OUTLET, SWITCH, JUNCTION AND PULL BOXES**

A. Outlet Boxes for Use with Electrical Metallic Tubing: Sheet steel for flush or concealed work; cast or malleable iron for exposed locations.

B. Flush Mounted Boxes: For single outlets, use boxes not less than 4 inches square and 2-1/8 inches deep. For multiple outlets, use gang type boxes not less than 2-1/4 inches deep. Furnish plaster rings not less than 1-1/8 inches deep.

C. Gaskets: Provide cover gaskets for boxes in damp or wet locations and in utility areas.

D. Pull and Junction Boxes for Use with Each Type of Conduit: As specified for outlet boxes for each conduit type under above paragraphs.

E. Install boxes in the wiring or raceway systems as required for pulling of wires, making connections, and mounting of devices and fixtures.

F. 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.

G. 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.

H. Locate outlets in classrooms 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.

I. Install outlets for wall switches controlling lighting on the latch side of door where possible.

J. 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.

K. Above suspended ceilings, support boxes independent of the ceiling; fasten boxes to the ceiling support system by bar hanger or other approved support.

L. For all junction boxes, write the panelboard name and circuit numbers of the circuits entering the box in permanent black ink. For concealed boxes (i.e. above lay-in ceilings), marks shall be made on the outside of the cover plate. For cover plates in finished areas, marks shall be made on the inside of the cover plate.

**END OF SECTION 16130**

# SECTION 16140 – WIRING 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 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 line-voltage switches, receptacles, device plates, as indicated or specified.

### 1.3 SUBMITTALS

A. General: Submit the following according to the Conditions of the Contract and Division 1 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 including device plates

## PART 2 - PRODUCTS

### 2.1 LINE VOLTAGE WALL SWITCHES

A. Switches for Controlling Lighting Directly on AC systems in General: Toggle-operated, white 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 AH1200 Series
b. Bryant 4900 Series
c. Hubbell 1220 Series
d. Leviton
e. Pass & Seymour 20AC Series

### 2.2 CONVENIENCE RECEPTACLES

A. 15 Ampere Duplex Convenience Receptacles for 120 Volt, Single Phase Service: Two straight blade, 2 pole, 3 wire, NEMA configuration 15-15R receptacles rated 15 amperes, 125 volts, NEMA performance standard, specification grade, for back and side wiring. Receptacles connected to utility power only shall be black color.

1. Manufacturer: Provide one of the following:

a. Arrow Hart 5262
b. Bryant 5262

c. Hubbell 5262
d. Leviton 5262
e. Pass & Seymour 5262

**2.3 DEVICE PLATES**

A. Device Plates in Dry Interior Areas: Stainless steel No. 302 finish.

B. Screws: Provide screws having a finish matching the plate.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

A. Mount equipment at locations indicated.

B. Install receptacles in outlet boxes as specified in Section 16130 "Raceways and Boxes" 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.

D. Device plates shall be installed so as to make continuous contact around the perimeter of the plate.

E. Install devices and assemblies plumb and secure.

F. Install wall plates when painting is complete.

G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical, and grounding terminal of receptacles on bottom. Group adjacent switches under single, multigang wall plates.

H. Protect devices and assemblies during painting.

**3.2 CONNECTIONS**

A. Connect wiring device grounding terminal to outlet box with bonding jumper.

B. Connect wiring device grounding terminal to branch-circuit equipment grounding conductor.

C. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturers torque values are not indicated, use those specified in UL 486A and UL 486B.

**3.3 FIELD QUALITY CONTROL**

A. Test wiring devices for proper polarity and ground continuity. Operate each device at least six times.

B. Replace damaged or defective components.

**3.4 CLEANING**

A. Internally clean devices, device outlet boxes, and enclosures. Replace stained or improperly painted wall plates or devices.

**END OF SECTION 16140**

# SECTION 16145 – 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

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, 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: Show installation details for occupancy and light-level sensors.

1. Lighting plans showing complete layout, location, orientation, and coverage area of each sensor. The locations and quantities of sensors indicated on the Drawings are diagrammatic and indicate only the rooms which are to be provided with sensors. Provide layout shop drawings indicating all additional sensors required to properly and completely cover the respective areas.
2. Interconnection diagrams showing field-installed wiring.

C. Field quality-control test reports.

D. 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 supplier's 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.

**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.

**1.7 SYSTEM OPERATION**

A. It shall be the contractor's responsibility to make all proper adjustments to assure owner's satisfaction with the occupancy sensor system.

B. 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.

**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 WALL SWITCH OCCUPANCY SENSOR**

A. The wall switch sensor shall be a 3 wire, self-contained passive infrared control system that replaces a standard toggle switch and fits behind a decorator/Decora style device plate. Sensor shall have ground wire for safety. Switching mechanism shall be latching air gap relay, compatible with electronic ballasts, compact fluorescent and inductive loads. Triac and other harmonic generating devices shall not be allowed. Zero Crossing Circuitry shall be used to increase the relay life, protect from the effects of inrush current, and increase the sensor's longevity.

B. Sensor shall be capable of detecting presence in the control area by detecting changes in the infrared energy. Small movements shall be detected such as when a person is writing while seated at a desk.

C. 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 the signal received by the sensor to ensure response only to those signals caused by human motion.

D. Sensor shall utilize signal technology to provide immunity to RFI and EMI.

E. Sensor shall utilize a temperature compensated, dual element sensor and a multi-element Fresnel lens. Fresnel lens shall be a Poly IR 4 based material to offer superior filtering capability of competing light sources, such as the sun and other visible light sources. Lens shall have grooves facing in to avoid dust and residue build-up which could affect IR reception. To assure detection at the desktop level uniformly across the space, sensor shall have a 2-level, 28 segment, multi-element Fresnel lens system. For protection against lens damage, sensor shall utilize a full radius lens brace.

F. Sensor shall have a coverage area of 900 sq. ft. for walking motion, with a field of view of 180 degrees.

G. Sensor shall operate at either 120 VAC or 277 VAC and shall be capable of switching 0 to 800 watt ballast or tungsten or 1/6 hp @ 120 volts, 60 Hz; 0 to 1200 watts for ballast or 1/3 hp @ 277 volts, 60 Hz.

H. Sensor shall have a built-in light level feature adjustable from 2 to 200 footcandles that holds lighting OFF when a desired footcandle level is present. Sensor shall have a time delay adjustable from 30 seconds to 30 minutes. Sensor shall have user-adjustable sensitivity setting. Adjustments and mounting hardware shall be concealed under a removable cover to prevent tampering of adjustments and hardware.

I. Sensor shall have two positions only: OFF and AUTO for normal operation.

J. The sensor shall utilize terminal style wiring. Sensor shall provide automatic equipment grounding to a metal junction box, and provide grounding to a metal cover plate.

K. Sensor shall have 100% off switch with no leakage current to load in OFF mode. In the event there is an open circuit in the AC line such as a ballast or lamp failure, the sensor shall automatically switch to OFF mode.

L. Manufacturer: Provide the following:

1. Leviton
2. Sensor Switch WSD
3. Watt Stopper WS-200

**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. Provide ceiling-mounted recessed dual technology occupancy sensors as indicated on the Drawings.

1. Manufacturer: Provide the following:

a. Leviton
b. Sensor Switch CM Series
c. Watt Stopper DT Series

**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 CONDUCTORS AND CABLES**

A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG, complying with Division 16 Sections.

B. Control wiring between sensors and control units shall be Class II, 18-24 AWG, stranded U.L. Classified, PVC insulated or TEFLON jacketed cable suitable for use in plenums, where applicable.

C. 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 is 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.

### 3.2 WIRING INSTALLATION

A. Wiring Method: Comply with Division 16 Sections. All wiring shall be installed in conduit. Minimum conduit size shall be ¾ 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.

### 3.3 IDENTIFICATION

A. Identify components and power and control wiring according to Division 16 Sections.

### 3.4 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.

**3.5 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.

**3.6 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.

**3.7 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 16145**

# SECTION 16190 - SUPPORTING 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 work of this Section.

### 1.2 SUMMARY

A. This section includes straps, clamps, steel channel, and fastening hardware for supporting electrical work.

### 1.3 REFERENCES

A. NECA - National Electrical Contractors Association.

B. ANSI/NFPA 70 - National Electrical Code.

### 1.4 SECTION INCLUDES

A. Conduit and equipment supports.

B. Anchors and fasteners.

## PART 2 - PRODUCTS

### 2.1 PRODUCT REQUIREMENTS

A. Materials and Finishes: all material provided shall have a protective zinc coating either Electro-Plated (ASTM B633 SCI or SC3), Pre-Galvanized (ASTM A525 coating designation G90) or Hot-Dip Galvanized after fabrication (ASTM A123). The minimum thickness of zinc coating shall be 0.2 mil (5 micrometers).

B. Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.

C. All structural supports and channels shall be manufactured from ASTM A570 grade 33 steel. The minimum gauge of steel shall #16.

D. The contractor shall replace all supports and channels that sag, twist, and or show signs of not providing proper structural support, to the equipment, it is intended for, as determined by the Owner and Engineer. All costs associated with replacing supports and steel channels shall be incurred by the contractor.

E. Anchors and Fasteners:

1. Concrete Structural Elements: Use expansion anchors, powder actuated anchors and preset inserts.
2. Steel Structural Elements: Use beam clamps and steel ramset fasteners.
3. Concrete Surfaces: Use expansion anchors.
4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use hollow wall fasteners.

5. Solid Masonry Walls: Use expansion anchors.
6. Sheet Metal: Use sheet metal screws.
7. Wood Elements: Use wood screws.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

A. Install products in accordance with manufacturer's instructions.

B. Provide anchors, fasteners, and supports in accordance with NECA "Standard of Installation."

C. Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.

D. Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.

**END OF SECTION 16190**

# SECTION 16195 - ELECTRICAL 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 work of this Section.

### 1.2 SUMMARY

A. Identification is required for the following principal items of equipment and systems (not an inclusive list):

1. Disconnecting means.
2. Ungrounded conductors.
3. Wiring device terminals.
4. Panelboard circuits.

## PART 2 - PRODUCTS

### 2.1 PRODUCTS

A. Provide identification on all electrical equipment installed, including panelboards, circuit breakers and switches.

B. Nameplates shall be laminated phenolic plastic, beveled edged black with engraved white letters. Except where impractical, letters and numerals shall be a minimum of 1/4 inch high. Nameplates shall be mechanically secured. Pressure sensitive nameplates are not acceptable. Panel directories shall be neatly typed, showing equipment served and location for each breaker or switch with a clear plastic protective cover. Update all panel directories in existing panelboards affected by the work of this project by providing new typed directories in these panels. Mark superseded panel directories "SUPERSEDED" with the date superseded and place superseded directory behind the new, updated directory in the door of the panelboard.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

A. Marking: The manufacturer's name, trademark, or other descriptive marking by which the organization responsible for the product may be identified shall be placed on all electric equipment. Other markings shall be provided indicating voltage, current, wattage, or other ratings as applicable. The marking shall be sufficient durability to withstand the environment involved.

B. Identification of the following specific equipment and systems should be addressed:

1. Disconnecting means for motors, appliances, and branch circuits.
2. Grounded conductors: identified by a continuous white or natural gray outer finish along its entire length.
3. Terminals.

    a. Terminals to which the grounded conductor is to be connected shall be white in color.

C. Identify and/or color code:

1. Ungrounded conductors where more than one nominal voltage system exists in a building.
2. Grounded conductor of branch circuit wiring identified by a continuous white or gray color.
3. Equipment grounding conductor identified by a continuous green color or continuous green color with one or more yellow stripes.
4. Higher voltage to ground phase conductor identified by an outer finish that is orange in color or tagging.

**END OF SECTION 16195**

# SECTION 16511 - INTERIOR LIGHTING

## 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. Lighting systems as required, and all materials and equipment, including emergency battery packs, accessories and associated systems and equipment, as indicated or specified.

### 1.3 SUBMITTALS

A. Product Data: For each type of lighting fixture indicated, arranged in order of fixture designation. Include data on features, accessories, and the following:

1. Emergency batteries

### 1.4 QUALITY ASSURANCE

A. Fixtures, Emergency Lighting Units, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

B. Comply with NFPA 70.

C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs and emergency lighting and OFS Policy No. 2-19 referencing Section 5-9.2.1 of NFPA 101.

D. Regulatory Requirements:

1. Furnish lighting fixtures and other equipment, including all modifications thereto and component electrical parts, listed by Underwriters' Laboratories as meeting National Electrical Code requirements and bearing the UL Label where such service is available for equipment specified.
2. All lighting fixtures with plastic lenses shall comply with the Michigan Department of State Police, Fire Marshal Division, Policy Letter 11-6, dated March 24, 1992, applying to schools, colleges, hospitals, institutions, nursing homes, etc. Shop drawings and product data fixture cuts of such fixtures shall be accompanied by an approved certification stating compliance with the above ruling for forwarding to the State Fire Marshal by the Architect/Engineer.

### 1.5 COORDINATION

A. Fixtures, Mounting Hardware, and Trim: Coordinate layout and installation of lighting fixtures with ceiling system and other construction.

**1.6 WARRANTY**

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

B. Special Warranty for Batteries: Written warranty, executed by manufacturer agreeing to replace rechargeable batteries that fail in materials or workmanship within specified warranty period.

1. Special Warranty Period for Batteries: Manufacturer's standard, but not less than 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for last nine years.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

A. Products: Subject to compliance with requirements, provide one of the products indicated for each designation in the Lighting Fixture Schedule on the drawings. No substitutions or alternates shall be accepted for lighting fixtures.

**2.2 FIXTURES AND FIXTURE COMPONENTS, GENERAL**

A. Metal Parts: Free from burrs, sharp corners, and edges.

B. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

**2.3 EMERGENCY BATTERY**

A. As noted in the Lighting Fixture Schedule.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

A. Fixtures: Set level, plumb, and square with ceiling and walls, and secure according to manufacturer's written instructions and approved submittal materials. Install lamps in each fixture.

B. Support for Fixtures in Grid-Type Suspended Ceilings:

1. Install a minimum of four ceiling support system rods or wires independent from the ceiling grid "T" for each fixture. Locate not more than 6 inches from fixture corners.
2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner.
3. Fixtures of Sizes Less Than Ceiling Grid: Arrange as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

## 3.2 CONNECTIONS

A. 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.

## 3.3 FIELD QUALITY CONTROL

A. Inspect each installed fixture for damage. Replace damaged fixtures and components.

B. Advance Notice: Give dates and times for field tests 5 business days prior to testing.

C. Provide instruments to make and record test results.

D. Tests: As follows:

1. Verify normal operation of each fixture after installation.
2. Emergency Lighting: Interrupt electrical supply to demonstrate proper operation.
3. Verify normal transfer to battery source and retransfer to normal.
4. Report results in writing.

E. Malfunctioning Fixtures and Components: Replace or repair, then retest. Repeat procedure until units operate properly.

F. Corrosive Fixtures: Replace during warranty period.

## 3.4 CLEANING AND ADJUSTING

A. Clean fixtures internally and externally after installation. Use methods and materials recommended by manufacturer.

**END OF SECTION 16511**

# SECTION 16721 - 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 1 Specification Sections, apply to work of this section.

### 1.2 SUMMARY

A. This Section includes the following:

1. Extend the existing fire alarm system as specified or shown. Components of the system shall be listed, labeled, or approved for its application as fire alarm equipment by Underwriters' Laboratories, Inc.
2. Provide all necessary hardware, modules, programming and wiring to connect the new fire alarm devices to the existing fire alarm control panel and to expand the existing system to accept the new components.
3. Device Layout:

    a. Use the device locations shown on Construction Drawings.
    b. Provide candela ratings as required to meet code.
    c. Do not use fewer devices that the quantity of devices shown on Construction Drawings.
    d. Do not provide ceiling mounted devices where wall mounted devices are shown on Construction Drawings.
    e. Provide additional devices as necessary for proper system function and for code compliance.

4. All new devices and components shall be compatible with the existing building system and approved for use with the existing fire alarm system.

### 1.3 STANDARDS

A. The equipment and install shall comply with the current provisions of the following standard:

1. National Electric Code, Article 760 and applicable standards of NFPA 13, 72 90A and 101.
2. Local and State building codes.
3. Local authorities having jurisdiction: ULC, CSFM, BSA, State Fire Marshal.
4. Underwriters' Laboratories, Inc.

B. The system and all components shall be listed by Underwriters' Laboratories, Inc., for use in fire protective signaling system under the following standards as applicable:

1. UL 865/UOJZ, APOU Control Units for Fire Protective Signaling system.
2. UL 268 Smoke Detectors for fire Protective Signaling Systems.
3. UL 268A Smoke Detectors for Duct Applications.
4. UL 217 Smoke Detectors Single Station.
5. UL 521 Heat Detectors for Fire Protective Signaling Systems.
6. UL 1638 Visual Signaling Appliances.
7. UL 38 Manually Activated Signaling Boxes.
8. UL 1076 Proprietary Burglary/Grade AA.
9. UL 346 Waterflow Indicators for Fire Protective Signaling Systems.
10. UL 1481 Power Supplies for Fire Protective Signaling Systems.

**1.4 SUBMITTALS**

A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.

1. Shop Drawings: Submit detailed point-to-point wiring diagrams and installation instructions. Shop drawings shall show color coding of connections and mounting dimensions of equipment. Submit floor plans to scale indicating all fire alarm devices along with wiring diagrams and installation instructions.
2. Product Data: Submit product data for each fire alarm system component specified.

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 (Rule 4/29.1904/Act 144). 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. The contractor shall submit complete sets of documentation. Indicate the type, size, rating, style, catalog number, manufacturer's names, photos, and/or catalog data sheets for all items to ensure compliance with these Specifications. This equipment shall be subject to this approval and no equipment shall be ordered without this approval. Equipment devices are shown on the Contract Drawings. Provide shop drawings as follows:

1. Complete one-line riser diagram showing all equipment and the size, type and number of all conductors.
2. Drawing of typically multiplexed field panel.
3. Provide calculations to support the size of standby batteries submitted.
4. Include programming and installation manuals.

D. 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.

**1.5 WARRANTY**

A. The installation of new devices shall be warranted for a period of one year from date of Owner's acceptance.

**PART 2 - PRODUCTS**

**2.1 CONTROL PANEL (EXISTING)**

A. Update and reprogram existing control panel as necessary to reflect added new devices. Provide all required cards, modules, hardware, wiring and accessories in the existing control panel as needed for the connection and operation of the new fire alarm devices. Provide all software upgrades and programming at the existing control panel. Provide all required power supply modules to support new devices. Provide area smoke detectors adjacent each new power supply panel as required to comply with codes.

**2.2 WIRE AND CABLE**

A. Wire and cable shall conform to the applicable provisions of Section 16120 "Wire and Cable (600 Volts and Less").

B. All fire alarm cable shall be plenum-rated with red insulation.

**2.3 INTERIOR AUDIOVISUAL ALARM HORNS**

A. Audiovisual Alarm Horns shall have a high intensity flashing light and alarm horn as an integral unit. Both audio and visual components shall operate from the 24V DC polarized indicating circuits. All horns shall mount on 4 x 4-inch electrical boxes. The horn assembly shall be housed in a rugged, die-cast enclosure, and the electronic light source shall be sealed in silicone and protected by a Lexan lens. The word FIRE shall appear on the lens. Light will flash at the rate of two flashes per second, minimum. The minimum sound level shall be 95 DB at ten feet. Audiovisual alarm horns shall be semiflush mounted, except as noted. Provide single and/or dual projectors as shown. Housing color shall be red.

**2.4 INTERIOR VISUAL NOTIFICATION DEVICES**

A. Visual notification devices shall have a high intensity flashing light. Visual components shall operate from the 24V DC polarized indicating circuits and shall mount on 4 x 4-inch electrical boxes. The device assembly shall be housed in a rugged, die-cast enclosure, and the electronic light source shall be sealed in silicone and protected by a Lexan lens. The word FIRE shall appear on the lens. Light will flash at the rate of two flashes per second, minimum. Visual notification devices shall be semiflush mounted, except as noted. Housing color shall be red.

**2.5 SEQUENCE OF OPERATION**

A. Maintain existing sequence of operation.

**PART 3 - EXECUTION**

**3.1 INSTALLATION**

A. Install all equipment at locations indicated, and secure to ceilings, walls, floors or structural members as required.

B. Install all wiring in conduit systems as indicated and as specified in Section 16130.

C. Use solder type connections on all splices and terminations in fire alarm system low voltage wiring.

D. Identify each fire alarm cable at each termination by means of wire labels. Indicate the fire alarm circuit number on the label. Mark the white marking strip of all control terminal blocks with the same identification as the connecting wire in permanent black ink.

E. Provide final wiring and connections per the manufacturer's wiring diagrams. Minimum wire size for the alarm sounding circuit shall be no. 14 AWG. Conduit for the fire alarm system shall not be shared with any other system.

F. Provide all necessary programming and/or reprogramming.

**3.2 FIELD QUALITY CONTROL**

A. Adjusting: After completion of system wiring, connect, program, test, adjust, and readjust as necessary, all equipment in terms of design function and performance.

1. Provide equipment to check the calibration of instruments. Instruments not in calibration, shall be recalibrated to function as required, or shall be replaced.
2. Calibrate and adjust devices, linkages, accessories, and components for stable and accurate operation to meet the design intent and to obtain optimum performance from the equipment. Final adjustment, calibration and checking shall be performed while the system is in full operation. Cause every device to automatically function as intended to insure its proper operation.

B. Demonstration: After calibration, adjustment, and checking have been completed and system is operational, demonstrate to the governing authorities having jurisdiction and to the Architect-Engineer the complete and correct functioning of all system components and equipment. These demonstrations shall consist of operating the controls through their normal full ranges and sequences. Simulate abnormal conditions to demonstrate proper functioning of the devices. Readjust settings to their correct design values and after sufficient time, observe ability of controls to establish the desired conditions, noting abnormal deviations. Make necessary repairs, replacements or adjustments on items which fail to perform satisfactorily and repeat tests to demonstrate compliance with the design intent.

1. When system is in specified operational condition, and when pertinent operational functions have been demonstrated, system will be accepted.

**END OF SECTION 16721**