

# PROJECT MANUAL

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Issued For Construction: January, 2021

Issued For Rebid: August, 2021



## Bathroom Renovations

**Knight Campus  
400 East Avenue  
WARWICK, RHODE ISLAND 02886**

**AHARONIAN & ASSOCIATES, INC. - ARCHITECTS**

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310 George Washington Highway - Suite 100 - Smithfield, Rhode Island 02917

T 401-232-5010

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## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

DOCUMENT 00 01 15

## LIST OF DRAWING SHEETS

### PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work specified in this Document.

#### 1.02 REFERENCE

- A. The Drawings hereinafter listed represents an integral part of the Contract Documents. They should not be considered as a separate entity, as along with the technical specifications, form a process of disseminating information required to perform the Work of this Project.
- B. The Drawings may be issued in multiple packages or phases. The Schedule below will be modified as these packages are issued.

#### 1.03 SCHEDULE

- A. The following schedule indicates the Drawings of this Contract. The manner of listing and respective order are for convenience only and do not obligate the Contractor to perform the Work in any specific sequence. The work indicated on each drawing should not be construed as specific work for a specific trade, subcontractor or supplier.

##### B. SCHEDULE OF DRAWINGS:

Number	Title
CS	COVER SHEET
CS1.0	CODE STUDY
X1.0	MAIN BUILDING EXIST GROUND FLOOR PLAN
X1.1	MAIN BUILDING EXIST FIRST FLOOR PLAN
X1.2	MAIN BUILDING EXIST SECOND FLOOR PLAN
X1.3	MAIN BUILDING EXIST THIRD FLOOR PLAN
X1.4	MAIN BUILDING EXIST FOURTH FLOOR PLAN
X1.5	MAIN BUILDING EXIST FIFTH FLOOR PLAN
X1.6	MAIN BUILDING EXIST SIXTH FLOOR PLAN
X2.0	FIELD HOUSE EXIST FLOOR PLAN
D1.1	MAIN BUILDING – GROUND & 1 <sup>ST</sup> FLOOR RESTROOMS DEMOLITION FLOOR PLANS
D1.2	MAIN BUILDING – 1 <sup>ST</sup> , 2 <sup>ND</sup> , 3 <sup>RD</sup> , 4 <sup>TH</sup> AND 6 <sup>TH</sup> FLOOR RESTROOMS DEMOLITION FLOOR PLANS
D2.1	FIELD HOUSE – 1 <sup>ST</sup> & 2 <sup>ND</sup> FLOOR REST AND LOCKER ROOMS DEMOLITION FLOOR PLANS
D2.2	FIELD HOUSE – GROUND FLOOR REST AND LOCKER ROOMS DEMOLITION FLOOR PLANS

A1.1	MAIN BUILDING – GROUND & 1 <sup>ST</sup> FLOOR RESTROOMS FLOOR PLANS
A1.2	MAIN BUILDING – 2 <sup>ND</sup> , 3 <sup>RD</sup> , 4 <sup>TH</sup> & 6 <sup>TH</sup> FLOOR RESTROOMS FLOOR PLANS
A2.1	FIELD HOUSE – 1 <sup>ST</sup> & 2 <sup>ND</sup> FLOOR REST AND LOCKER ROOMS FLOOR PLANS
A2.2	FIELD HOUSE – GROUND FLOOR REST AND LOCKER ROOMS FLOOR PLANS
P0.01	PLUMBING GENERAL
P0.02	PLUMBING GENERAL
P1.00A	(DEMO) GROUND FLOOR A
P1.00B	(DEMO) GROUND FLOOR B
P1.00C	(DEMO) GROUND FLOOR C
P1.01A	(DEMO) FIRST FLOOR SCOPE A
P1.01B	(DEMO) FIRST FLOOR SCOPE B
P1.01C	(DEMO) FIRST FLOOR SCOPE C
P1.02A	(DEMO) SECOND FLOOR SCOPE A
P1.02B	(DEMO) SECOND FLOOR SCOPE B
P1.02C	(DEMO) SECOND FLOOR SCOPE C
P1.03A	(DEMO) THIRD FLOOR SCOPE A
P1.03B	(DEMO) THIRD FLOOR SCOPE B
P1.03C	(DEMO) THIRD FLOOR SCOPE C
P1.04A	(DEMO) FOURTH FLOOR SCOPE A
P1.04B	(DEMO) FOURTH FLOOR SCOPE B
P1.04C	(DEMO) FOURTH FLOOR SCOPE C
P1.05A	(DEMO) FIFTH FLOOR SCOPE A
P1.05B	(DEMO) FIFTH FLOOR SCOPE B
P1.05C	(DEMO) FIFTH FLOOR SCOPE C
P1.06A	(DEMO) SIXTH FLOOR SCOPE A
P1.06B	(DEMO) SIXTH FLOOR SCOPE B
P1.06C	(DEMO) SIXTH FLOOR SCOPE C
P1.08FH	FIELD HOUSE DEMO
P1.10A	(NEW) GROUND FLOOR SCOPE A
P1.10B	(NEW) GROUND FLOOR SCOPE B
P1.10C	(NEW) GROUND FLOOR SCOPE C
P1.11A	(NEW) FIRST FLOOR SCOPE A
P1.11B	(NEW) FIRST FLOOR SCOPE B
P1.11C	(NEW) FIRST FLOOR SCOPE C
P1.12A	(NEW) SECOND FLOOR SCOPE A
P1.12B	(NEW) SECOND FLOOR SCOPE B
P1.12C	(NEW) SECOND FLOOR SCOPE C
P1.13A	(NEW) THIRD FLOOR SCOPE A
P1.13B	(NEW) THIRD FLOOR SCOPE B
P1.13C	(NEW) THIRD FLOOR SCOPE C
P1.14A	(NEW) FOURTH FLOOR SCOPE A
P1.14B	(NEW) FOURTH FLOOR SCOPE B
P1.14C	(NEW) FOURTH FLOOR SCOPE C
P1.15A	(NEW) FIFTH FLOOR SCOPE A
P1.15B	(NEW) FIFTH FLOOR SCOPE B
P1.15C	(NEW) FIFTH FLOOR SCOPE C
P1.16A	(NEW) SIXTH FLOOR SCOPE A
P1.16B	(NEW) SIXTH FLOOR SCOPE B
P1.16C	(NEW) SIXTH FLOOR SCOPE C
P1.18FH	FIELD HOUSE NEW
P2.00A	GROUND FLOOR CALLOUT
P2.00B	GROUND FLOOR CALLOUT
P2.00C	GROUND FLOOR CALLOUT
P2.00D	GROUND FLOOR CALLOUT

P2.01A	FIRST FLOOR CALLOUT
P2.01B	FIRST FLOOR CALLOUT
P2.01C	FIRST FLOOR CALLOUT
P2.01D	FIRST FLOOR CALLOUT
P2.01E	FIRST FLOOR CALLOUT
P2.01F	FIRST FLOOR CALLOUT
P2.02A	SECOND FLOOR CALLOUT
P2.02B	SECOND FLOOR CALLOUT
P2.02C	SECOND FLOOR CALLOUT
P2.02D	SECOND FLOOR CALLOUT
P2.02E	SECOND FLOOR CALLOUT
P2.03A	THIRD FLOOR CALLOUT
P2.03B	THIRD FLOOR CALLOUT
P2.03C	THIRD FLOOR CALLOUT
P2.03D	THIRD FLOOR CALLOUT
P2.03E	THIRD FLOOR CALLOUT
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P2.03G	THIRD FLOOR CALLOUT
P2.04A	FOURTH FLOOR CALLOUT
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P2.06A	SIXTH FLOOR CALLOUT
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P11.02	ALTERNATIVES 3101 & 3103
E0.01	ELECTRICAL GENERAL
E1.00A	DEMO GROUND FLOOR SCOPE A
E1.00B	DEMO GROUND FLOOR SCOPE B
E1.00C	DEMO GROUND FLOOR SCOPE C
E1.01A	DEMO FIRST FLOOR SCOPE A
E1.01B	DEMO FIRST FLOOR SCOPE B
E1.01C	DEMO FIRST FLOOR SCOPE C
E1.02A	DEMO SECOND FLOOR SCOPE A
E1.02B	DEMO SECOND FLOOR SCOPE B

E1.02C	DEMO SECOND FLOOR SCOPE C
E1.03A	DEMO THIRD FLOOR SCOPE A
E1.03B	DEMO THIRD FLOOR SCOPE B
E1.03C	DEMO THIRD FLOOR SCOPE C
E1.04A	DEMO FOURTH FLOOR SCOPE A
E1.04B	DEMO FOURTH FLOOR SCOPE B
E1.04C	DEMO FOURTH FLOOR SCOPE C
E1.06A	DEMO SIXTH FLOOR SCOPE A
E1.06B	DEMO SIXTH FLOOR SCOPE B
E1.06C	DEMO SIXTH FLOOR SCOPE C
E1.10A	NEW GROUND FLOOR SCOPE A
E1.10B	NEW GROUND FLOOR SCOPE B
E1.10C	NEW GROUND FLOOR SCOPE C
E1.11A	NEW FIRST FLOOR SCOPE A
E1.11B	NEW FIRST FLOOR SCOPE B
E1.11C	NEW FIRST FLOOR SCOPE C
E1.12A	NEW SECOND FLOOR SCOPE A
E1.12B	NEW SECOND FLOOR SCOPE B
E1.12C	NEW SECOND FLOOR SCOPE C
E1.13A	NEW THIRD FLOOR SCOPE A
E1.13B	NEW THIRD FLOOR SCOPE B
E1.13C	NEW THIRD FLOOR SCOPE C
E1.14A	NEW FOURTH FLOOR SCOPE A
E1.14B	NEW FOURTH FLOOR SCOPE B
E1.14C	NEW FOURTH FLOOR SCOPE C
E1.16A	NEW SIXTH FLOOR SCOPE A
E1.16B	NEW SIXTH FLOOR SCOPE B
E1.16C	NEW SIXTH FLOOR SCOPE C
E2.00	DEMO FIELDHOUSE GROUND FLOOR
E2.01	DEMO FIELDHOUSE FIRST FLOOR
E2.02	DEMO FIELDHOUSE SECOND FLOOR
E2.10	NEW FIELDHOUSE GROUND FLOOR
E2.11	NEW FIELDHOUSE FIRST FLOOR
E2.12	NEW FIELDHOUSE SECOND FLOOR
E3.00	SCHEDULES
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**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTIONS (Not Applicable)**

END OF DOCUMENT 00 01 15



# AIA® Document A310™ – 2010

## Bid Bond

### CONTRACTOR:

*(Name, legal status and address)*

### SURETY:

*(Name, legal status and principal place of business)*

### OWNER:

*(Name, legal status and address)*

### BOND AMOUNT: \$

### PROJECT:

*(Name, location or address, and Project number, if any)*

CCRI Restrooms Renovations  
CCRI Knight Campus  
400 East Avenue  
Warwick, RI 02886

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

If this Bond is issued in connection with a subcontractor's bid to a Contractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so

### 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.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

Signed and sealed this    day of    ,

\_\_\_\_\_  
(Witness)

\_\_\_\_\_  
(Witness)

\_\_\_\_\_  
(Contractor as Principal)

\_\_\_\_\_  
(Seal)

\_\_\_\_\_  
(Title)

\_\_\_\_\_  
(Surety)

\_\_\_\_\_  
(Seal)

\_\_\_\_\_  
(Title)

Init.

/



**AHARONIAN & ASSOCIATES INC. - ARCHITECTS**

**310 George Washington Highway - Suite 100 - Smithfield, Rhode Island 02917**

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## **CCRI KNIGHT CAMPUS**

**Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

**DOCUMENT 00 43 13**

## **BID SECURITY FORM**

**AIA DOCUMENT A310 – Latest Edition**

**BID BOND**

Document bound herewith. Failure to review this document will not relieve parties of the contractual requirements contained herein.

**END OF DOCUMENT 00 43 13**

# AIA<sup>®</sup> Document A101<sup>™</sup> – 2017

## **Standard Form of Agreement Between Owner and Contractor** where the basis of payment is a Stipulated Sum

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

**BETWEEN** the Owner:

(Name, legal status, address, telephone and facsimile numbers, and website)

State of Rhode Island, acting by and through the Department of Administration,  
Division of Purchases, on behalf of the User AgencyOne Capitol Hill, Second Floor  
Providence, Rhode Island 02908-5855  
401.578.8100 (telephone); 401.574.8387 (facsimile)  
[www.purchasing.ri.gov](http://www.purchasing.ri.gov)

on behalf of the User Agency:

(Name, legal status, address, telephone and facsimile numbers, and website)

CCRI Knight Campus  
400 East Avenue  
Warwick, RI 02886  
401-826-2380  
(telephone)

and the Contractor:

(Name, legal status, address, telephone and facsimile numbers, and website)

for the following Project:

(Name, location and detailed description)

CCRI Knight Campus Bathroom Renovations  
400 East Avenue  
Warwick, Rhode Island 02886

The Design Agent:

(Name, legal status, address, telephone and facsimile numbers, and website)

### **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.

The parties should complete A101<sup>™</sup>–2017, Exhibit A, Insurance and Bonds, contemporaneously with this Agreement. AIA Document A201<sup>™</sup>–2017, General Conditions of the Contract for Construction, is adopted in this document by reference. Do not use with other general conditions unless this document is modified.

The Owner and Contractor agree as follows.

Init.



(Paragraph Deleted)

The Owner and Contractor agree as follows.

## TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE WORK OF THIS CONTRACT
- 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
- 4 CONTRACT SUM
- 5 PAYMENTS
- 6 DISPUTE RESOLUTION
- 7 TERMINATION OR SUSPENSION
- 8 MISCELLANEOUS PROVISIONS
- 9 ENUMERATION OF CONTRACT DOCUMENTS

## EXHIBIT A INSURANCE AND BONDS

### ARTICLE 1 THE CONTRACT DOCUMENTS

The Contract Documents consist of this Agreement, Conditions of the Contract (General Conditions, Supplementary Conditions (if any), and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement, and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations, or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

### ARTICLE 2 THE WORK OF THIS CONTRACT

The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others. No part of the Work shall be performed by Subcontractors without the Owner's prior written consent.

### ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

**§ 3.1** The date of commencement of the Work shall  
*be the later of: (i) the issuance of the Purchase Order by the Owner; and (ii) the*  
*(Paragraph Deleted)*

date set forth in a notice to proceed issued by the User Agency.

*(Paragraphs Deleted)*

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

#### **§ 3.3 Substantial Completion**

**§ 3.3.1** Subject to adjustments of the Contract Time as provided in the Contract Documents, the Contractor shall achieve Substantial Completion of the entire Work:

*(Check one of the following boxes and complete the necessary information.)*

☐ Not later than ( ) calendar days from the date of commencement of the Work.

Init.

[ ] By the following date:

**§ 3.3.2** Subject to adjustments of the Contract Time as provided in the Contract Documents, if portions of the Work are to be completed prior to Substantial Completion of the entire Work, the Contractor shall achieve Substantial Completion of such portions by the following dates:

**Portion of Work**

**Substantial Completion Date**

**§ 3.3.3** If the Contractor fails to achieve Substantial Completion as provided in this Section 3.3, liquidated damages, if any, shall be assessed as set forth in Section 4.5.

**ARTICLE 4 CONTRACT SUM**

**§ 4.1** The Owner shall pay the Contractor the Contract Sum in current funds for the Contractor's performance of the Contract. Subject to additions and deductions as provided in the Contract Documents, the Contract Sum shall be: \$\_\_\_\_\_.

**§ 4.2 Alternates**

**§ 4.2.1** Alternates, if any, included in the Contract Sum:

**Item**

**Price**

**§ 4.2.2** Subject to the conditions noted below, the following alternates may be accepted by the Owner following execution of this Agreement. Upon acceptance, the Owner shall issue a Modification to this Agreement.  
*(Insert below each alternate and the conditions that must be met for the Owner to accept the alternate.)*

**Item**

**Price**

**Conditions for Acceptance**

**§ 4.3** Allowances, if any, are specified in the Bid Proposal Form and are included in the Contract Sum.  
*(Paragraph Deleted)*

*(Table Deleted)*

**§ 4.4** Unit prices, if any, are specified in the Bid Proposal Form and include all costs, including without limitation, labor, materials, services, regulatory compliance, overhead, and profit necessary for the completion of the Work. Unit prices shall be used for both additions to, and deletions from the Work.

*(Table Deleted)*

**§ 4.5** Liquidated damages, if any:  
*(Insert terms and conditions for liquidated damages, if any.)*

**.1** In the event that there is one date for Substantial Completion of the Work, the Contractor shall pay the Owner the sum stipulated in this Section 4.5.1 as liquidated damages, and not as a penalty, for each calendar day of delay until the Work is substantially complete: \$\_\_\_\_\_.

**.2** In the event that the Project is scheduled to be completed in phases, and there is more than one date for Substantial Completion of the Work, the Contractor shall pay the Owner an aggregate amount equal to the sums stipulated in this Section 4.5.2 as liquidated damages, and not as a penalty, for each calendar day of delay until the Work for each phase is substantially complete:

Init.

Phase	Liquidated Damages Sum
-------	------------------------

.3 The Owner and the Contractor have reasonably determined the sums set forth in this Section 4.5 to be a fair estimate of the Owner's actual damages which are difficult to ascertain in the event of delay.

**§ 4.6 Other:**  
*(Paragraph Deleted)*

The Owner shall not be liable to the Contractor or any Subcontractor for claims or damages of any nature caused by or arising out of any delays. The sole remedy against the Owner for delays shall be the allowance of additional time for completion of the Work.

**ARTICLE 5 PAYMENTS**

**§ 5.1 Progress Payments**

**§ 5.1.1** Based upon Applications for Payment submitted to the Design Agent by the Contractor and Certificates for Payment issued by the Design Agent and approved by the Owner in writing, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

**§ 5.1.2** The period covered by each Application for Payment shall be one calendar month ending on the last day of the month.

**§ 5.1.3** The Owner shall make payment of the certified amount, less retainage, to the Contractor not later than the 30<sup>th</sup> working day following written approval by the Owner.

*(Paragraph Deleted)*

**§ 5.1.4** Each Application for Payment shall be based on the most recent schedule of values submitted by the Contractor and approved by the Design Agent and the Owner in accordance with the Contract Documents. The schedule of values shall allocate the entire Contract Sum among the various portions of the Work. The schedule of values shall be prepared in such form, and supported by such data to substantiate its accuracy, as the Design Agent and the Owner may require. This schedule of values shall be used as a basis for reviewing the Contractor's Applications for Payment.

**§ 5.1.5** Applications for Payment shall show the percentage of completion of each portion of the Work as of the end of the period covered by the Application for Payment.

**§ 5.1.6** In accordance with AIA Document A201™-2007, General Conditions of the Contract for Construction as modified by the Owner, and subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

**§ 5.1.6.1** The amount of each progress payment shall first include:

- .1 That portion of the Contract Sum properly allocable to completed Work;
- .2 That portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction, or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing; and
- .3 That portion of Construction Change Directives that the Design Agent determines, in the Design Agent's professional judgment, to be reasonably justified.

**§ 5.1.6.2** The amount of each progress payment shall then be reduced by:

- .1 The aggregate of any amounts previously paid by the Owner;
- .2 The amount, if any, for Work that remains uncorrected and for which the Design Agent has previously withheld a Certificate for Payment as provided in Article 9 of AIA Document

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A201–2007 as modified by the Owner;

- .3 For Work performed or defects discovered since the last payment application, any amount for which the Design Agent may withhold payment, or nullify a Certificate of Payment in whole or in part, as provided in Article 9 of AIA Document A201–2007 as modified by the Owner; and
- .4 Retainage withheld pursuant to Section 5.1.7.

#### § 5.1.7 Retainage

§ 5.1.7.1 For each progress payment made prior to Substantial Completion of the Work, the Owner may withhold the following amount, as retainage, from the payment otherwise due: five (5%) percent.

*(Paragraph Deleted)*

##### § 5.1.7.1.1 Deleted.

*(Paragraph Deleted)*

##### § 5.1.7.2 Deleted.

*(Paragraph Deleted)*

§ 5.1.7.3 Except as set forth in this Section 5.1.7.3, upon Substantial Completion of the Work, the Contractor may submit an Application for Payment that includes the retainage withheld from prior Applications for Payment pursuant to this Section 5.1.7. The Application for Payment submitted at Substantial Completion shall not include retainage as follows:

*(Paragraph Deleted)*

The amount of five (5%) percent shall be retained by the Owner through the date of Substantial Completion of the Work and then after the date of Substantial Completion of the Work in accordance with R.I. Gen. Laws § 37-12-10.1.

§ 5.1.8 If final completion of the Work is materially delayed through no fault of the Contractor, the Owner shall pay the Contractor any additional amounts in accordance with Article 9 of AIA Document A201–2007 as modified by the Owner.

§ 5.1.9 Except with the Owner's prior written approval, the Contractor shall not make advance payments to suppliers for materials or equipment which have not been delivered and stored at the site.

**§ 5.1.10 Within 10 working days of receipt of any progress payment from the Owner, the Contractor must pay its Subcontractors the full amount included for each such Subcontractor within the Contractor's Application for Payment in accordance with the provisions of AIA A201 – 2007, General Conditions of the Contract for Construction as modified by the Owner.**

#### § 5.2 Final Payment

§ 5.2.1 Final payment, constituting the entire unpaid balance of the Contract Sum, less the amount withheld pursuant to § 5.1.7.3, 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 Article 12 of AIA Document A201–2007 as modified by the Owner, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Design Agent and approved in writing by the Owner;
- .3 the Contractor has submitted its final release and final releases from all of its Subcontractors and suppliers in a form acceptable to the Owner; and
- .4 the Contractor has submitted to the Owner all close-out documents, including without limitation, all as-built plans, warranties, manuals, and other materials set forth in the Contract Documents.

§ 5.2.2 The Owner's final payment to the Contractor shall be made no later than 30 working days after the issuance of the Design Agent's final Certificate for Payment and written approval by the Owner.

### § 5.3 Interest

Payments due and unpaid under the Contract shall bear interest from the date payment is due in accordance with the provisions of "Prompt Payment by Department of Administration," R.I. Gen. Laws §§ 42-11.1-1 **et seq.**

### § 5.4 Owner's Rights

§ 5.4.1 The Owner shall have the right to deduct from any payments due to the Contractor the amount of any unpaid obligations owed to the State of Rhode Island by the Contractor, including without limitation, any and all unpaid taxes, the amount of any claim against the Contractor arising out of this Agreement, or any amount on account of any other reason permitted by applicable law.

§ 5.5 Pursuant to R.I. Gen. Laws § 44-1-6, the Owner shall withhold payment from the Contractor if the Contractor does not maintain a regular place of business in Rhode Island in the amount of three (3%) percent of the Contract Sum until 30 calendar days after Final Completion and compliance by the Contractor with the requirements of such section. The three (3%) percent withheld pursuant to R.I. Gen. Laws § 44-1-6 is not considered retainage which is held pursuant to § 5.1.7.

*(Paragraph Deleted)*

## ARTICLE 6 DISPUTE RESOLUTION

### § 6.1 Initial Decision Maker

Claims shall be referred to the Initial Decision Maker for initial decision. The Purchasing Agent appointed pursuant to the provisions of the "State Purchases Act," R.I. Gen. Laws § 37-2-1 **et seq.**, will serve as the Initial Decision Maker *in accordance with the provisions of the State Purchases Act, State of Rhode Island Procurement Regulations, and this Section 6.1. An initial decision shall be required as a condition precedent to binding dispute resolution pursuant to Section 6.3 of any Claim arising prior to the* date final payment is due.

### § 6.2 Mediation

For any Claim not resolved by the Initial Decision Maker procedures set forth in Section 6.1, and prior to the implementation of the binding dispute resolution procedures set forth in Section 6.3, the Contractor shall *have the* option to pursue mediation, exercisable by written notice to the Owner within 30 calendar days of an Initial Decision. In the event of the exercise of such option by the Contractor, the Owner and the Contractor shall attempt to select a mediator, and in the event that the Owner and the Contractor cannot agree on a mediator, either party may apply in writing to the Presiding Justice of the Providence County Superior Court, with a copy to the other, with a request for the court to appoint a mediator, and the costs of the mediator shall be borne equally by both parties.

*(Paragraph Deleted)*

### § 6.3 Binding Dispute Resolution

For any Claim not resolved by the Initial Decision Maker procedures set forth in Section 6.1, or mediation at the option of the Contractor pursuant to Section 6.2, the method of binding dispute resolution shall be determined in accordance with the provisions of the "Public Works Arbitration Act," R.I. Gen. Laws §§ 37-16-1 **et seq.**

## ARTICLE 7 TERMINATION OR SUSPENSION

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201-2007, as modified by the Owner. The Contract may also be terminated by the Owner: (i) in the event of the unavailability of appropriated funds; (ii) in the absence of a determination of continued need; or (iii) as *otherwise provided in the State of Rhode Island Procurement Regulations General Conditions of Purchase or other applicable law.*

### § 7.1.1 Deleted.

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§ 7.2 The Work may be suspended by the Owner as provided in: (i) the State of Rhode Island General Conditions of Purchase Regulation or other applicable law; or (ii) Article 14 of AIA Document A201–2007 as modified by the Owner.

## ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2007 or another Contract Document, the reference refers to: (i) the AIA Document A201 – 2007 or other Contract Document as modified by the Owner; and (ii) that provision in the AIA Document A201 – 2007 as modified by the Owner or other Contract Document as amended or supplemented by other provisions of the Contract Documents.

### § 8.2 Representatives for the Owner

§ 8.2.1 The Owner's representative:

*(Name, title, address, email address, and other information for the preferred methods of contact)*

§ 8.2.2 The User Agency's representative:

*(Name, title, address, email address, and other information for the preferred methods of contact)*

§ 8.2.3 The Design Agent's representative:

*(Name, title, address, email address, and other information for the preferred methods of contact)*

§ 8.3 The Contractor's representative:

*(Name, title, address, email address, and other information for the preferred methods of contact)*

§ 8.4 Neither the Owner's nor the Contractor's representative nor the Design Agent's representative shall be changed without 10 working days' prior notice to the other party.



## § 8.5 Insurance and Bonds

§ 8.5.1 The Owner and the Contractor shall purchase and maintain insurance as set forth in the Solicitation and elsewhere in the Contract Documents.

§ 8.5.2 The Contractor shall provide bonds as set forth in the Solicitation and elsewhere in the Contract Documents.

## § 8.6 Deleted.

§ 8.7 Other provisions:

§ 8.7.1 The Contractor represents and warrants to the Owner, in addition to any other representations and warranties of the Contractor elsewhere in the Contract Documents:

.1 The Contractor and its Subcontractors are each financially solvent, able to pay their debts as they mature, and possess sufficient working capital to perform their obligations under the Contract Documents.

.2 The Contractor and its Subcontractors are each able to furnish the tools, materials, equipment, and labor required to complete the Project as required under the Contract Documents.

.3 *The Contractor and each Subcontractor are authorized to do business in the State of Rhode Island and are properly licensed by all necessary governmental authorities having jurisdiction over them and over the Work and the Project.*

.4 The execution of this Agreement and its performance is within its duly authorized powers.

.5 The Contractor has visited the site of the Project, familiarized itself with the local and special conditions under which the Work is to be performed, and correlated its observations with the requirements of the Contract Documents.

.6 The Contractor possesses the requisite level of experience and expertise in the business administration, construction, and superintendence of projects of the size, complexity, and nature of the Project, and it will perform the Work with the care, skill, and diligence of a contractor possessing such experience and expertise.

§ 8.7.2 The representations and warranties of the Contractor in this Section 8.7 and elsewhere in the Contract Documents will survive the execution and delivery of this Agreement, any termination of this Agreement, and the final completion of the Work.

§ 8.7.3 Any Change Orders or other Modifications must be approved in writing by the Owner.

§ 8.7.4 The Owner is the State of Rhode Island, acting by and through its Department of Administration, Division of Purchases, and therefore, pursuant to the provisions of R.I. Gen. Laws § 34-28-31, mechanics liens may not be placed against the Project.

## ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

§ 9.1 This Agreement is comprised of the following documents:

.1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, as modified by the Owner

.2 Deleted.

.3 AIA Document A201™–2007, General Conditions of the Contract for Construction, as modified by the Owner.

.4 Deleted.

.5 Drawings

*(Table Deleted)*

The Drawings are included in the Solicitation and are available on the Division of Purchases website at [www.purchasing.ri.gov](http://www.purchasing.ri.gov).

.6 Specifications

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(Table Deleted)

The Specifications are included in the Solicitation and are available on the Division of Purchases website at [www.purchasing.ri.gov](http://www.purchasing.ri.gov).

.7 Addenda, if  
(Table Deleted)

any, issued pursuant to the Solicitation form a part of the Solicitation and are available on the Division of Purchases website at [www.purchasing.ri.gov](http://www.purchasing.ri.gov).

.8  
*Supplementary and other Conditions of the Contract, including without limitation, the State of Rhode Island General Conditions of Purchase Regulation.*

.9 Other documents listed below:

(Paragraph Deleted)

.1 The Solicitation, issued by the Owner, including without limitation, the Invitation to Bid, the Instructions to Bidders, the Specifications and Drawings, any Addenda, and the Bid Checklist.

(Paragraph Deleted)

.2 The Bid Proposal, including without limitation, the Bid Form and the Bidder Certification Cover Form.

(Table Deleted)

.3 The Purchase Order issued by the Owner.

§ 9.2 This Agreement and the Contract Documents are subject to, and governed by, the laws of the State of Rhode Island, including all procurement statutes and regulations (available at [www.purchasing.ri.gov](http://www.purchasing.ri.gov)), and applicable federal and local law, all of which are fully incorporated into this Agreement by this reference.

(Table Deleted)

(Paragraph Deleted)

§ 9.3 *In the event of any conflict between or among the Contract Documents, or any Contract Documents and any provision of the State of Rhode Island Procurement Regulations and/or any other provision of the Rhode Island General Laws, the State of Rhode Island Procurement Regulations and the Rhode Island General Laws shall control.*

## ARTICLE 10 BENEFITS OF AGREEMENT

§ 10.1 The User Agency is a disclosed third-party beneficiary of this Agreement and shall have all of the rights and benefits hereunder to which such a party is entitled. Nothing contained in this Agreement shall create a contractual relationship with, or a cause of action in favor of, any other third party against the Owner or the User Agency.

§ 10.2 This Agreement shall be binding on the Contractor and its successors and assigns; provided, however, that the Contractor may not assign its rights nor delegate its responsibilities under this Agreement without the Owner's prior written consent.

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This Agreement is entered into as of the day and year first written above; provided, however, that this Agreement shall not become a valid, binding, and enforceable contract unless and until the Owner shall have issued a Purchase Order.

**THE STATE OF RHODE ISLAND, acting by  
and through its Department of Administration,  
Division of Purchases**

\_\_\_\_\_  
**OWNER** *(Signature)*

\_\_\_\_\_  
*(Printed name and title)*

\_\_\_\_\_  
**CONTRACTOR** *(Signature)*

\_\_\_\_\_  
*(Printed name and title)*

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# AIA® Document A312™ – 2010

## Performance Bond

**CONTRACTOR:**

*(Name, legal status and address)*

**SURETY:**

*(Name, legal status and principal place of business)*

**OWNER:**

*(Name, legal status and address)*

State of Rhode Island, acting by and through the Department of Administration,  
Division of Purchases, on behalf of the User Agency  
One Capitol Hill, Second Floor  
Providence, RI 002908

**CONSTRUCTION CONTRACT**

Date:

Amount: \$ 0.00

Description:

*(Name and location)*

CCRI Knight Campus Restrooms Renovations  
CCRI Knight Campus  
400 East Avenue  
Warwick, RI 02886

**BOND**

Date:

*(Not earlier than Construction Contract Date)*

Amount: \$

Modifications to this Bond:

None

See Section 16

**CONTRACTOR AS PRINCIPAL**

Company: *(Corporate Seal)*

Signature: \_\_\_\_\_

Name and

Title: \_\_\_\_\_

*(Any additional signatures appear on the last page of this Performance Bond.)*

**SURETY**

Company: *(Corporate Seal)*

Signature: \_\_\_\_\_

Name and

Title: \_\_\_\_\_

*(FOR INFORMATION ONLY — Name, address and telephone)*

**AGENT or BROKER:**

**OWNER'S REPRESENTATIVE:**

*(Architect, Engineer or other party:)*

**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.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

**§ 1** The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

**§ 2** If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

**§ 3** If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- .1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- .2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

**§ 4** Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

**§ 5** When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

**§ 5.1** Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

**§ 5.2** Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

**§ 5.3** Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

**§ 5.4** Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as practicable after the amount is determined, make payment to the Owner; or
- .2 Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

**§ 6** If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

**§ 7** If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

**§ 8** If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

**§ 9** The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

**§ 10** The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

**§ 11** Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

**§ 12** Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

**§ 13** When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

#### **§ 14 Definitions**

**§ 14.1 Balance of the Contract Price.** The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

**§ 14.2 Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

**§ 14.3 Contractor Default.** Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

**§ 14.4 Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

**§ 14.5 Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

*(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)*

**CONTRACTOR AS PRINCIPAL**

Company: \_\_\_\_\_ *(Corporate Seal)*

Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_

Address: \_\_\_\_\_

**SURETY**

Company: \_\_\_\_\_ *(Corporate Seal)*

Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_

Address: \_\_\_\_\_

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# AIA® Document A312™ – 2010

## Payment Bond

### CONTRACTOR:

*(Name, legal status and address)*

### SURETY:

*(Name, legal status and principal place of business)*

### OWNER:

*(Name, legal status and address)*

The State of Rhode Island, acting through the Department of Administration  
Division of Purchases, on behalf of the User Agency  
One Capitol Hill, Second Floor  
Providence, RI 02908-5855  
401-574-8100 (telephone)  
www.purchasing.ri.gov

### CONSTRUCTION CONTRACT

Date:

Amount: \$ 0.00

Description:

*(Name and location)*

CCRI Knight Campus Restroom Renovations  
CCRI Knight Campus  
400 East Avenue  
Warwick, RI 02886

### BOND

Date:

*(Not earlier than Construction Contract Date)*

Amount: \$

Modifications to this Bond:

None

See Section 18

### CONTRACTOR AS PRINCIPAL

Company: *(Corporate Seal)*

Signature:

### SURETY

Company: *(Corporate Seal)*

Signature:

Name and

Title:

*(Any additional signatures appear on the last page of this Payment Bond.)*

Name and

Title:

*(FOR INFORMATION ONLY — Name, address and telephone)*

### AGENT or BROKER:

### OWNER'S REPRESENTATIVE:

*(Architect, Engineer or other party:)*

### 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.

Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.



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**§ 1** The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

**§ 2** If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

**§ 3** If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

**§ 4** When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

**§ 5** The Surety's obligations to a Claimant under this Bond shall arise after the following:

**§ 5.1** Claimants, who do not have a direct contract with the Contractor,

- .1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- .2 have sent a Claim to the Surety (at the address described in Section 13).

**§ 5.2** Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

**§ 6** If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

**§ 7** When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

**§ 7.1** Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

**§ 7.2** Pay or arrange for payment of any undisputed amounts.

**§ 7.3** The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

**§ 8** The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

**§ 9** Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.



**§ 10** The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

**§ 11** The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

**§ 12** No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

**§ 13** Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

**§ 14** When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

**§ 15** Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

#### **§ 16 Definitions**

**§ 16.1 Claim.** A written statement by the Claimant including at a minimum:

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- .5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

**§ 16.2 Claimant.** An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

**§ 16.3 Construction Contract.** The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

**§ 16.4 Owner Default.** Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

**§ 16.5 Contract Documents.** All the documents that comprise the agreement between the Owner and Contractor.

**§ 17** If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

**§ 18** Modifications to this bond are as follows:

*(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)*

**CONTRACTOR AS PRINCIPAL**

Company: \_\_\_\_\_ (Corporate Seal)

Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_

Address: \_\_\_\_\_

**SURETY**

Company: \_\_\_\_\_ (Corporate Seal)

Signature: \_\_\_\_\_

Name and Title: \_\_\_\_\_

Address: \_\_\_\_\_



**AHARONIAN & ASSOCIATES INC. - ARCHITECTS**

**310 George Washington Highway - Suite 100 - Smithfield, Rhode Island 02917**

**T 401-232-5010**

**F 401-232-5080**

## **CCRI KNIGHT CAMPUS**

**Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

### **SECTION 00 62 16**

## **ACORD CERTIFICATE OF INSURANCE FORM**

### **AIA DOCUMENT G715 Latest Edition ACORD CERTIFICATE OF INSURANCE FORM**

Document is bound herewith. Failure to review this document will not relieve parties of the contractual requirements contained herein.

**END OF DOCUMENT 00 62 16**



# AIA® Document G715™ – 2017

## Supplemental Attachment for ACORD Certificate of Insurance 25

<b>PROJECT:</b> <i>(name and address)</i> CCRI Knight Campus Restrooms Renovations CCRI Knight Campus 400 East Avenue Warwick, RI 02886  <b>OWNER:</b> <i>(name and address)</i> The State of Rhode Island, acting by and through the Department of Administration Division of Purchases, on behalf of the User Agency One Capitol Hill, Second Floor Providence, RI 02908	<b>CONTRACT INFORMATION:</b> Contract For: General Construction  Date:   <b>ARCHITECT:</b> <i>(name and address)</i> Aharonian & Associates, Inc. 310 George Washington Highway Smithfield, Rhode Island 02917	<b>CERTIFICATE INFORMATION:</b> Producer:  Insured: Date:   <b>CONTRACTOR:</b> <i>(name and address)</i>
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<b>A. General Liability</b>  1. Does this policy include coverage for: a Damages because of bodily injury, sickness, or disease, including occupational sickness or disease, and death of any person? b Personal injury and advertising injury? c Damages because of physical damage to or destruction of tangible property, including the loss of use of such property? d Bodily injury or property damage arising out of completed operations? e The Contractor's indemnity obligations included in the Contract Documents?  2. Does this policy contain an exclusion or restriction of coverage for: a Claims by one insured against another insured, where the exclusion or restrictions is based solely on the fact that the claimant is an insured, and there would otherwise be coverage for the claim? b Claims for property damage to the Contractor's Work arising out of the products-completed operations hazard where the damaged Work or the Work out of which the damage arises was performed by a Subcontractor? c Claims for bodily injury other than to employees of the insured? d Claims for the Contractor's indemnity obligations included in the Contract Documents arising out of injury to employees of the insured? e Claims for loss excluded under a prior work endorsement or other similar exclusionary language? f Claims or loss due to physical damage under a prior injury endorsement or similar exclusionary language? g Claims related to residential, multi-family, or other habitational projects? h Claims related to roofing? i Claims related to exterior insulation finish systems, synthetic stucco, or similar exterior coatings or surfaces? j Claims related to earth subsistence or movement? k Claims related to explosion, collapse, and underground hazards?	<table border="0"> <tr> <td>Yes</td> <td>No</td> <td>N/A</td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </table>	Yes	No	N/A	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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<b>B. Other Insurance Coverage</b>	<table border="0"> <tr> <td>Yes</td> <td>No</td> <td>N/A</td> </tr> </table>	Yes	No	N/A																																																
Yes	No	N/A																																																		

1. Indicate whether the Contractor has the following insurance coverages and, if so, indicate the coverage limits for each.

- |   |  |                          |                          |                          |
|---|--|--------------------------|--------------------------|--------------------------|
| a | Professional liability insurance   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|   | Coverage limits:   |                          |                          |                          |
| b | Pollution liability insurance  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|   | Coverage limits:   |                          |                          |                          |
| c | Insurance for maritime liability risks associated with the operation of a vessel                         | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|   | Coverage limits:   |                          |                          |                          |
| d | Insurance for the use or operation of manned or unmanned aircraft  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|   | Coverage limits:   |                          |                          |                          |
| e | Property insurance   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|   | Coverage limits:   |                          |                          |                          |
| f | Railroad protective liability insurance  | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|   | Coverage limits:   |                          |                          |                          |
| g | Asbestos abatement liability insurance   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|   | Coverage limits:   |                          |                          |                          |
| h | Insurance for physical damage to property while it is in storage and in transit to the construction site | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
|   | Coverage limits:   |                          |                          |                          |
| i | Other:   | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

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(Authorized Representative)

---

(Date of Issue)



AHARONIAN & ASSOCIATES INC. - ARCHITECTS

310 George Washington Highway - Suite 100 - Smithfield, Rhode Island 02917

T 401-232-5010

F 401-232-5080

## **CCRI KNIGHT CAMPUS**

**Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

**DOCUMENT 00 65 20**

## **RELEASE OF LIENS**

**AIA DOCUMENT G706A – Latest Edition**

**Release of Liens**

Document bound herewith. Failure to review this document will not relieve parties of the contractual requirements contained herein.

**END OF DOCUMENT 00 65 20**





# AIA<sup>®</sup> Document G706A<sup>™</sup> – 1994

## Contractor's Affidavit of Release of Liens

<b>PROJECT:</b> <i>(Name and address)</i> CCRI Knight Campus Restroom Renovations CCRI Knight Campus 400 East Avenue Warwick, RI 02886	<b>ARCHITECT'S PROJECT NUMBER:</b> Aharonian & Associates Inc.	<b>OWNER:</b> <input type="checkbox"/>
<b>TO OWNER:</b> <i>(Name and address)</i>	<b>CONTRACT FOR:</b> General Construction	<b>ARCHITECT:</b> <input type="checkbox"/>
	<b>CONTRACT DATED:</b>	<b>CONTRACTOR:</b> <input type="checkbox"/>
		<b>SURETY:</b> <input type="checkbox"/>
		<b>OTHER:</b> <input type="checkbox"/>

**STATE OF:**  
**COUNTY OF:**

The undersigned hereby certifies that to the best of the undersigned's knowledge, information and belief, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Contract referenced above.

### EXCEPTIONS:

#### SUPPORTING DOCUMENTS ATTACHED HERETO:

1. Contractor's Release or Waiver of Liens, conditional upon receipt of final payment.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment suppliers, to the extent required by the Owner, accompanied by a list thereof.

**CONTRACTOR:** *(Name and address)*

**BY:**

\_\_\_\_\_  
*(Signature of authorized representative)*

\_\_\_\_\_  
*(Printed name and title)*

Subscribed and sworn to before me on this date:

Notary Public:  
My Commission Expires:



# AIA<sup>®</sup> Document A201<sup>™</sup> – 2007

## General Conditions of the Contract for Construction

### for the following PROJECT:

*(Name and location or address)*

CCRI Knight Campus Bathroom Renovations  
400 East Avenue  
Warwick, Rhode Island 02886

### THE OWNER:

*(Name, legal status and address)*

The State of Rhode Island, acting by and through the Department of Administration  
Division of Purchases, on behalf of the User Agency  
One Capitol Hill, Second Floor  
Providence, Rhode Island 02908-5855  
(401) 574-8100 (telephone)  
(401) 574-8387 (facsimile)  
www.purchasing.ri.gov

### THE USER AGENCY

*(Name, address, telephone and facsimile numbers, and web address)*

CCRI Knight Campus  
400 East Avenue  
Warwick, RI 02886  
401-826-2380 (telephone)

### THE Design Agent:

*(Name, legal status, address, telephone and facsimile numbers, and web address)*

Aharonian & Associates, Inc.  
310 George Washington Highway  
Smithfield, RI 02917  
401-232-5010 (telephone)

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| 6 | CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS |
| 7 | CHANGES IN THE WORK                              |

### 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.

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User Notes:

(1197826404)



8	TIME
9	PAYMENTS AND COMPLETION
10	PROTECTION OF PERSONS AND PROPERTY
11	INSURANCE AND BONDS
12	UNCOVERING AND CORRECTION OF WORK
13	MISCELLANEOUS PROVISIONS
14	TERMINATION OR SUSPENSION OF THE CONTRACT
15	CLAIMS AND DISPUTES

## ARTICLE 1 GENERAL PROVISIONS

### § 1.1 BASIC DEFINITIONS

#### § 1.1.1 THE CONTRACT DOCUMENTS

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (the Agreement) and consist of the Agreement (and the documents enumerated therein), Conditions of the Contract (General Conditions, Supplementary Conditions, if any, and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to 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 Design Agent.

#### § 1.1.2 THE CONTRACT

The Contract Documents form the Contract for Construction. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual relationship of any kind (1) between the Contractor and the Design Agent or the Design Agent's consultants, (2) between the Owner and a Subcontractor or a Sub-subcontractor, (3) between the Owner and the Design Agent or the Design Agent's consultants or (4) between any persons or entities other than the Owner and the Contractor. The Design Agent shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Design Agent's duties.

#### § 1.1.3 THE WORK

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

#### § 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

#### § 1.1.5 THE DRAWINGS

The Drawings are the graphic and pictorial portions of the Contract Documents showing the design, location, and dimensions of the Work, generally including plans, elevations, sections, details, schedules, and diagrams.

#### § 1.1.6 THE SPECIFICATIONS

The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services.

#### § 1.1.7 INSTRUMENTS OF SERVICE

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

#### § 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

### § 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS

§ 1.2.1 The intent of the Contract Documents is to include all items and services 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; the Contractor shall perform all work reasonably inferable from the Contract Documents as being necessary to produce the indicated results.

§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

§ 1.2.3 Unless otherwise stated in the Contract Documents, words that have well-known technical or construction industry meanings are used in the Contract Documents in accordance with such recognized meanings.

§ 1.2.4 In the event of any conflicts or discrepancies among the Contract Documents, the provisions of the Contract Documents will be interpreted in the following order of priority:

- .1 Modifications (if any).
- .2 The Purchase Order.
- .3 The Agreement.
- .4 The Solicitation, including any Addenda, and the Specifications and Drawings
- .5 The Supplementary Conditions (if any).
- .6 The General Conditions.
- .7 The Bid Proposal.

§ 1.2.5 In the event of any conflicts or discrepancies between the Contract Documents and the State of Rhode Island Procurement Regulations or any provision of the Rhode Island General Laws, the State of Rhode Island Procurement Regulations and the Rhode Island General Laws will control.

§ 1.2.6 In the event of any inconsistency between the Drawings and Specifications, the better quality or greater quantity of Work shall be provided.

§ 1.2.7 The Owner will be the final decision maker for any and all interpretations.

### § 1.3 CAPITALIZATION

Terms capitalized in these General Conditions include those that are (1) specifically defined, (2) the titles of numbered articles or (3) the titles of other documents published by the American Institute of Architects.

### § 1.4 INTERPRETATION

In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement.

### § 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Owner and the User Agency shall have a perpetual license to utilize the Drawings, Specifications, and other documents, including electronic or digital documents, prepared by the Design Agent and the Design Agent's consultants, for the execution of the Project and shall have and retain all rights to use them and reproduce them for the production and maintenance of the Work described therein. 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 Design Agent's or Design Agent's consultants' reserved rights.

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

### § 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

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

## ARTICLE 2 OWNER

### § 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express

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authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Design Agent does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

**§ 2.1.2 Deleted.**

**§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER**

**§ 2.2.1 Deleted.**

**§ 2.2.2** The Contractor shall secure and pay for permits and fees, necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

**§ 2.2.3** If required for the Work in the discretion of the Owner, the Owner shall furnish surveys describing physical characteristics, legal limitations and utility locations for the site of the Project, and a legal description of the site. The Contractor shall be entitled to rely on the accuracy of any information furnished by the Owner but shall exercise proper precautions relating to the safe performance of the Work.

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

**§ 2.2.5 Deleted.**

**§ 2.3 OWNER'S RIGHT TO STOP THE WORK**

If the Contractor fails to correct Work that is not in accordance with the requirements of the Contract Documents as required by Section 12.2 or repeatedly fails to carry out Work in accordance with the Contract Documents, the Owner may issue a written order to the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work shall not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity, except to the extent required by Section 6.1.3.

**§ 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK**

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a 10 working-day period after receipt of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Design Agent's additional services made necessary by such default, neglect, or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Design Agent. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

**ARTICLE 3 CONTRACTOR**

**§ 3.1 GENERAL**

**§ 3.1.1** The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

**§ 3.1.2** The Contractor shall perform the Work in accordance with the Contract Documents.

**§ 3.1.3** The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Design Agent, or by tests, inspections, or approvals required or performed by persons or entities other than the Contractor.

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

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Owner and the Design Agent any errors, inconsistencies, or omissions discovered by or made known to the Contractor or additional Drawings, Specifications, or instructions required to define the Work in greater detail to permit the proper progress of the Work as a request for information in such form as the Design Agent 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.

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

§ 3.2.3.1 Omissions from the Drawings and Specifications of items obviously needed to perform the Work properly, such as attachments, bolts, hangers, and other fastening devices, shall not relieve the Contractor from the obligation to furnish and install such items.

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Design Agent issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2, 3.2.3, or 3.2.3.1, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Design Agent for damages resulting from errors, inconsistencies, or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

§ 3.2.4.1 The Contractor shall not make any changes without prior written authorization from the Design Agent and the Owner.

§ 3.2.5 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Design Agent for evaluating and responding to the Contractor's requests for information that are not prepared in accordance with the Contract Documents or where the requested information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior Project correspondence or documentation.

## § 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures. If the Contractor determines that such means, methods, techniques, sequences or procedures may not be safe, the Contractor shall give timely written notice to the Owner and Design Agent and shall not proceed with that portion of the Work without further written instructions from the Design Agent. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without



acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

**§ 3.3.2** 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.

**§ 3.3.3** The Contractor shall be responsible for inspection of portions of Work already performed to determine that such portions are in proper condition to receive subsequent Work.

## **§ 3.4 LABOR AND MATERIALS**

**§ 3.4.1** Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work. Whenever the Contractor has an obligation to provide labor and materials under the Agreement, the Contractor, at a minimum, shall provide the labor for, and furnish and install and place in operation all items, including without limitation, all proper connections.

**§ 3.4.2** Except in the case of minor changes in the Work authorized by the Design Agent in accordance with Sections 3.12.8 or 7.4, the Contractor may make substitutions only with the consent of the Owner, after evaluation by the Design Agent and in accordance with a Change Order or Construction Change Directive.

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

## **§ 3.5 WARRANTY**

The Contractor warrants to the Owner and the Design Agent that materials and equipment furnished under the Contract will be of first quality, prime manufacture, 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, including substitutions not properly authorized, may be considered defective. The Contractor's warranty excludes remedy for damage or defect caused by abuse, alterations to the Work not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear and normal usage. If required by the Design Agent, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment.

## **§ 3.6 TAXES**

**§ 3.6.1** The Contractor shall pay sales, consumer, use and similar taxes for the Work provided by the Contractor that are legally enacted when bids are received or negotiations concluded, whether or not yet effective or merely scheduled to go into effect.

**§ 3.6.2** The State of Rhode Island is exempt from payment of any federal or state excise, transportation, or sales tax. The Rhode Island Department of Administration Division of Purchases will furnish Exemption Certificates upon request.

## **§ 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS**

**§ 3.7.1** Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections required by the Rhode Island State Building Code 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. The Contractor shall be responsible for obtaining the Certificate of Occupancy from the appropriate governmental authorities.

**§ 3.7.2** The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

§ 3.7.3 The Contractor shall promptly notify the Design Agent and the Owner if the Contractor becomes aware that the Contract Documents are not in accordance with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of public authorities. 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.

§ 3.7.4 **Concealed or Unknown Conditions.** If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Design Agent before conditions are disturbed and in no event later than 21 working days after first observance of the conditions. The Design Agent will promptly investigate such conditions and, if the Design Agent determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Design Agent determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Design Agent shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Design Agent's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Design Agent. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

### § 3.8 ALLOWANCES

§ 3.8.1 The Contractor shall include in the Contract Sum all allowances stated in the Contract Documents. Items covered by allowances shall be supplied for such amounts and by such persons or entities as the Owner may direct, but the Contractor shall not be required to employ persons or entities to whom the Contractor has reasonable objection.

§ 3.8.2 Unless otherwise provided in the Contract Documents,

- .1 Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;
- .2 Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and
- .3 Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor's costs under Section 3.8.2.2.

§ 3.8.3 Materials and equipment under an allowance shall be selected by the Owner with reasonable promptness.

### § 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Design Agent the name and qualifications of a proposed superintendent. The Design Agent may reply within 14 working days to the Contractor in writing stating (1) whether the Owner or the Design Agent has reasonable objection to the proposed superintendent or (2) that the Design Agent requires additional time to review. Failure of the Design Agent to reply within the 14 working-day period shall constitute notice of no reasonable objection.

§ 3.9.3 The Contractor shall not employ a proposed superintendent to whom the Owner or Design Agent has made reasonable and timely objection. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

#### § 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, within 20 working days after the issuance of the Purchase Order, shall prepare and submit for the Owner's and Design Agent'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, not less frequently than monthly, 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. The Contractor shall certify on the initial schedule and all revised schedules that they comply with the Contract Documents.

§ 3.10.2 The Contractor shall prepare a submittal schedule, within 20 working days after the issuance of the Purchase Order, and thereafter as necessary to maintain a current submittal schedule, and shall submit the schedule(s) for the Owner's and the Design Agent's approval. The Owner's and the Design Agent's approval shall not unreasonably be delayed or withheld. The submittal schedule shall (1) be coordinated with the Contractor's construction schedule, and (2) allow the Owner and the Design Agent reasonable time to review submittals. If the Contractor fails to submit a submittal schedule, the Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals.

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Design Agent.

#### § 3.11 DOCUMENTS AND SAMPLES AT THE SITE

The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Design Agent and shall be delivered to the Design Agent for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

#### § 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

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

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

§ 3.12.6 By submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents to the Owner and Design Agent that the Contractor has (1) reviewed and approved them, (2) determined and verified



materials, field measurements and field construction criteria related thereto, or will do so and (3) checked and coordinated the information contained within such submittals with the requirements of the Work and of the Contract Documents.

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

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

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

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

**§ 3.12.11** The Owner shall be entitled to reimbursement from the Contractor for amounts paid to the Design Agent for evaluation of resubmittals.

### **§ 3.13 USE OF SITE**

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

### **§ 3.14 CUTTING AND PATCHING**

**§ 3.14.1** The Contractor shall be responsible for cutting, fitting or patching required to complete the Work or to make its parts fit together properly. All areas requiring cutting, fitting and patching shall be restored to the condition existing prior to the cutting, fitting and patching, unless otherwise required by the Contract Documents.

**§ 3.14.2** The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably

withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

### **§ 3.15 CLEANING UP**

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

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

### **§ 3.16 ACCESS TO WORK**

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

### **§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS**

The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement of copyrights and patent rights and shall hold the Owner and Design Agent 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 Design Agent. 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 Design Agent and the Owner.

### **§ 3.18 INDEMNIFICATION**

**§ 3.18.1** To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, the State of Rhode Island, and each executive, legislative, judicial, regulatory, and administrative body of the state, and any political subdivision thereof, including without limitation, any department, division, agency, commission, board, office, bureau, committee, authority, educational institution, school, water, and fire district, and other agency of Rhode Island state, municipal, and local government that exercises governmental functions, any other governmental authority, and any quasi-public corporation and/or body corporate and politic, including without limitation, the User Agency, their elected and appointed officials, members, employees, and agents, the Design Agent, the Design Agent's Consultants, Subconsultants, and Subcontractors, and agents and employees and any of them from and against any and all claims, demands, damages, liabilities, judgments, losses and expenses, including but not limited to attorneys' fees and costs of mediation, arbitration, and/or litigation, arising out of or resulting from performance of the Work, and/or the obligations of the under the Contract Documents, but only to the extent caused by the 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 any such claim, demand, damage, liability, judgment, 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 that would otherwise exist as to a party or person described in this Section 3.18.

**§ 3.18.2** In claims against any person or entity indemnified under this Section 3.18 by an employee of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under Section 3.18.1 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts.

**§ 3.18.3** Without limiting the generality of the foregoing, the defense and indemnity set forth in this Section 3.18 includes, without limitation, all liabilities, damages, losses, claims, demands, and actions on account of bodily injury, death, or property loss to a person or entity indemnified hereunder or any other persons or entities, whether based upon statutory (including, without limitation, workers compensation), contractual, tort, or other liability of any person or entity so indemnified.

**§ 3.18.4** The remedies set forth herein shall not deprive any person indemnified hereunder of any other indemnity action, right, or remedy otherwise available to any such person or entity at common law or otherwise.

§ 3.18.5 The Contractor will include the indemnity set forth in this Section 3.18, without modification, in each Subcontract with any Subcontractor.

§ 3.18.6 Notwithstanding any other language in the Contract Documents to the contrary, the indemnity hereunder shall survive Final Completion of the Work and final payment under the Agreement and shall survive any termination of the Agreement.

#### ARTICLE 4 DESIGN AGENT

##### § 4.1 GENERAL

§ 4.1.1 The Design Agent is the person lawfully licensed to practice his or her profession in the State of Rhode Island or an entity lawfully practicing its profession in the State of Rhode Island and identified in the Contract Documents as the Design Agent. The term "Design Agent" means the Design Agent or the Design Agent's authorized representative.

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

§ 4.1.3 If the employment of the Design Agent is terminated, the Owner shall employ a successor Design Agent as to whom the Contractor has no reasonable objection and whose status under the Contract Documents shall be that of the Design Agent.

##### § 4.2 ADMINISTRATION OF THE CONTRACT

§ 4.2.1 The Owner with assistance from the Design Agent will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction through the date the Design Agent issues the final Certificate for Payment and continuing until the expiration of the one-year period following Final Completion. The Design Agent will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

§ 4.2.2 The Design Agent will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, 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 Design Agent will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Design Agent will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.2.1 The Owner is entitled to reimbursement from the Contractor for amounts paid to the Design Agent for site visits made necessary by the fault of the Contractor or by defects and deficiencies in the Work.

§ 4.2.3 On the basis of the site visits, the Design Agent 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 Design Agent will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Design Agent will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.

##### § 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Design Agent about matters arising out of or relating to the Contract. Communications by and with the Design Agent's consultants shall be through the Design Agent. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

§ 4.2.5 Based on the Design Agent's evaluations of the Contractor's Applications for Payment, the Design Agent will review and certify the amounts due the Contractor and will issue Certificates for Payment in such amounts.

§ 4.2.6 The Design Agent has authority to reject Work that does not conform to the Contract Documents. Whenever the Design Agent considers it necessary or advisable, the Design Agent will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Design Agent nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Design Agent to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Design Agent will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Design Agent's action will be taken in accordance with the submittal schedule approved by the Design Agent or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Design Agent's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Design Agent's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Design Agent's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Design Agent, of any construction means, methods, techniques, sequences or procedures. The Design Agent's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

§ 4.2.8 The Design Agent will prepare Change Orders and Construction Change Directives, and may authorize minor changes in the Work as provided in Section 7.4. The Design Agent will investigate and make determinations and recommendations regarding concealed and unknown conditions as provided in Section 3.7.4.

§ 4.2.9 The Design Agent will conduct inspections to determine the date or dates of Substantial Completion and the date of final completion; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10.

§ 4.2.10 If the Owner and Design Agent agree, the Design Agent will provide one or more project representatives to assist in carrying out the Design Agent's responsibilities at the site. The duties, responsibilities and limitations of authority of such project representatives shall be as set forth in an exhibit to be incorporated in the Contract Documents.

§ 4.2.11 The Design Agent will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Design Agent's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness.

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

§ 4.2.13 The Design Agent's decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents and approved by the Owner.

§ 4.2.14 The Design Agent will review and respond to requests for information about the Contract Documents. The Design Agent's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Design Agent will prepare and issue supplemental Drawings and Specifications in response to the requests for information.



## ARTICLE 5 SUBCONTRACTORS

### § 5.1 DEFINITIONS

§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term "Subcontractor" does not include a separate contractor or subcontractors of a separate contractor.

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

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

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner and the Design Agent the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each portion of the Work. The Owner may reply within 14 working days to the Contractor in writing stating (1) whether the Owner or the Design Agent has reasonable objection to any such proposed person or entity or (2) that the Owner or Design Agent requires additional time for review.

§ 5.2.2 The Contractor shall not contract with a proposed person or entity to whom the Owner or Design Agent has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.3 If the Owner or Design Agent has reasonable objection to a person or entity proposed by the Contractor, the Contractor shall propose another to whom the Owner or Design Agent has no reasonable objection. If the proposed but rejected Subcontractor was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be increased or decreased by the difference, if any, occasioned by such change, and an appropriate Change Order shall be issued before commencement of the substitute Subcontractor's Work. However, no increase in the Contract Sum or Contract Time shall be allowed for such change unless the Contractor has acted promptly and responsively in submitting names as required.

§ 5.2.4 The Contractor shall not substitute a Subcontractor, person or entity previously selected if the Owner or Design Agent makes reasonable objection to such substitution.

### § 5.2.5 MANUFACTURERS AND FABRICATORS

§ 5.2.5.1 Not later than 10 working days after the date of commencement of the Work, the Contractor shall furnish in writing to the Owner and the Design Agent the names of the manufacturers or fabricators for certain products, equipment, and systems identified in the Specifications and, where applicable, the name of the installing Subcontractor. The Owner may reply within 14 working days to the Contractor in writing, stating: (i) whether the Owner or the Design Agent has reasonable objection to any such proposed person manufacturer or fabricator; or (ii) whether the Owner or Design Agent requires additional time to review.

§ 5.2.5.2 The Contractor shall not contract with a proposed manufacturer, fabricator, or Subcontractor to whom the Owner or Design Agent has made reasonable and timely objection. The Contractor shall not be required to contract with anyone to whom the Contractor has made reasonable objection.

§ 5.2.5.3 If the Owner or Design Agent has an objection to a manufacturer, fabricator, or Subcontractor proposed by the Contractor, the Contractor shall propose another to whom the Owner or Design Agent has no objection.

§ 5.2.5.4 The Contractor shall not substitute a manufacturer, fabricator, or Subcontractor previously selected if the Owner or Design Agent makes reasonable objection to such substitution.

### § 5.3 SUBCONTRACTUAL RELATIONS

By appropriate written agreement, the Contractor shall require each Subcontractor, to the extent of the Work to be performed by the Subcontractor, to be bound to the Contractor by terms of the Contract Documents, and to assume toward the Contractor all the obligations and responsibilities, including the responsibility for safety of the

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Subcontractor's Work, which the Contractor, by these Documents, assumes toward the Owner and Design Agent. Upon the request of the User Agency and/or the Owner, the Contractor shall provide the User Agency and/or the Owner with copies of each subcontract agreement. Each subcontract agreement shall preserve and protect the rights of the Owner and Design Agent under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

#### **§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS**

**§ 5.4.1** Each subcontract agreement for a portion of the Work is assigned by the Contractor to the Owner, provided that

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and
- .2 assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

*(Paragraph deleted)*

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

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

#### **ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

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

**§ 6.1.1** The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation.

**§ 6.1.2** When separate contracts are awarded for different portions of the Project or other construction or operations on the site, the term "Contractor" in the Contract Documents in each case shall mean the Contractor who executes each separate Owner-Contractor Agreement.

**§ 6.1.3** The Owner shall provide for coordination of the activities of the Owner's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Contractor, separate contractors and the Owner until subsequently revised.

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

##### **§ 6.2 MUTUAL RESPONSIBILITY**

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

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

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

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

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

### § 6.3 OWNER'S RIGHT TO CLEAN UP

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and allocate the cost among those responsible.

## ARTICLE 7 CHANGES IN THE WORK

### § 7.1 GENERAL

§ 7.1.1 Changes in the Work may be accomplished after execution of the Contract, and without invalidating the Contract, by Change Order, Construction Change Directive or order for a minor change in the Work, subject to the limitations stated in this Article 7 and elsewhere in the Contract Documents.

§ 7.1.2 A Change Order shall be based upon agreement between the Owner and the Contractor; a Construction Change Directive requires agreement by the Owner and may or may not be agreed to by the Contractor; an order for a minor change in the Work may be issued by the Design Agent alone.

§ 7.1.3 Changes in the Work shall be performed under applicable provisions of the Contract Documents, and the Contractor shall proceed promptly, unless otherwise provided in the Change Order, Construction Change Directive or order for a minor change in the Work.

### § 7.2 CHANGE ORDERS

§ 7.2.1 A Change Order is a written instrument prepared by the Contractor and signed by the Owner, Contractor and Design Agent stating their agreement upon all of the following:

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

§ 7.2.2 Subsequent to the approval of a Change Order as provided in § 7.1.2, whether such Change Order changes the Contract Sum or Contract Time or both, no additional claim related to such Change Order will be considered by the Owner. Any change, once incorporated into a Change Order, is all inclusive, and includes all factors that could have been considered at the time of the Change Order such as Project impact or schedule "ripple" effect.

### § 7.3 CONSTRUCTION CHANGE DIRECTIVES

§ 7.3.1 A Construction Change Directive is a written order prepared by the Design Agent and signed by the Owner, directing a change in the Work prior to agreement on adjustment, if any, in the Contract Sum or Contract Time, or both. The Owner may by Construction Change Directive, without invalidating the Contract, order changes in the Work within the general scope of the Contract consisting of additions, deletions or other revisions, the Contract Sum and Contract Time being adjusted accordingly.

§ 7.3.2 A Construction Change Directive shall be used in the absence of total agreement on the terms of a Change Order.

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.7.

§ 7.3.4 Deleted.

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

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

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Design Agent shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in Section 7.3.1. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Design Agent may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

- .1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers' compensation insurance;
- .2 Costs of materials, supplies and equipment, including cost of delivery;
- .3 Rental costs of machinery and equipment, exclusive of hand tools; or
- .4 Costs of premiums for all bonds and insurance and permit fees related to the Work..

§ 7.3.8 The amount of credit to be allowed by the Contractor to the Owner for a deletion or change that results in a net decrease in the Contract Sum shall be actual net cost as confirmed by the Design Agent. When both additions and credits covering related Work or substitutions are involved in a change, the allowance for overhead and profit shall be figured on the basis of net increase, if any, with respect to that change.

§ 7.3.9 Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment for Work completed under the Construction Change Directive in Applications for Payment. The Design Agent will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Design Agent determines, in the Design Agent's professional judgment, to be reasonably justified. The Design Agent's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

§ 7.3.10 When the Owner and Contractor agree with a determination made by the Design Agent concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Contractor will prepare a Change Order. Change Orders may be issued for all or any part of a Construction Change Directive.

§ 7.3.11 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, an amount not to exceed ten (10%) percent of the cost.
- .2 For the Contractor, for work performed by the Contractor's Subcontractors, an amount not to exceed five (5%) of the amount due to the Subcontractors.
- .3 For each Subcontractor, for work performed by the Subcontractor's own forces, an amount not to exceed ten (10%) percent of the cost.
- .4 Where the Work represents both additions and deletions and results in a net increase, the allowable overhead and profit shall be in accordance with this Section 7.3.11, but in no event shall the amount exceed fifteen (15%) percent of the net increase in the cost of the Work.

**§ 7.3.12** All proposals with an aggregate cost equal to or in excess of \$500.00 shall be accompanied by a detailed itemization of costs, including labor, materials (quantities and prices), and Subcontracts, in a form acceptable to the Owner. In no event will a change order request reflecting an aggregate cost equal to or in excess of \$500.00 be approved without such itemization.

#### **§ 7.4 MINOR CHANGES IN THE WORK**

The Design Agent with the prior written approval of the Owner has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be affected by written order signed by the Design Agent and shall be binding on the Owner and Contractor.

### **ARTICLE 8 TIME**

#### **§ 8.1 DEFINITIONS**

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

The date of commencement of the Work is the date established in Section 3.1 of the Agreement..

*(Paragraph deleted)*

**§ 8.1.3** The date of Substantial Completion is the date certified by the Design Agent in accordance with Section 9.8.

**§ 8.1.4 Deleted.**

#### **§ 8.2 PROGRESS AND COMPLETION**

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

**§ 8.2.2** The Contractor shall not except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

**§ 8.2.3** The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

#### **§ 8.3 DELAYS AND EXTENSIONS OF TIME**

**§ 8.3.1** If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Design Agent, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control, then the Contract Time shall be extended by Change Order for such reasonable time as the Owner may determine.

**§ 8.3.2** Claims relating to time shall be made in accordance with applicable provisions of Article 15.

**§ 8.3.3** This Section 8.3 does not preclude recovery of damages for delay by either party under other provisions of the Contract Documents.

## ARTICLE 9 PAYMENTS AND COMPLETION

### § 9.1 CONTRACT SUM

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

### § 9.2 SCHEDULE OF VALUES

Within 20 working days of the issuance of the Purchase Order, and promptly if revision is necessary from time to time as a result of a Change Order, the Contractor shall submit to the Owner, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Design Agent and the Owner may require. This schedule, if and when approved by the Design Agent and the Owner in writing, shall be used as a basis for reviewing the Contractor's Applications for Payment.

### § 9.3 APPLICATIONS FOR PAYMENT

§ 9.3.1 At least 10 working days before the date established for each progress payment, the Contractor shall submit to the Design Agent and the Owner for approval an itemized Application for Payment prepared in accordance with the schedule of values for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or the Design Agent may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.

§ 9.3.1.1 All Applications for Payment for Change Orders must be accompanied by a Notice of Change in Purchase Order issued by the Owner, and if directed by the Owner, by the User Agency.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

§ 9.3.1.3 The form of Application for Payment shall be AIA Document G702, Application and Certification for Payment, supported by AIA Document G702A, Continuation Sheet.

§ 9.3.1.4 Until Substantial Completion, the Owner shall pay ninety-five (95%) percent of the amount due the Contract on account of progress payments.

§ 9.3.2 Unless otherwise provided in the Contract Documents, payments shall be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. If approved in advance by the Owner, payment may similarly be made for materials and equipment suitably stored off the site at a location agreed upon in writing. Payment for materials and equipment stored on or off the site shall be conditioned upon compliance by the Contractor with procedures satisfactory to the Owner to establish the Owner's title to such materials and equipment or otherwise protect the Owner's interest, and shall include the costs of applicable insurance, storage and transportation to the site for such materials and equipment stored off the site.

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the Owner shall be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work. The Contractor shall immediately satisfy any lien, claim, or encumbrance against the site where the Project is located and indemnify the Owner from and against all resulting costs and expenses, including without limitation, attorneys' fees.

### § 9.4 CERTIFICATES FOR PAYMENT

§ 9.4.1 The Design Agent will, within 7 working 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 Design Agent determines is properly due, or notify the Contractor and Owner in writing of the Design Agent's reasons for withholding certification in whole or in part as provided in Section 9.5.1.

**§ 9.4.2** The issuance of a Certificate for Payment will constitute a representation by the Design Agent to the Owner, based on the Design Agent's evaluation of the Work and the data comprising the Application for Payment, that, 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 Design Agent. 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 Design Agent has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

**§ 9.4.3** The Contractor must submit all product literature, material and color samples with each Application for Payment, or as otherwise required by the Owner.

## **§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION**

**§ 9.5.1** The Design Agent will withhold a Certificate for Payment in whole or in part, to the extent reasonably necessary to protect the Owner, if in the Design Agent's opinion the representations to the Owner required by Section 9.4.2 cannot be made. If the Design Agent is unable to certify payment in the amount of the Application, the Design Agent will notify the Contractor and Owner as provided in Section 9.4.1. If the Contractor and Design Agent cannot agree on a revised amount, the Design Agent will promptly issue a Certificate for Payment for the amount for which the Design Agent is able to make such representations to the Owner. The Design Agent 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 Design Agent's opinion to protect the Owner from loss for which the Contractor is responsible, including loss resulting from acts and omissions described in Section 3.3.2, because of:

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

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

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

## **§ 9.6 PROGRESS PAYMENTS**

**§ 9.6.1** After the Design Agent has issued a Certificate for Payment and the Owner has approved the Certificate for Payment in writing, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Design Agent.

**§ 9.6.2** The Contractor shall pay each Subcontractor no later than 10 working days after receipt of payment from the Owner the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner.

§ 9.6.3 The Design Agent will, on request, furnish to a Subcontractor, if practicable, information regarding percentages of completion or amounts applied for by the Contractor and action taken thereon by the Design Agent and Owner on account of portions of the Work done by such Subcontractor.

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers amounts paid by the Owner to the Contractor for subcontracted Work. If the Contractor fails to furnish such evidence within 7 working days, the Owner shall have the right to contact Subcontractors to ascertain whether they have been properly paid. The Owner shall have the right to withhold payment(s) to the Contractor in the event that any Subcontractors or material and equipment suppliers have not been properly paid. Neither the Owner nor Design Agent shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

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

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

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

## § 9.7 FAILURE OF PAYMENT

If the Design Agent does not issue a Certificate for Payment, through no fault of the Contractor, within 7 working days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within 7 working days after the date established in the Contract Documents the amount certified by the Design Agent or awarded by binding dispute resolution, then the Contractor may, upon 7 additional working days' written notice to the Owner and Design Agent, make a claim for payment as provided under the provisions of applicable law.

## § 9.8 SUBSTANTIAL COMPLETION

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

§ 9.8.2 When the Contractor considers that the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall prepare and submit to the Design Agent 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.

§ 9.8.3 Upon receipt of the Contractor's list, the Design Agent will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Design Agent's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Design Agent. In such case, the Contractor shall then submit a request for another inspection by the Design Agent to determine Substantial Completion. The Design Agent will perform no more than 2 inspections to determine whether the Work or a designated portion thereof has attained Substantial Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Design Agent for any additional inspections.

§ 9.8.4 When the Work or designated portion thereof is substantially complete, the Design Agent will prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish



responsibilities of the Owner and Contractor for security, maintenance, heat, utilities, damage to the Work and insurance, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate.

**§ 9.8.5** The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment less the amount of five (5%) percent to be retained by the Owner in accordance with R.I. Gen. Laws § 37-12-10.1. Such payment shall be adjusted for Work that is incomplete or not in accordance with the requirements of the Contract Documents.

## **§ 9.9 PARTIAL OCCUPANCY OR USE**

**§ 9.9.1** The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Design Agent as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Design Agent.

**§ 9.9.2** Immediately prior to such partial occupancy or use, the Owner, Contractor and Design Agent shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work.

**§ 9.9.3** Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

## **§ 9.10 FINAL COMPLETION AND FINAL PAYMENT**

**§ 9.10.1** Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Design Agent will promptly make such inspection and, when the Design Agent finds the Work acceptable under the Contract Documents and the Contract fully performed, the Design Agent will promptly issue a final Certificate for Payment stating that to the best of the Design Agent's knowledge, information and belief, and on the basis of the Design Agent'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 Design Agent's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. The Design Agent will perform no more than 2 inspections to determine whether the Work or a designated portion thereof has attained Final Completion in accordance with the Contract Documents. The Owner is entitled to reimbursement from the Contractor for amounts paid to the Design Agent for any additional inspections.

**§ 9.10.2** Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Design Agent (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 working days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner, and (6) all other close-out documents required by the Owner, including without limitation, all as-built plans, warranties, manuals, and other materials set forth in the Contract Documents. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the

Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Design Agent so confirms, the Owner shall, upon application by the Contractor and certification by the Design Agent, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, and if bonds have been furnished, the written consent of surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Design Agent prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

§ 9.10.4 The making of final payment shall constitute a waiver of Claims by the Owner except those arising from:

- .1 liens, Claims, security interests, or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents; or
- .4 claims permitted under the State of Rhode Island General Conditions of Purchase Regulation.

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

§ 9.11 The Contractor and the Contractor's surety shall be liable for and shall pay the Owner as liquidated damages the sums specified in the Solicitation and Bid Form, or if completed, the amount set forth in Section 3.4 of the Agreement.

§ 9.12 Warranties required by the Contract Documents shall commence on the date of Final Completion of the Work.

## ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

### § 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

### § 10.2 SAFETY OF PERSONS AND PROPERTY

§ 10.2.1 The Contractor shall take reasonable precautions for safety of, and shall provide reasonable protection to prevent damage, injury or loss to:

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

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

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

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

§ 10.2.4.1 When use or storage of explosives, or other hazardous materials, substances or equipment, or unusual methods are necessary for execution of the Work, the Contractor shall give the User Agency and the Owner reasonable advance notice.

§ 10.2.4.2 If the Contract Documents require the Contractor to handle materials or substances that under certain circumstances may be designated as hazardous, the Contractor shall handle such materials in an appropriate manner.

§ 10.2.5 The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Design Agent or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

§ 10.2.6 The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner and Design Agent.

§ 10.2.7 The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage or create an unsafe condition.

#### § 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such injury or damage, whether or not insured, shall be given to the other party within a reasonable time. The notice shall provide sufficient detail to enable the other party to investigate the matter.

#### § 10.3 HAZARDOUS MATERIALS

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

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

§ 10.3.3 To the extent permitted by the provisions of R.I. Gen. Laws §§ 9-31-1 et seq., the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Design Agent, Design Agent's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided

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

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

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

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

#### **§ 10.4 EMERGENCIES**

In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 15 and Article 7.

### **ARTICLE 11 INSURANCE AND BONDS**

#### **§ 11.1 CONTRACTOR'S LIABILITY INSURANCE**

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

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.

**§ 11.1.1.2** The Contractor's liability insurance shall include all major coverages and be on a comprehensive general liability basis.

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



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

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the User Agency, and their elected and appointed officials, members, employees, and agents, the Design Agent and the Design Agent's consultants as additional insureds for claims caused in whole or in part by the Contractor's acts or omissions during the Contractor's operations; and (2) the Owner, the User Agency, and their elected and appointed officials, members, employees, and agents, as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

§ 11.1.5 The Contractor shall be responsible for the prompt payment to the Owner of any deductible amounts under any insurance policies required under the Contract Documents for claims made pursuant to such policies.

## § 11.2 OWNER'S LIABILITY INSURANCE.

§ 11.2.1 The Contractor shall furnish the Owner and the User Agency, through the Design Agent, an insurance certificate providing Owner's Protective Liability extended to include the interests of the Design Agent, and to protect the Owner, User Agency, and Design Agent from any liability which might be incurred against any of them as a result of any operation of the Contractor or Subcontractors or their employees or anyone for whom either the Contractor or Subcontractors are responsible. Such insurance shall be written for the same limits as the Contractor's commercial general liability insurance and shall include the same coverage.

§ 11.2.2 If the Owner engages separate contractors to perform work for, or in or around, the Project, it shall require in its contracts with each separate contractor that Contractor and its officers, directors, partners, members, employees, and agents shall be: (i) named as additional insureds on a primary, noncontributory basis to any commercial general liability, pollution liability, and excess liability insurance policies; and (ii) provided a waiver of subrogation on all workers compensation and professional liability insurance policies.

## § 11.3 PROPERTY INSURANCE

§ 11.3.1 The Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the state of Rhode Island, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. This insurance shall include interests of the Owner, the User Agency, the Contractor, Subcontractors and Sub-subcontractors in the Project. If the Owner and/or the User Agency incur any damages by failure of the Contractor to maintain such insurance, then the Contractor shall bear all reasonable cost resulting from such failure.

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Design Agent's and Contractor's services and expenses required as a result of such insured loss.

### § 11.3.1.2 Deleted.

Init.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.

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

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

§ 11.3.2 Deleted.

§ 11.3.3 Deleted.

§ 11.3.4 Deleted.

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

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

#### § 11.3.7 WAIVERS OF SUBROGATION

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

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

§ 11.3.9 If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Contractor's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Contractor shall deposit in a separate account proceeds so received, which the Contractor shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and

Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

§ 11.3.10 The Contractor as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within 5 working days after occurrence of loss to the Contractor's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement.

#### § 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in the Solicitation.

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

### ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

#### § 12.1 UNCOVERING OF WORK

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

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

#### § 12.2 CORRECTION OF WORK

##### § 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

The Contractor shall promptly correct Work rejected by the Design Agent 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 Design Agent's services and expenses made necessary thereby, shall be at the Contractor's expense.

##### § 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Final Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly 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. If the Contractor fails to correct nonconforming Work within a reasonable time after receipt of notice from the Owner or Design Agent, the Owner may correct it in accordance with Section 2.4.

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

§ 12.2.2.3 The one-year period for correction of Work shall not be extended by corrective Work performed by the Contractor pursuant to this Section 12.2.

§ 12.2.2.4 Upon request by the Owner and prior to the expiration of one year from the date of Final Completion, the Design Agent will conduct and the Contractor shall attend 2 meetings with the Owner to review the facility operations and performance.

§ 12.2.3 The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

§ 12.2.4 The Contractor shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

§ 12.2.5 Nothing contained in this Section 12.2 shall be construed to establish a period of limitation with respect to other obligations the Contractor has under the Contract Documents. Establishment of the one-year period for correction of Work as described in Section 12.2.2 relates only to the specific obligation of the Contractor to correct the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations other than specifically to correct the Work.

## § 12.3 ACCEPTANCE OF NONCONFORMING WORK

If the Owner prefers to accept Work that is not in accordance with the requirements of the Contract Documents, the Owner may do so instead of requiring its removal and correction, in which case the Contract Sum will be reduced as appropriate and equitable. Such adjustment shall be effected whether or not final payment has been made.

## ARTICLE 13 MISCELLANEOUS PROVISIONS

### § 13.1 GOVERNING LAW

The Contract shall be governed by the law of the State of Rhode Island.

### § 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such an assignment without such consent, that party shall nevertheless remain legally responsible for all obligations under the Contract.

§ 13.2.2 The Owner may, without consent of the Contractor, assign the Contract to any executive, legislative, judicial, regulatory, or administrative body of the state, or any political subdivision thereof, including without limitation, any department, division, agency, commission, board, office, bureau, authority, school, water, or fire district, or other agency of Rhode Island state or local government that exercises governmental functions, any other governmental authority, and any quasi-public corporation and/or body corporate and politic. The Contractor shall execute all consents reasonably required to facilitate such assignment.

### § 13.3 WRITTEN NOTICE

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

### § 13.4 RIGHTS AND REMEDIES

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

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



## § 13.5 TESTS AND INSPECTIONS

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

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

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

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

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

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

## § 13.6 INTEREST

No interest shall be due or payable on account of any payment due or unpaid under the Contract Documents except in accordance with the provisions of "Prompt Payment by Department of Administration," R.I. Gen. Laws §§ 42-11.1-1 et seq.

## § 13.7 TIME LIMITS ON CLAIMS

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

## ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

### § 14.1 TERMINATION BY THE CONTRACTOR

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

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;  
or
- .3 Because the Design Agent has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1

### § 14.1.2 Deleted.

Init.

§ 14.1.3 If one of the reasons described in Section 14.1.1 exists, the Contractor may, upon 7 working days' written notice to the Owner and Design Agent, terminate the Contract and recover from the Owner payment for Work executed.

§ 14.1.4 If the Work is stopped for a period of 60 calendar days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon 7 additional days' written notice to the Owner and the Design Agent, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

## § 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor:

- .1 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 disregards or fails to comply with applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority;
- .4 otherwise is guilty of breach of a provision of the Contract Documents; or
- .5 cancels or the Contractor or the Owner receives notice of cancellation or nonrenewal of any insurance required under the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, 7 working days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Design Agent'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 Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

## § 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

§ 14.3.2 The  
(Paragraphs deleted)

Owner shall not be liable to the Contractor or any Subcontractor for claims or damages of any nature caused by or arising out of any delays. The sole remedy against the Owner for delays shall be the allowance of additional time for completion of the Work in accordance with the provisions of Section 8.3.1.

## § 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

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

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination.

## ARTICLE 15 CLAIMS AND DISPUTES

### § 15.1 CLAIMS

#### § 15.1.1 DEFINITION

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

#### § 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party. Such notice shall be provided in writing to the designated representative of the party to whom the notice is addressed and shall be deemed to have been duly serviced if delivered in person, by mail, by courier, or by electronic transmission. Claims by either party must be initiated within 21 working days after occurrence of the event giving rise to such Claim or within 21 working days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

#### § 15.1.3 CONTINUING CONTRACT PERFORMANCE

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

#### § 15.1.4 CLAIMS FOR ADDITIONAL COST

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

#### § 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

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

§ 15.1.5.3 Claims for increase in the Contract Time shall set forth in detail the circumstances that form the basis for the Claim, the date upon which each cause of delay began to affect the progress of the Work, the date upon which each cause of delay ceased to affect the progress of the Work and the number of days' increase in the Contract Time claimed as a consequence of each such cause of delay. The Contractor shall provide such supporting documentation as the Owner may require including, where appropriate, a revised construction schedule indicating all the activities affected by the circumstances forming the basis of the Claim.

§ 15.1.5.4 The Contractor shall not be entitled to a separate increase in the Contract Time for each one of the number of causes of delay which may have concurrent or interrelated effects on the progress of the Work, or for concurrent delays due to the fault of the Contractor.

Init.

#### § 15.1.6

*(Paragraphs deleted)*

**Deleted.**

#### § 15.2 INITIAL DECISION

§ 15.2.1 Claims shall be referred to the Initial Decision Maker for initial decision. The Purchasing Agent appointed pursuant to the provisions of the "State Purchases Act," R.I. Gen. Laws § 37-2-1 **et seq.**, will serve as the Initial Decision Maker in accordance with the provisions of the State Purchases Act, State of Rhode Island Procurement Regulations, and this Section 15.2.1. An initial decision shall be required as a condition precedent to binding dispute resolution pursuant to Section 15.3.1 of any Claim arising prior to the date final payment is due.

§ 15.2.2 Deleted.

§ 15.2.3 Deleted.

§ 15.2.4 Deleted.

§ 15.2.5 Deleted.

§ 15.2.6 Deleted.

§ 15.2.6.1 Deleted.

§ 15.2.7 Deleted.

§ 15.2.8 Deleted.

#### § 15.3 MEDIATION

§ 15.3.1 For any Claim not resolved by the Initial Decision Maker procedures set forth in Section 15.2.1, and prior to the implementation of the binding dispute resolution procedures set forth in Section 15.4.1, the Contractor or the Design Agent shall have the option to pursue mediation, exercisable by written notice to the Owner within 30 calendar days of an Initial Decision. In the event of the exercise of such option by the Contractor or the Design Agent, the Owner and the Contractor or the Design Agent shall attempt to select a mediator, and in the event that the Owner and the Contractor or the Design Agent cannot agree on a mediator, either party may apply in writing to the Presiding Justice of the Providence County Superior Court, with a copy to the other, with a request for the court to appoint a mediator, and the costs of the mediator shall be borne equally by both parties.

§ 15.3.2 Deleted.

§ 15.3.3 Deleted.

#### § 15.4 BINDING DISPUTE RESOLUTION

§ 15.4.1 For any Claim not resolved by the Initial Decision Maker procedures set forth in Section 15.2.1, or mediation at the option of the Contractor pursuant to Section 15.3.1, the method of binding dispute resolution shall be determined in accordance with the provisions of the "Public Works Arbitration Act," R.I. Gen. Laws §§ 37-16-1 **et seq.**

*(Paragraphs deleted)*

§ 15.4.4 Deleted.

§ 15.4.4.1 Deleted.

§ 15.4.4.2 Deleted.

§ 15.4.4.3 Deleted.

#### § 16 COMPLIANCE WITH APPLICABLE LAW

Init.



The Contractor and its Subcontractors shall comply with all applicable federal, state, and local laws.



Init.

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## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

## **DOCUMENT 00 73 46**

## **WAGE DETERMINATION SCHEDULE**

The State of Rhode Island Department of Labor, Division of Professional Regulation General Decision Modification document, in effect at the time of the Bid issuance for this Project, is an integral part of the Bid Documents for use in fulfilling prevailing wage rate requirements.

The Department of Labor and Training, Division of Professional Regulations Web Site Address:

[www.dlt.ri.gov/pw](http://www.dlt.ri.gov/pw)

Click on "Information"; click on "Prevailing Wage Table".

Documents are not contained within this Project Manual, may be obtained from the State of Rhode Island, Department of Labor and Training, Division of Professional Regulations, 1511 Pontiac Avenue, Cranston, RI 02920-4407, Tel. No. 401-462-8580.

**END OF DOCUMENT 00 73 46**



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**DOCUMENT 00 91 13**  
**ADDENDA**

**PART 1 GENERAL**

**1.01 WORK COVERED BY CONTRACT DOCUMENTS**

- A. As of the time of publication of this project manual no addenda had been issued.
- B. Should Addenda be issued during the Bid Period, They will augment this Document and become a part of the Project Manual.
- C. Such Addenda and Modifications when issued, with reference to the Project Manual, the General Conditions, Supplemental General Conditions, Drawings or Specifications, shall be inserted following this page and become integral parts of the Contract Documents.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION (Not Applicable)**



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

## **SECTION 01 10 00**

## **SUMMARY OF WORK**

### **PART 1 GENERAL**

#### **1.01 WORK COVERED BY CONTRACT DOCUMENTS**

- A. The Project consists of bathroom renovations including ADA upgrades and Sanitary Line Replacements.
- B. Coordination with Owner's separate concurrent contracts, if any.
- C. General Requirements:
  - 1. Contractor shall perform the Work of the Contract under a stipulated sum Contract with the Owner in accordance with the Conditions of Contract.
  - 2. Vendor is responsible for obtaining and paying for any required Local and State licenses, Permits and Inspections.
  - 3. Contractor to include all Bond costs in their Bid.
  - 4. Before starting work, all Contractor workers and Subs are required to obtain and submit a current BCI and State-approved picture ID. CCRI reserves the right to deny Campus access to any worker based on information provided on the submitted BCI. All BCI's to be from Rhode Island and in addition the Workers State of Residence, be current within six (6) calendar months of start of onsite work.
  - 5. All onsite workers are to be OSHA 10 certified. Copies of certifications along with driver licenses are required on the first day of work.
  - 6. The Contractor is responsible for all repairs to existing interior & exterior finish damages relating from this project.
  - 7. The Contractor is responsible for providing their workers with all personal protection equipment. at a minimum, this includes hard hats, reflective vests, eye protection, harnesses and ear protection.
  - 8. All completed work must be inspected and approved by College and Architect.
  - 9. Vendor and/or its subcontractors are to be licensed as required by RI Department of Labor.
  - 10. All contractors and subcontractors to sign in each employee at the CCRI Security Office located on the lower level at the start of each shift.
  - 11. A full time superintendant is required for the extent of construction. Selected vendor to submit resume of proposed Super and/or on site personnel for College team to review and approve. College reserves the right to reject proposed Superintendent.

12. A full list of subcontractors to be provided as part of the submittal package at the time of tentative award.
13. No substitution will be considered prior to receipt of bid unless written request for approval has been received by the Division of Purchases during the questioning phase. Such requests 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 and other information necessary for any evaluation. A statement setting forth changes in other materials, equipment, or other portions of the work, including changes in work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The State of Rhode Island's decision of approval or disapproval of the proposed substitution shall be final. If the State approves a proposed substitution prior to receipt of bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approvals made in any other manner. No substitutions will be considered after the Contract Award except as provided for in the contract documents.
14. Contractors are not permitted to display a project sign anywhere on the campus grounds.
15. Contractor to provide all conex boxes for storing of their equipment of tools. The College is not responsible for lost or stolen tools/equipment or materials.
16. Contractor is responsible for welding safety procedures. Personal protective equipment according to OSHA latest recommendations.
18. For welding tasks accomplishment contractor shall coordinate previously with Owner all related conditions, including and not limited to area ventilation, exhausting electrical power sources and storage and handling of compressed gas cylinders.
19. General Contractor required to utilize CCRI Fire Alarm and Sprinkler warrantee contractors and include all costs in base bid proposal.
20. Hot work permit required including fire watch. Cost to be included in Base Bid.
21. Any/all adjustments or work for Fire Alarm, Sprinkler or Roofing shall be performed by the Colleges maintenance warranty subs and shall be included in the base bid costs.
22. Include all required signage to direct public to other bathrooms and post restrictions.
23. Refer to 01 10 00 Summary of Work – EXHIBIT B for additional phasing notes and relevant dates.
24. Refer to 01 10 00 Summary of Work – EXHIBIT C for supplemental notes regarding clarification to design intent and scope of work.

#### **1.02 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.

#### **1.03 FUTURE WORK**

- A. FUTURE CONTRACT: The Owner reserves the right to award contracts for additional work to be performed at the site during construction and following the Substantial Completion. Completion of that future work depends on the progress of, and the successful and timely completion of, the preparatory and related Work of this Contract.

#### **1.04 CONTRACTOR USE OF SITE AND PREMISES**

- A. GENERAL: The Owner intends to fully occupy the facility during the period of construction.
- B. CONSTRUCTION OPERATIONS: Coordinate with Owner to insure delivery and completion per the schedule. Include all costs of this coordination, including all premium time wages that may be required to meet these requirements, in the Base bid. Fulltime maintenance and security personnel are on staff at CCRI during night and weekend hours. The College is not responsible for stolen materials, tools, equipment, etc.
- C. Provide access to and from site as required by law and by Owner:
  - 1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if routes are temporarily altered during 3rd shift only. Include and maintain temporary fire extinguishers within the limit of construction.
  - 2. Do not obstruct roadways, sidewalks or other public ways without permission from the Owner.
  - 3. Contractor to provide temporary signage to identify the work area and emergency egress points.
  - 4. Contractor to provide temporary wall at modification to stairwell for safety.
- D. TIME RESTRICTIONS
  - 1. All weekend work is to be coordinated with the college at least 72 hours in advance.
  - 2. All work to be done 3<sup>rd</sup> shift, 11pm to 6am.
  - 3. Coordinate work with college staff to avoid disruptions of college activities. Coordinate and adjust workflow weekly and by special request.
  - 4. Coordinate all shot downs with college representative at least 96 hours in advance.
- E. UTILITY OUTAGES AND SHUTDOWN
  - 1. Do not disrupt or shut down life safety systems, including but not limited to fire alarm system, without 7 days notice to the Owner and authorities having jurisdiction.
  - 2. Prevent accidental disruption of utility services to other facilities. Any and all shutdowns to occur during third shift.
  - 3. Do not disrupt building control wiring or fire alarm wiring passing through the area of work.
- F. Protect all existing surfaces from damages. Any damages to the existing surfaces requiring replacement and or repair shall be at Contractor's expense.
- G. Construction areas shall be kept in a clean, safe and acceptable condition on a daily basis at all times and at completion of the Project.
- H. Contractor is responsible for removing all debris off the site daily, including all costs associated with waste containers and proper disposal of waste.
- I. Vendor is to have all equipment necessary to perform the installation and service including, tools, staging, lift truck, etc. No CCRI equipment or tools will be available.
- J. A Conex box is allowed for storage on site. Location to be determined.
- K. The College operations cannot be disrupted.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTIONS (Not Applicable)**

END OF SECTION 01 11 00



## **CCRI KNIGHT CAMPUS - BATHROOM RENOVATIONS PROJECT**

### **01 10 00 SUMMARY OF WORK – EXHIBIT B**

#### **PHASING SCHEDULE**

##### General Comments:

1. Phasing Plan includes all scope of work associated with affected areas inclusive of boiler room, core drilling penetrations, patching existing piping and abandoning in place.
2. Phasing Plan is from start of onsite construction until final completion inclusive of all punch list work being 100% complete.
3. Each sequential Phase cannot start until the preceding Phase has been completed and signed off 100%.

##### **PHASING:**

##### **Start Onsite Construction within 60 Calendar days after date of CCRI Purchase Order.**

PHASING 1:	230 CALENDAR DAYS
PHASING 2:	200 CALENDAR DAYS
PHASING 3:	200 CALENDAR DAYS
PHASING 4:	165 CALENDAR DAYS
PHASING 5:	270 CALENDAR DAYS
PHASING 6:	155 CALENDAR DAYS
PHASING 1A:	200 CALENDAR DAYS
PHASING 2A:	155 CALENDAR DAYS
PHASING 3A:	100 CALENDAR DAYS

## **CCRI KNIGHT CAMPUS - BATHROOM RENOVATIONS PROJECT**

### **01 10 00 SUMMARY OF WORK – EXHIBIT C**

#### **SUPPLIMENTAL SCOPE NOTES AND DESIGN INTENT:**

1. Design intent for ground floor under slab sanitary waste piping is as follows and shall be included in the base bid. All sanitary waste piping shall be replaced from the vertical stacks to the location where the waste piping exits the building with the exception of waste piping run below the kitchen.
2. All Fire Alarm and Sprinkler System work shall be included in the base bid, GC shall use CCRI System Warranty vendors for all associated work to these systems. Current vendors are FSI (Fire Alarm) & Encore (Sprinkler). Vendors are subject to change yearly.
3. All sanitary waste piping shall be cast iron.
4. GC shall own in their base bid patching/infill of all unused/abandoned holes in all Stainless-Steel Restroom Doors & Frames.
5. GC Shall own in their base bid Cleaning and Refurbishing both sides of all existing Stainless-Steel Restroom Doors & Frames to original finish.
6. All abandoned sanitary waste piping that is encased in concrete floor slabs shall be capped and made safe.
7. GC shall own in the base bid all assumptions and routing alternatives outlined in the Plumbing Drawings. Additional costs will not be approved for failure to accommodate work in these areas in the base bid.
8. Remove all work associated with Bathrooms 0040 & 0042 located on the Ground Floor at Student Services.
9. GC shall X-Ray all floors prior to cutting or drilling.

10. Any utility shutdowns or disruptions shall be performed as to not interfere with campus operations and shall be coordinated with CCRI. All associated cost shall be the responsibility of the GC.

11. All new equipment scheduled for installation shall be wired to the nearest electrical panel with spare circuits available, whether or not it is shown on the electrical drawings. This shall include hand dryers and automatic door operators.

12. Abatement plan filing with state and all cost shall be responsibility of the GC

13. Abatement air sampling and final clearance air sampling cost and scheduling shall be the responsibility of the GC.

14. GC/EC to provide (1) 20 amp service outlet in each multi user restroom. Location shall be adjacent to the entry door@5'-0" AFF. Power from nearest available spare breaker.

15. All new light fixtures to be removed, shall be returned to the college.  
(fluorescent and LED)

16. All the materials for the project can be purchased, billed and stored in Phase 1 due to the volatility in the material market.

17. On Sheet A-4.1 LVT -01 flooring will be replaced with SRF-01 Flooring



**CCRI KNIGHT CAMPUS  
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**SECTION 01 29 00  
PAYMENT PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Schedule of Values.
- B. Change procedures.
- C. Procedures for preparation and submittal of Applications For Payment.
- D. Defect Assessment.
- E. Sales Tax Exemption.
- F. Warranty Inspection Retainage.

**1.02 RELATED SECTIONS**

- A. Document 00 72 00 - General Conditions: Progress Payments and Final Payment.
- C. Section 01 33 00 – Submittal Procedures.
- D. Section 01 78 00 – Closeout Procedures and Submittals: Final Payment.

**1.03 SCHEDULE OF VALUES**

- A. Submit typed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form or electronic media printout will be considered.
- B. Submit Schedule of Values in duplicate within 15 days after date of receipt of a Purchase Order from the State Division of Purchases.
- C. FORMAT: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the major specification Section. Identify site mobilization, bonds and insurance and General Conditions.
- D. Include in each line item, the amount of Allowances specified in this Section. For Unit Cost Allowances, identify quantities taken from Contract Documents multiplied by the unit cost to achieve the total for the item.
- E. Include within each line item, a directly proportional amount of Contractor's overhead and profit.
- F. Revise schedule to list approved Change Orders, with each Application For Payment.

#### **1.04 CHANGE PROCEDURES**

- A. The Architect will advise of minor changes in the Work not involving an adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on AIA Form G710 Architect's Supplemental Instructions or other similar form.
- B. The Architect may issue a Proposal Request which includes a detailed description of a proposed change with supplementary or revised Drawings and specifications, a change in Contract Time for executing the change. Contractor will prepare and submit an estimate within 7 days.
- C. The Contractor may propose a change by submitting request for change to the Architect, describing the proposed change and its full effect on the Work. Include a statement describing the reason for the change, and the effect on the Contract Sum/Price and Contract Time with full documentation and a statement describing the effect on Work by separate or other contractors. Document any requested substitutions in accordance with Section 01 60 00.
- D. **STIPULATED SUM/PRICE CHANGE ORDER:** Based on Proposal Request and Contractor's fixed or maximum price quotation or Contractor's request for a Change Order as approved by Architect.
- E. **UNIT PRICE CHANGE ORDER:** For pre-determined unit prices and quantities, the Change Order will be executed on a fixed unit price basis. For unit costs or quantities of units of work which are not pre-determined, execute Work under a Construction Change Authorization. Changes in Contract Sum/Price or Contract Time will be computed as specified for Time and Material Change Order.
- F. **TIME AND MATERIAL CHANGE ORDER:** Submit itemized account and supporting data after completion of change, within time limits indicated in the Conditions of the Contract. Architect will determine the change allowable in Contract Sum/Price and Contract Time as provided in the Contract Documents.
- G. **CONSTRUCTION CHANGE AUTHORIZATION:** Architect may issue a directive, on AIA Form G713 Construction Change Authorization or similar form, signed by the Owner, instructing the Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order. Document will describe changes in the Work, and designate method of determining any change in Contract Sum/Price or Contract Time. Promptly execute the change.
- H. Maintain detailed records of work done on Time and Material basis. Provide full information required for evaluation of proposed changes, and to substantiate costs for changes in the Work.
- I. **CHANGE ORDER FORMS:** AIA G701 Change Order.
- J. **EXECUTION OF CHANGE ORDERS:** Architect will issue Change Orders for signatures of parties as provided in the Conditions of the Contract.
- K. **CORRELATION OF CONTRACTOR SUBMITTALS**
  - 1. Promptly revise the Schedule of Values and the Application for Payment forms to record each authorized Change Order as a separate line item and adjust the Contract Sum.
  - 2. Promptly revise Progress Schedules to reflect any change in Contract Time. Revise sub-schedules to adjust times for any other items of Work affected by the change and resubmit.
  - 3. Promptly enter changes in the Project Record Documents.

#### **1.05 ADMINISTRATIVE SUBMITTALS**

- A. **APPLICATION FOR PAYMENT:** In accordance with the General Conditions and as specified herein.
- B. **FINAL APPLICATION FOR PAYMENT:** As specified herein.

**1.06 SUBMITTAL PROCEDURES**

- A. Submit three copies of each Application for Payment.
- B. Submit an updated construction schedule with each Application for Payment.
- C. PAYMENT PERIOD: Submit at intervals stipulated in the Agreement.
- D. Submit under transmittal letter specified in Section 01 33 00.
- E. Submit lien waivers.

**1.06 FORMAT**

- A. AIA G702 - Application and Certificate for Payment, including continuation sheets when required.
- B. For each item, provide a column for listing: Item Number; Description of Work; Scheduled Value, Previous Applications: Work in Place and Stored Materials under this Application: Authorized Change Orders; Total Completed and Stored to Date of Application; Percentage of Completion; Balance to Finish; and Retainage.
- C. Reference the General Conditions.

**1.07 SUBSTANTIATING DATA**

- A. When Architect requires substantiating information, submit data justifying dollar amounts in question.
- B. Provide one copy of data with cover letter for each copy of submittal. Show Application number and date, and line item by number and description.

**1.08 PREPARATION OF APPLICATIONS**

- A. Present required information in typewritten form or on electronic media printout.
- B. Execute certification by signature of authorized officer.
- C. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored Products.
- D. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original item of Work.
- E. Prepare Application for Final Payment as specified in Section 01 77 99.

**1.09 PAYMENT**

- A. GENERAL: Progress payment requests shall be submitted monthly as specified in the General Conditions.
- B. Payment for Lump Sum Work covers all Work necessary to furnish, install and/or complete the Work of the Contract.
- C. Payment for unit price items covers all Work necessary to furnish, install and/or complete the item.
- D. Payment for equipment, materials and labor for items not included on the Bid shall be considered incidental and no separate payment will be made.

**1.10 DEFECT ASSESSMENT**



- A. Replace the Work or portions of the Work not conforming to the specified requirements.
- B. If, in the opinion of the Architect, it is not practical to remove and replace the Work, the Architect will direct an appropriate remedy or adjust payment.
  - 1. The defective work may remain but the unit sum will be adjusted to a new sum at the discretion of the Architect.
  - 2. The defective Work will be partially repaired to the instructions of the Architect and the unit sum will be adjusted to a new some sum at the discretion of the Architect.
  - 3. The authority of the Architect to assess the defect and identify a payment adjustment is final.
- C. Payment will not be made for following:
  - 1. Loading, hauling, and disposing of rejected products.
  - 2. Quantities of material wasted or disposed of in manner not acceptable.
  - 3. Products determined as unacceptable before or after placement.
  - 4. Material not completely unloaded from transporting vehicle.
  - 5. Products remaining on hand after completion of the Work.
  - 6. Material remaining on hand after completion of Work.

#### **1.11 PARTIAL PAYMENT FOR STORED MATERIALS AND EQUIPMENT**

- A. FINAL PAYMENT: Will be made only for materials incorporated into the Work in the Contract; no partial payments shall be made for equipment or materials delivered to the site but not used.

#### **1.12 FINAL APPLICATION FOR PAYMENT**

- A. Reference the General Conditions, and as may otherwise be required in the Contract Documents.
- B. Prior to submitting final application, make acceptable delivery of required documents.

#### **1.13 SALES TAX EXEMPTION**

- A. Owner is exempt for sales tax on products permanently incorporated in the Work of the Project.
  - 1. Obtain Sales Tax Exemption Certificate number from Owner.
  - 2. Place Exemption Certificate number on invoice for materials permanently incorporated in the Work of the Project.
  - 3. Furnish copies of invoices to Owner.
  - 4. Upon completion of Work, file a notarized statement with Owner that all purchases made under exemption certificate were entitled to be exempt.
  - 5. Pay legally assessed penalties for improper use of Exemption Certificate number.
- C. Prior to submitting final application, make acceptable delivery of required documents.

### **PART 2 PRODUCTS (Not Applicable)**

### **PART 3 EXECUTION (Not Applicable)**

**END OF SECTION 01 29 00**



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

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## **SECTION 01 30 00**

## **ADMINISTRATIVE PROCEDURES**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Site Administration.
- B. Coordination and project conditions.
- C. Pre-construction meeting.
- D. Site mobilization meeting.
- E. Progress meetings.
- F. Pre-installation meetings.

#### **1.02 SITE ADMINISTRATION**

- A. Maintain a Daily Attendance Log to include the names of all project employees and guests to the site. The log sheets must clearly indicate the Project Name, and the name of the General Contractor. Each line in the log should allow for the name of that employee, the employee's job title (use terminology used by prevailing wage job title), and the name of that employee's employer. Each guest signing the log should indicate a brief description of the reason for the visit and the guest's employer or organization.

#### **1.03 COORDINATION AND PROJECT CONDITIONS**

- A. Coordinate the scheduling, submittals and the Work of the various Sections of the Project Manual to ensure an efficient and orderly sequence of the installation of interdependent construction elements.
- B. Coordinate the scheduling, submittals and the Work of the various Sections of the Project Manual to ensure an efficient and orderly sequence of the installation of interdependent construction elements.
- C. Coordinate the space requirements, supports and installation of the electrical Work. Utilize spaces efficiently to maximize accessibility for other installations, maintenance or repairs.
- D. Coordinate the completion and clean up of the Work of the separate Sections in preparation for Substantial Completion.

#### **1.04 PRE-CONSTRUCTION MEETING**

- A. The Contractor will schedule a meeting after a Purchase Order is issued to the Contractor by the CCRI Department of Purchasing.

B. ATTENDANCE REQUIRED: Owner, Architect and Contractor.

C. AGENDA:

- A. Distribution of the Contract Documents.
- B. Submission of a list of Subcontractors, a list of products, Schedule of Values and a Progress Schedule.
- C. Designation of personnel representing the parties in the Contract, and the Architect.
- D. The procedures and processing of field decisions, submittals, substitutions, Applications for Payment, Proposal Requests, Change Orders and Contract Closeout procedures.
- E. Scheduling.
- F. Contractor shall record the minutes and distribute copies within two days after the meeting to the participants, with two copies to the Architect, the Owner the participants and those affected by the decisions made.

#### **1.05 SITE MOBILIZATION MEETING**

The Contractor will schedule a meeting at the Project site prior to the Contractor's occupancy.

ATTENDANCE REQUIRED: Owner, Architect, Special Consultants, Contractor, Contractor's Superintendent and major Subcontractors.

AGENDA

- 1. Use of premises by the Owner and Contractor.
- 2. Owner's requirements and occupancy.
- 3. Security and housekeeping procedures.
- 4. Schedules.
- 5. Application for Payment procedures.
- 6. Contractor shall record the minutes and distribute copies within two days after the meeting to the participants, with two copies to the Architect, the Owner the participants and those affected by the decisions made.

#### **1.06 PROGRESS MEETINGS**

- A. Contractor shall schedule and administer the meetings throughout the progress of the Work at weekly or no more than monthly intervals.
- B. Make arrangements for the meetings, prepare the agenda with copies for the participants and preside at the meetings.
- C. ATTENDANCE REQUIRED: Contractor's Superintendent, major Subcontractors and suppliers, Owner and Architect as appropriate to the agenda topics at each meeting.
- D. AGENDA
  - A. Review approval of minutes of previous meeting.

- B. Review of Work progress since previous meeting.
- C. Field observations, problems and decisions.
- D. Problems that impede construction schedule.
- E. Review of off-site fabrication, delivery schedules.
- F. Maintenance of Progress Schedule.
- G. Corrective measures and procedures to regain projected schedule.
- H. Progress schedule during succeeding work period.
- I. Maintenance of quality and Work standards.
- J. Effect of proposed changes and substitutions on the Progress Schedule and coordination.
- K. Coordination of schedules.
- L. Other business.
- M. Contractor shall record the minutes and distribute copies within two days after the meeting to the participants, with two copies to the Architect, the Owner the participants and those affected by the decisions made.

#### **1.07 PRE-INSTALLATION MEETINGS**

- A. When required in the individual specification Sections, convene a pre-installation meeting at the site prior to commencing the Work of the Section.
- B. Make arrangements for the meetings, prepare the agenda with copies for the participants and preside at the meetings.
- C. Require attendance of the parties directly affecting, or affected by, the Work of the specific Section.
- D. Prepare an agenda and preside at the meeting.
  - 1. Review the conditions of the installation, preparation and installation procedures.
  - 2. Review coordination with the related work.
  - 3. Contractor to provide a mock-up installation at one of the Dental stations for review prior to installing all supports and arms.
  - 4. Contractor shall record the minutes and distribute copies within two days after the meeting to the participants, with two copies to the Architect, the Owner the participants and those affected by the decisions made.

### **PART 2 PRODUCTS (Not Applicable)**

### **PART 3 EXECUTIONS (Not Applicable)**

**END OF SECTION 01 30 00**



**CCRI KNIGHT CAMPUS**  
**Bathroom Renovations**  
**Warwick, Rhode Island 02886**

**AA# 19158**

**SECTION 01 33 00**  
**SUBMITTAL PROCEDURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Submittal procedures.
- B. Construction Progress Schedules.
- C. Proposed Products List.
- D. Product data and shop drawings.
- E. Samples.
- F. Design data.
- G. Test Reports.
- H. Certificates.
- I. Manufacturer's instructions.
- J. Manufacturer's field reports.
- K. Architect's action.

**1.02 RELATED DOCUMENTS**

- A. Drawings, General Provisions of the Contract and Division 1 Specification Sections apply to work of this Section.

**1.03 SUBMITTAL PROCEDURES**

**A. MASTER LIST SUBMITTAL**

- 1. Submit a Master List of the required submittals with a proposed date for each item to be submitted.
- 2. Show the date the submittal was sent, days since submittal was sent, status of submittal, date submittal was received in return and any date associated with re-submittals.
- 3. Update Master List with each submission and response.

- B. GENERAL: Refer to the General Conditions for basic procedures for submittal handling.



- C. SUBMITTAL PREPARATION: Mark each submittal with a permanent label for identification. Provide the following information on the label for proper processing and recording of action taken.
1. Project name; Date.
  2. Name and address of Owner, Contractor and Supplier.
  3. Name of manufacturer; Number and title of appropriate Specification Section; Drawing number and detail references, as appropriate; Similar definite information as necessary.
  4. Provide a space on the label for the Contractor's review and approval markings, and a space for the Architect's "Action" marking.
- D. SUBMITTAL TRANSMITTAL: Package each submittal appropriately for transmittal and handling. Transmit four (4) copies, plus the number of copies the Contractor wants returned to him after review of each submittal by the Architect, and to other destinations as required, by use of a transmittal form. Prepare a separate transmittal form for each division of work and identify each submittal by Specification Section number on the transmittal form. Submittals received from sources other than the Contractor will be returned to the sender "without action".
1. Submittals will be accepted via E-mail transmission.
  2. Record relevant information and requests for data on the transmittal form. On the transmittal form, or on a separate sheet attached to the form, record deviations from the requirements of the Contract Documents, if any, including minor variations and limitations.
  3. **No submittals will be accepted by the Architect if transmitted via FAX machine.**
  4. Include the Contractor's signed certification stating that information submitted complies with requirements of the Contract Documents.
  5. Sequentially number the transmittal forms; resubmittals to have original number with an alphabetic suffix.
- E. CONTRACTOR'S REVIEW: Stamp of approval indicates to Owner and Architect that all quantities, dimensions, field construction criteria, materials, catalog numbers and similar data have been determined and verified, and that each submittal has been reviewed or coordinated with requirements of Work and Contract Documents. **Failure to provide the Contractor's Review Stamp shall be grounds for the Submittal to be returned to the Contractor with no action taken.**
- F. No portion of Work requiring shop drawings shall be started or any materials be fabricated, delivered to site or installed prior to approval of such items. Fabrication performed, materials purchased or on-site construction accomplished which does not conform to approved shop drawings and data shall be at Contractor's risk. Owner will not be liable for any expense or delay due to corrections or remedies required to accomplish conformity.
- G. Project work, materials, fabrications and installation shall conform to approved shop drawings.
- H. COORDINATION: 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 that require sequential activity.
1. 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.
- I. SCHEDULING: In each appropriate administrative submittal, such as the Progress Schedule, show the principal work-related submittals and time requirements for coordination of submittal activity with related work.

- J. **COORDINATION OF SUBMITTAL TIMES:** Prepare and transmit each submittal to the Architect sufficiently in advance of the scheduled performance of related work and other applicable activities. Transmit different kinds of submittals for the same unit of work so that processing will not be delayed by the Architect's need to review submittals concurrently for coordination.
- K. **REVIEW TIME:** 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. Advise the Architect on each submittal, as to whether processing time is critical to the progress of the work, and if the work would be expedited if processing time could be shortened.
  - 1. Allow Five (5) calendar days for the Architect's initial processing of each submittal, excluding delivery time from and to the Contractor. 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.
  - 2. Allow Two (2) calendar days for reprocessing each submittal.
  - 3. No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect sufficiently in advance of the work.
- L. **MISCELLANEOUS SUBMITTALS**
  - 1. **INSPECTION AND TEST REPORTS:** Classify each inspection and test report as being either "shop drawings" or "product data" depending on whether the report is specially prepared for the project, or a standard publication of workmanship control testing at the point of production. Process inspection and test reports accordingly.
  - 2. **SURVEY DATA:** Provide copies of all survey data collected for property surveys, field measurements, and quantitative records of actual work, damage surveys and similar data required by the individual Sections of these specifications. None of the specified copies will be returned.
  - 3. **STANDARDS:** Where submittal of a copy of standards is indicated, and except where copies of standards are specified as an integral part of a "Product Data" submittal, submit a single copy of standards for the Architect's use. Where workmanship, whether at the project site or elsewhere, is governed by a standard, furnish additional copies of the standard to installers, Owner's field representative and others involved in the performance of the Work.
  - 4. **CLOSEOUT SUBMITTALS:** Refer to section "Project Closeout" and to individual Sections of these specifications for specific submittal requirements of project closeout information, materials, tools and similar items.
  - 5. **RECORD DOCUMENTS:** Furnish set of original documents as maintained on the project site.
  - 6. **GENERAL DISTRIBUTION:** Provide additional distribution of submittals to Subcontractors, suppliers, fabricators, installers, governing authorities and others as necessary for the proper performance of the Work. Include such additional copies of submittals in the transmittal to the Architect where the submittals are required to receive "Action" marking before final distribution. Record distributions on transmittal forms.

#### **1.04 CONSTRUCTION PROGRESS SCHEDULES**

- A. Submit preliminary outline Schedules within 5 days after the receipt of a Purchase Order from CCRI Department of Purchasing for coordination with Owner's requirements. After being reviewed, submit detailed Schedules within 2 days modified to accommodate the revisions recommended by the Architect.

- B.** Show a complete sequence of construction by activity, identifying the Work of separate stages and other logically grouped activities. Indicate the early and late start, the early and late finish, float dates and duration. All work shall take place after school hours.

#### **1.05 PRODUCT DATA AND SHOP DRAWINGS**

- A.** Submit for review for the limited purpose of checking for conformance with the information given and the design concept expressed in the Contract Documents.
- B.** Submit the number of copies which the Contractor requires plus two copies the Architect will retain. For shop drawings, submit in the form of 4 opaque reproductions.
- C.** Should contractor choose to e-mail submittals, contractor will be responsible for copies to be filed for the owner upon completion of the project.
- D.** Mark each copy to identify the applicable products, models, options and other data. Supplement the manufacturer's standard data to provide information specific to this Project.
- E.** Indicate the product utility and electrical characteristics, utility connection requirements and the location of utility outlets for service for functional equipment and appliances.
- F.** After being reviewed, distribute in accordance with the requirements of this Section and provide copies for Record Documents described in Section 01 78 39.

#### **1.06 SAMPLES**

- A.** Submit for review for the limited purpose of checking for conformance with the information given and the design concept expressed in the Contract Documents.
- B.** Submit samples to illustrate the functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate the sample submittals for interfacing Work.
- C.** Include identification on each sample with full Project information.
- D.** Submit 2 samples of specified materials specified within the Construction Documents, in the individual specification Sections or as requested by the Architect. Architect will retain one sample.
- E.** Reviewed samples which may be used in the Work are indicated in the individual specification Sections.
- F.** Samples will not be used for testing purposes unless they are specifically stated to be in the individual specification Sections.

#### **1.07 DESIGN DATA**

- A.** Submit for the Architect's knowledge as Contract Administrator or for the Owner.
- B.** Submit for information for the limited purpose of assessing conformance with the information given and the design concept expressed in the Contract Documents.

#### **1.08 TEST REPORTS**

- A.** Submit simultaneously to the Architect and the Owner.
- B.** Submit for review for the limited purpose of assessing conformance with the information given and the design concept expressed in the Contract Documents.

#### **1.09 CERTIFICATES**

- A. When specified in the individual specification Sections, submit certification by the manufacturer, installation/applicator subcontractor, or Contractor to the Architect, in the quantities specified for the Product Data.
- B. Indicate that the material or product conforms to or exceeds the specified requirements. Submit supporting reference data, affidavits and certifications as appropriate.
- C. Certificates may be recent or previous test results on the material or product, but must be acceptable to the Architect.

#### **1.10 MANUFACTURER'S INSTRUCTIONS**

- A. When specified in the individual specification Sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting and finishing to the Architect for delivery to the Owner in the quantities specified for the Product Data.
- B. Indicate the special procedures, the perimeter condition requiring special attention and the special environmental criteria required for application or installation.

#### **1.11 MANUFACTURER'S FIELD REPORTS**

- A. Submit reports for the Architect's benefit as Contract Administrator or for the Owner.
- B. Submit the report in duplicate within 30 days of observation to the Architect for information.
- C. Submit for review for the limited purpose of assessing conformance with the information given and the design concept expressed in the Contract Documents.

#### **1.12 ARCHITECT'S ACTION**

- A. GENERAL: Except for submittals for the record and similar purposes, where action and return on submittals is required or requested, the Architect will review each submittal, mark with appropriate "Action", and where possible return within Five (5) calendar days of receipt. Where the submittal must be held for coordination the Architect will so advise the Contractor without delay.
- B. ACTION STAMP: The Architect will stamp, sign and date each submittal copy to be returned to Contractor and indicate disposition of each submittal in accordance with the following grading requirements:
  - 1. "Approved" or "Reviewed" indicates that Architect notes not exception to the intent of the Contract Documents. Fabrication of item may commence.
  - 2. "Not Approved" or "Rejected" indicates nonconformance with the Contract requirements. The Architect will state the reasons for rejections.
  - 3. "Revise and Resubmit" indicates nonconformance with the Contract requirements or that too many corrections would be necessary. No fabrication may commence.
  - 4. "Furnish As Corrected" indicates that the Architect notes changes needed to the intent of the Contract Documents. The Contractor is responsible for completing all noted changes.
- C. ARCHITECT'S REVIEW
  - 1. Architect's review of submitted drawings and data will cover only general conformity to drawings and specification, external connections and dimensions which affect layout.
  - 2. Architect's review does not indicate thorough review of all dimensions.

3. Architect's review of submittals does not relieve Contractor's responsibility for errors, omissions or deviations, field verification of all dimensions nor responsibility for compliance with Contract Documents.

#### **1.13 RESUBMISSION REQUIREMENTS**

- A. Make any corrections or changes in the submittals required by the Architect and resubmit until they are denoted "Approved", "Reviewed", "Approved as Noted" or "Furnish As Corrected" by the Architect. Resubmission requirements specified in individual specifications Sections, which differ from these requirements, will take precedence over these requirements.
- B. SHOP DRAWINGS AND PRODUCT DATA
  1. Revise initial drawings or data, and resubmit as specified for the initial submittal.
  2. Indicate any changes which have been made other than those requested by the Architect.
- C. SAMPLES: Submit new samples as required for initial submittal.

#### **1.14 DISTRIBUTION**

- A. Distribute reproductions of shop drawings and copies of product data which carry the Architect's stamp denoting "Approved", "Reviewed", "Approved as Noted" or "Furnish As Corrected" to:
  1. Job site file; Record documents file.
  2. Subcontractors; Supplier or fabricator.
- B. Distribute samples which carry the Architect's stamp denoting "Approved", "Reviewed", "Approved as Noted" or "Furnish As Corrected" as directed by the Architect.

### **PART 2 PRODUCTS (Not Applicable)**

### **PART 3 EXECUTION (Not Applicable)**

**END OF SECTION 01 33 00**



**CCRI KNIGHT CAMPUS**  
**Bathroom Renovations**  
**Warwick, Rhode Island 02886**

**AA# 19158**

**SECTION 01 45 00**  
**QUALITY CONTROL**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Quality assurance and control of installation.
- B. Verification of Credentials and Licenses
- C. Tolerances.
- D. References.

**1.02 RELATED SECTIONS**

- A. Section 01 33 00 – Submittal Procedures: Submission of Manufacturers' Instructions and Certificates.
- B. Section 01 60 00 – Product Requirements: Requirements for material and product quality.

**1.03 QUALITY ASSURANCE/CONTROL OF INSTALLATION**

- A. Monitor quality control over suppliers, manufacturers, Products, services, site conditions and workmanship, to produce Work of specified quality.
- B. Comply fully with manufacturers' instructions, including each step in sequence.
- C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as a minimum quality for the Work except when more stringent tolerances, codes or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship of specified quality.
- F. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

**1.04 VERIFICATION OF CREDENTIALS AND LICENSES**

- A. The Owner has implemented a project management oversight process and is applying it to current construction projects at CCRI.
- B. An element of this oversight process is the verification that persons employed on the Project site have appropriate and current credentials and licenses in their possession, at the Project site, for the work they are performing.



- C. Those persons without appropriate and current credentials and licenses will be subject to dismissal from the Project site.

#### **1.05 TOLERANCES**

- A. Monitor the fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When the manufacturers' tolerances conflict with the Contract Documents, request clarification from the Architect before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

#### **1.06 REFERENCES**

- A. For products or workmanship specified by association, trade or other consensus standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable Codes.
- B. Conform to reference standard by date of issue current on date of Contract Documents, except where a specific date is established by Code.
- C. Obtain copies of standards when required by Contract Documents.
- D. Should specified reference standards conflict with Contract Documents, request clarification for Architect before proceeding.
- E. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

### **PART 2 PRODUCTS (Not Applicable)**

### **PART 3 EXECUTION (Not Applicable)**

**END OF SECTION 01 45 00**



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

## **SECTION 01 45 33**

# **CODE REQUIRED SPECIAL INSPECTIONS AND PROCEDURES**

### **PART 1 GENERAL**

#### **2.01 SECTION INCLUDES**

- A. Code-required special inspections.

#### **2.02 REFERENCE STANDARDS**

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).
- B. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel 2018.

### **PART 2 PRODUCTS - NOT USED**

### **PART 3 EXECUTION**

#### **4.01 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION**

- A. Reinforcing Steel, Including Prestressing of Tendons and Placement: Verify compliance with approved Contract Documents and ACI 318, Sections 3.5 and 7.1 through 7.7; periodic.
- B. Reinforcing Steel Welding: Verify compliance with AWS D1.4/D1.4M and ACI 318, Section 3.5.2; periodic.
- C. Design Mix: Verify plastic concrete complies with the design mix in approved Contract Documents and with ACI 318, Chapter 4 and 5.2; periodic.
- D. Specified Curing Temperature and Techniques: Verify compliance with approved Contract Documents and ACI 318, Sections 5.11 through 5.13; periodic.
- E. Concrete Strength in Situ: Verify concrete strength complies with approved Contract Documents and ACI 318, Section 6.2, for the following.
- F. Formwork Shape, Location and Dimensions: Verify compliance with approved Contract Documents and ACI 318, Section 6.1.1; periodic.

**END OF SECTION**



**CCRI KNIGHT CAMPUS**  
**Bathroom Renovations**  
**Providence, Rhode Island 02886**

**AA# 19158**

**SECTION 01 60 00**  
**PRODUCT REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Products, materials and equipment.
- B. Transportation and handling.
- C. Storage and protection.
- D. Product options.
- E. Substitutions.

**1.02 RELATED SECTIONS**

- A. Document 00 21 13 - Instructions to Bidders: Product options and substitution procedures.
- B. Section 01 45 00 - Quality Control: Product quality monitoring.

**1.03 MANUFACTURED AND FABRICATED PRODUCTS**

- A. Design, fabricate and assemble in accordance with the best engineering and shop practices.
- B. Manufacture like parts of duplicate units to standard sizes and gages, to be interchangeable.
- C. Two or more items of the same kind shall be identical, by the same manufacturer.
- D. Products shall be suitable for service conditions.
- E. Equipment capacities, sizes and dimensions shown or specified shall be adhered to unless variations are specifically reviewed by Architect.
- F. Do not use material or equipment for any purpose other than that for which it is designed or is specified.

**1.04 MATERIAL AND EQUIPMENT INCORPORATED INTO THE WORK**

- A. Conform to applicable specifications and standards.
- B. Comply with size, make, type and quality specified within these specifications and construction documents or as specifically reviewed by the Architect.

**1.5 MANUFACTURER'S INSTRUCTIONS**

- A. When the Contract Documents require that installation of Work shall comply with manufacturer's printed instructions, obtain and distribute copies of such instructions to parties involved in the installation, as specified in Section 01 33 00 – Submittal Procedures.
- B. Maintain one set of complete instructions at the job site during installation and until completion.
- C. Handle, install, connect, clean, condition and adjust products in strict accordance with such instructions and in conformity with specified requirements.
- D. Should job conditions or specified requirements conflict with manufacturer's instructions, consult with Architect for further instructions.
- E. Do not proceed with Work without clear instructions.
- F. Perform Work in accordance with manufacturer's instructions. Do not omit any preparatory step or installation procedure unless specifically modified or exempted by the Contract Documents.

**1.06 CERTIFICATES OF CONFORMANCE AND MANUFACTURE**

- A. In addition to other requirements specified herein, the Contractor shall furnish to the Architect, as specified in Section 01 33 00 - Submittals, notarized certificates of conformance and manufacture that all materials and/or equipment to be furnished under this Contract meet the specification requirements. When directed, each shipment of material shall be accompanied by the manufacturer's notarized certificates of conformance and manufacture. Unless otherwise specifically specified, all testing of materials shall be provided by the Contractor at no additional expense to the Owner.
- B. Each manufacturer's certificate shall be endorsed or accompanied by the Contractor's certificate that the material certified by the manufacturer will be the material incorporated in the Work.

**1.7 TRANSPORTATION AND HANDLING**

- A. Arrange deliveries of products in accordance with construction and CCRI school schedules, coordinate to avoid conflict with Work, conditions at the site, CCRI daily operations and also when two or more trades, contractors or suppliers are involved.
- B. Transport all materials and equipment on legally approved conveyances as required or recommended by the respective manufacturer, supplier, and CCRI.
- C. Deliver products in undamaged condition, in manufacturer's original containers or packaging with identifying labels intact and legible.
- D. Receive and handle all materials and equipment, at the Project site, by conveyances or methods as recommended by the respective manufacturer or supplier to prevent damage to products.
- E. Immediately on delivery, inspect shipments to assure compliance with requirements of Contract Documents and reviewed submittals, and that products are properly protected and undamaged.
- F. Remove from the site any material or item of equipment damaged during the transportation or handling process, and immediately replace at no additional cost to the Owner.

**1.08 STORAGE AND PROTECTION**

- A. Coordinate on site storage locations with CCRI staff.
- B. Store products in accordance with the manufacturer's instructions, with seals and labels intact and legible.

- C. Store products subject to damage by the elements in weathertight enclosures.
- D. Maintain temperature and humidity within the ranges required by manufacturer's instructions.
- E. Storage within the building is limited. Contractor will not have full access to project area. Work shall be phased and 100% completed before moving on. Maintain all storage areas in a clean and orderly condition at all times.

**1.09 EXTERIOR STORAGE**

- A. No products shall be stored outside.

**1.10 PROTECTION AFTER INSTALLATION**

- A. Provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. Remove when no longer needed.

**1.11 PRODUCT OPTIONS**

- A. **PRODUCTS SPECIFIED BY REFERENCE STANDARDS OR BY DESCRIPTION ONLY:** Any product meeting those standards or description.
- B. **PRODUCTS SPECIFIED BY NAMING ONE OR MORE MANUFACTURERS:** Products of manufacturers named and meeting specifications, no options or substitutions allowed.
- C. **PRODUCTS SPECIFIED BY NAMING ONE OR MORE MANUFACTURERS WITH A PROVISION FOR SUBSTITUTIONS:** Submit a request for substitution for any manufacturer not named.

**1.12 SUBSTITUTIONS**

- A. Instructions to Bidders specify time restrictions for submitting requests for Substitutions during the bidding period to requirements specified in this Section.
- B. Thereafter, Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. **A REQUEST CONSTITUTES A REPRESENTATION THAT THE CONTRACTOR:**
  - 1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
  - 2. Will provide the same warranty for the Substitution as for the specified product.
  - 3. Will coordinate installation and make changes to other Work that may be required for the Work to be complete, with no additional cost to Owner.
  - 4. Waives claims for additional costs or time extension that may subsequently become apparent.
  - 5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.
- E. **Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.**
- F. **SUBSTITUTION SUBMITTAL PROCEDURE**

1. Submit four copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
2. Submit shop drawings, product data and certified test results attesting to the proposed product equivalence.
3. The Architect will notify the Contractor, in writing, of decision to accept or reject request.

**PART 2 PRODUCTS (Not Applicable)**

**PART 3 EXECUTION (Not Applicable)**

**END OF SECTION 01 60 00**





**CCRI Knight Campus  
Bathroom Renovations  
Warwick, Rhode Island 02886**

**AA# 19158**

**SECTION 01 78 00  
CLOSEOUT PROCEDURES AND SUBMITTALS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Closeout Procedures.
- B. Requirements.
- C. Substantial Completion.
- D. Final Review.
- E. Additional Reviews.
- F. Submittals.
- G. Final Adjustment of Accounts.
- H. Final Application for Payment.
- I. Final Cleaning.
- J. Adjusting.
- K. Operation and Maintenance Data.
- L. Warranties.
- M. Spare Parts and Maintenance Materials.

**1.02 RELATED SECTIONS**

- A. **Section 01 78 39 – Project Record Documents.**

**1.03 REQUIREMENTS**

- A. Comply with requirements stated in conditions of the Contract and in specifications for administrative procedures in closing out the Work.

**1.04 SUBSTANTIAL COMPLETION**

- A. When Contractor considers the work is Substantially Complete, he/she shall submit to the Architect:
  - 1. A written notice that the Work or designated portion thereof, is Substantially Complete.
  - 2. A list of items to be completed or corrected.
- B. Within a reasonable time after receipt of such notice, Architect will review the Work to determine the status of completion.
- C. Within a reasonable time after receipt of such notice, Architect will review the Work to determine the status of completion.

- D. Within a reasonable time after receipt of such notice, Architect will review the Work to determine the status of completion.
- E. Should Architect determine that the Work is not Substantially Complete:
  - 1. Architect will promptly notify the Contractor in writing, giving the reasons therefor.
  - 2. Contractor shall remedy the deficiencies in the work and send out another written notice of substantial completion to the Architect.
  - 3. Architect will again review the work.
- D. When Architect concurs that the Work is Substantially Complete, he will:
  - 1. Prepare a Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected, as verified and amended by the Architect.
  - 2. Submit the certificate to Owner, Contractor and manufacturer for their written acceptance of the responsibilities assigned to them in the certificate.

#### **1.05 FINAL REVIEW**

- A. When Contractor considers the Work is complete, he shall submit written certification that:
  - 1. Contract documents have been reviewed.
  - 2. Work has been inspected for compliance with Contract Documents.
  - 3. Work has been completed in accordance with Contract Documents.
  - 4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.
  - 5. Work is completed and ready for final review.
- B. Architect will make final review to verify the status of completion with reasonable promptness after receipt of such certification.
- C. Should Architect consider that the Work is incomplete or defective:
  - 1. Architect will promptly notify the Contractor in writing, listing the incomplete or defective work.
  - 2. Contractor shall take immediate steps to remedy the stated deficiencies and send out another written certification to Architect that the work is complete.
  - 3. Architect will again review the Work.
  - 4. Should Architect consider that the Work is still incomplete or defective, all subsequent reviews shall be considered as Additional Reviews, subject to the provisions **listed in 1.06 below**.
- D. When the Architect finds that the Work is acceptable under the Contract Documents and that all Punch List items have been accomplished to his satisfaction, he shall request the Contractor to make closeout submittals.

#### **1.06 FEES FOR ADDITIONAL REVIEWS**

- A. Should Architect perform additional reviews due to failure of the Work to comply with the claims of status of completion made by the Contractor:
  - 1. Owner will compensate Architect for such additional services.
  - 2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

#### **1.07 CONTRACTOR'S CLOSEOUT SUBMITTALS TO ARCHITECT**

- A. OPERATING AND MAINTENANCE DATA: Submit documentation as **described in 1.12 below**.
- B. WARRANTIES, GUARANTEES AND BONDS: Submit documentation as **described in 1.13 below**.
- C. SPARE PARTS AND MAINTENANCE MATERIALS FOR OWNER: Submit documentation as **described in 1.14 below**.

- D. Contractor's affidavit of payment of debts and claims.
- E. Contractor's affidavit of release of liens.
- F. Consent of surety to final payment.
- G. Certificate of insurance for products and completed operations.
- H. PROJECT RECORD DRAWINGS: Submit documentation as **described in Section 01 78 39.**

**1.08 FINAL ADJUSTMENT OF ACCOUNTS**

- A. Submit a final statement of accounting to Architect.
- B. Statement shall reflect all adjustments to the Contract Sum:
  - 1. The original Contract Sum.
  - 2. Additions and deductions resulting from:
    - a. Previous Change Orders, allowances and unit prices.
    - b. Deductions for uncorrected work, liquidated damages and re-inspection payments.
    - c. Other adjustments.
  - 3. Total Contract Sum, as adjusted.
  - 4. Previous payments.
  - 5. Sum remaining due.
- C. Architect will prepare a final change order reflecting approved adjustments to the Contract sum that were not previously made by Change Orders.

**1.09 FINAL APPLICATION FOR PAYMENT**

- A. Contractor shall submit the final application for payment in accordance with procedures and requirements stated in the General Conditions.

**1.10 FINAL CLEANING**

- A. Execute final cleaning prior to final inspection.
- B. Clean interior surfaces exposed to view; remove temporary labels, stains and foreign substances, vacuum resilient, carpeted and soft surfaces.
- C. Clean equipment and fixtures to a sanitary condition.
- D. Remove waste and surplus materials, rubbish and construction facilities from the site.

**1.11 ADJUSTING**

- A. Adjust operating products and equipment to ensure smooth and unhindered operation.

**1.12 OPERATION AND MAINTENANCE DATA**

- A. Submit one copy of completed volumes in final form 5 days prior to final inspection. This copy will be returned with Architect/Engineer comments. Revise content of documents as required prior to final submittal.
- B. Submit Operation and Maintenance Data; Three (3) bound and three (3) electronic copies. Bound copies in 8-1/2 x 11 inch text pages, three D side-ring capacity expansion binders with durable plastic covers. Prepare binder covers and electronic copies with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project and subject matter of binder when multiple binders are required.
- C. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
- D. CONTENTS: Prepare a Table of Contents for each volume, with each Product or system description identified, type on 24 pound white paper.

- E. PART 1: Directory, listing names, addresses and telephone numbers of Architect, Engineers, Contractor, Subcontractors and major equipment suppliers.
- F. PART 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses and telephone numbers of Subcontractors and suppliers. Identify the following:
  - 1. Significant design criteria.
  - 2. List of equipment.
  - 3. Parts list for each component.
  - 4. Operating instructions.
  - 5. Maintenance instructions for equipment and systems.
  - 6. Maintenance instructions for all finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.
- G. PART 3: Project documents and certificates, including the following:
  - 1. Shop drawings and product data.
  - 2. Certificates.
  - 3. Photocopies of warranties and bonds.
- I. Submit final volumes revised, within ten days after final inspection.

#### **1.13 WARRANTIES**

- A. Provide duplicate notarized copies.
  - 1. In addition to the Warranty and Guarantee Requirements of the General Conditions, provide all other guarantees, bonds, affidavits and certifications required throughout the Project Manual.
- B. Execute and assemble documents from Subcontractors, suppliers and manufacturers.
- C. Provide Table of Contents and assemble in three D side-ring binder with durable plastic cover.
- D. Submit prior to final Application for Payment.
- E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

#### **1.14 SPARE PARTS AND MAINTENANCE MATERIALS**

- A. Provide products, spare parts, maintenance and extra materials in quantities specified in individual specification Sections.
- B. Deliver to Project site and place in location as directed by the Owner; obtain receipt prior to final payment.

### **PART 2 PRODUCTS (Not Applicable)**

### **PART 3 EXECUTION (Not Applicable)**

**END OF SECTION 01 78 00**



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

## **SECTION 01 78 39**

## **PROJECT RECORD DOCUMENTS**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

1. Project Record Documents required for Contract closeout.

#### **1.02 RELATED SECTIONS**

- A. Section 01 78 00 – Closeout Procedures and Submittals.

#### **1.03 REQUIREMENTS**

- A. Maintain at the site for the Owner one record copy of:
  1. Drawings
  2. Specifications
  3. Addenda
  4. Change Orders and other modifications to the Contract
  5. Architect field orders or written instructions
  6. Reviewed shop drawings, product data and samples

#### **1.04 MAINTENANCE OF DOCUMENTS AND SAMPLES**

- A. Store documents and samples in Contractor's field office apart from documents used for construction.
- B. Provide locked file cabinet for storage of documents and samples.
- C. File documents and samples in accordance with CSI/CSC format.
- D. Maintain documents in a clean, dry, legible condition and in good order. Do not use Record Documents for construction purposes.
- E. Make documents and samples available at all times for inspection by Architect and Owner.

#### **1.05 MARKING DEVICES**

- A. Provide felt tip marking pens for recording information in the color code designated by Architect.

**1.06 RECORDING**

- A. Label each document "Project Record" in neat large printed letters.
- B. Record information concurrently with construction progress.
- C. Do not conceal any work until required information is recorded.
- D. DRAWINGS: Principal dimensions, elevations and other data as required shall be recorded for all work, such as:
  - 1. Deviations of any nature made during construction.
  - 2. Location of underground utilities.
  - 3. Field changes of dimension and detail.
  - 4. Changes made by field order or by Change Order.
  - 5. Details not on original Contract Drawings.
- E. The marked-up prints shall be inspected weekly by the Architect and shall be corrected immediately if found either inaccurate or incomplete.
- F. SPECIFICATIONS AND ADDENDA: Legibly mark each Section to record:
  - 1. Manufacturer, trade name, catalog number and supplier of each product and item of equipment actually installed.
  - 2. Changes made by field order or by Change Order.

**1.07 FINAL MEASUREMENTS**

- A. The Contractor shall provide qualified personnel and equipment for taking final measurements for quantities and Record Documents.

**1.08 RECORD DRAWINGS**

- A. Submit documents to Architect with claim for final Application for Payment for review & comment.
  - 1. Submit two electronic copies and one print copy of all documents.
- B. The Contractor shall correct, amplify and do all other work as may be required by the Architect to complete the drawings in a manner satisfactory to the Architect and at no additional cost to the Owner.
- C. Upon approval, the Contractor shall provide a final Record Drawing set, two electronic copies and one print copy (electronic format (PDF, heavyweight bond). The bond and electronic version shall be submitted to the Owner by the Architect.
- D. Shall be marked up to include all changes, RFI responses, addendums, clarifications, etc.

**1.09 SUBMITTAL**

- A. At Contract close-out, deliver Record Documents to Architect for the Owner.
- B. Accompany submittal with transmittal letter in duplicate, containing:
  - 1. Date.

2. Project title and number.
3. Contractor's name and address.
4. Title and number of each record document.
5. Signature of Contractor or his authorized representative.

**PART 2 PRODUCTS (Not Used)**

**PART 3 EXECUTION (Not Used)**

**END OF SECTION 01 78 39**





## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

## **SECTION 02 30 00**

### **Sub Surface Investigation**

#### **PART 1 GENERAL**

##### **1.1 SECTION INCLUDES**

- A. Surface Investigation in areas where demolition and new construction is to be conducted

##### **1.2 REQUIREMENTS INCLUDE**

- A. Contractor:
  - 1. Verify all data and existing conditions (electrical, plumbing gas, telecommunications/data, etc.).
  - 2. At Contractor's option, perform additional subsurface investigation at own expense.

##### **1.3 RELATED DOCUMENTS**

- A. Drawings and general provisions of Contract including General and Supplemental General Conditions and Division 1 Specification sections, apply to this section.

##### **1.4 RELATED REQUIREMENTS**

- A. Specified elsewhere:
  - 1. 01 10 00 Summary of Work, Exhibit B & C
  - 2. 02 41 13 – Selective Demolition
  - 3. 03 80 00– Concrete Cutting & Boring

#### **PART 2 PRODUCTS**

(NOT APPLICABLE)

#### **PART 3 EXECUTION**

(NOT APPLICABLE)

**END OF SECTION 02 30 00**



**CCRI Knight Campus  
Bathroom Renovations  
Warwick, Rhode Island 02886**

**AA# 19158**

**SECTION 03 30 00  
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 work of this section.

**1.2 SUMMARY**

- A. This Section specifies requirements for concrete cast in place for loading dock pad, heavy duty cement concrete pavement and concrete steps and associated footings.

**1.3 DEFINITIONS**

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

**1.4 SUBMITTALS**

- A. Product Data: For each type of product indicated, including but not limited to, cementitious material, form release agent, preformed joint filler, concrete additives, curing compounds, slab treatments, bonding agents, adhesives, repair materials.
- B. Submit description of methods and sequence of placement for each type of concrete. Indicate proposed construction joint locations required.
- C. Design Mixtures: For each concrete mixture. Submit alternate design mixture when character of materials, project conditions, weather, test results, or other circumstances warrant modifications.
  - a. Indicate amount of mixing water to be withheld for later addition at Project site.
  - b. Concrete mix shall be designed to achieve 3,200 psi compressive strength at seven (7) days. Ultimate strength shall be 5,000 psi at twenty-eight (28) days.
- D. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bends and placement. Include bar sizes, lengths, materials, grade, bar schedules, stirrup spacing, bend diagrams, splices, laps, tie spacing, mechanical connections, and supports.

**1.5 ADMINISTRATIVE SUBMITTALS**

- A. Qualification Data: For installer, manufacturer and testing agency.
- B. Welding Certifications.

- C. Material Test Reports from a qualified testing agency indicating compliance with all requirements.
- D. Field quality-control reports

## 1.6 QUALITY ASSURANCE

- A. Cast in place concrete shall conform to ACI 301.
- B. Dimensions, locations, and details of equipment pads, anchors, supports, and similar features shown on the Drawings are approximate. Manufacturer's approved shop Drawings of equipment to be supported, anchored, or contained thereby shall be consulted for exact location, size, and details.
- C. Refer to Section 01 45 00 – Quality Requirements for testing and inspection services requirements.
  - a. Contractor shall prepare test specimens in accordance with ASTM C31, standard cylinder size 4 inch x 8 inch.
  - b. Rejected materials and installed work shall be removed and replaced.
- D. **Installer Qualifications:** Installer shall be qualified installer who employs personnel qualified as ACI Certified Flatwork Technicians and Finisher and a supervisor who is an ACI-Certified Concrete Flatwork Technician.
- E. **Manufacturer Qualifications:** Manufacturer shall be a firm experienced in manufacturing ready-mix concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment. Manufacturer shall be certified according to NRMCA's Certification of Ready Mixed Concrete Production Facilities.
- F. Obtain each type of cementitious material from the same manufacturer's plant, obtain aggregate from a single source, and obtain admixtures from a single manufacturer.
- G. Concrete mix designs shall be developed by a qualified independent agency.
- H. Comply with the following:
  - a. ACI 301 – Specifications for Structural Concrete
  - b. ACI 117 – Specifications for Tolerances for Concrete Construction and Materials

## 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.
- B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. Materials for cement concrete shall conform to the requirements of Section 905 of the Rhode Island Standard Specifications.
- B. Concrete mix design must be on the most current revision of the RIDOT Approved Ready-Mix Portland Cement Concrete Mix Classifications list.
- C. Concrete mix shall be designed to achieve 3,200 psi compressive strength at seven (7) days. Ultimate strength shall be 4,000 psi at twenty-eight (28) days.

## 2.2 FORMS

- A. **Forms for Exposed Finish:** Plywood, metal, metal- framed plywood faced, or other acceptable panel materials. Plywood shall conform to U.S. Product Standard PS- 1 and APA Graded B- B (Concrete Form) Class I Exterior Grade plywood or B- B or A- C Class I high density overlay concrete form plywood. Formwork materials shall produce smooth, continuous, straight and level surfaces.
- B. **Forms for Unexposed Finish:** Plywood, lumber, or metal, with lumber dressed on at least two edges and one side.
- C. **Form Ties:** Prefabricated, adjustable length galvanized steel snap- off ties, with brackets, cones, cornerlocks, and other accessories as necessary.
- D. **Form Release Agent:** Commercial formulation compounds that will not bond with, stain or adversely affect concrete
- E. **Imprinting Tools:** Mats and tools used to stamp projecting texture and patterns onto plastic concrete surfaces and which shall be specifically designed with rigid back supports to enable a clean, sharp, stamping image. Stamps for curb ramps shall be designed to meet ADA detectable warning requirements.

## 2.3 STEEL REINFORCEMENT

- A. Steel reinforcing bars shall conform to ASTM A 615/A 615M, Grade 60, deformed.
  - a. Bars employed as dowels shall be hot- rolled plain rounds.
- B. Steel Wire: ASTM A82, plain cold drawn steel.
- C. Welded Wire Fabric (WWF) Reinforcement: Welded wire fabric reinforcement shall conform to the applicable requirements of ASTM A185. Fabric reinforcement shall be furnished in flat sheets. Fabric reinforcement in rolls will not be permitted.
- D. Supports for Reinforcement: Bolsters, chairs, and other devices for spacing, supporting, and fastening reinforcing bars, and welded wire fabric in place shall be wire bar- type supports complying with CRSI Manual.
  - a. For slabs on grade, use supports with sand plates or horizontal runners where base material will not support chair legs.
  - b. For exposed to view concrete surfaces where legs of supports are in contact with forms, provide supports with legs that are protected by plastic (CRSI Class 1).

## 2.4 CONCRETE MATERIALS

- A. **Cementitious Material:** Use the following cementitious materials, of the same type, brand and source throughout the Project:
  - a. **Portland Cement:** ASTM C 150, Type I, Type II.
- B. **Aggregate:** ASTM C 33, course aggregate or better, graded. Provide aggregates from a single source.
- C. **Water:** Clean, potable water, in accordance with ASTM C 94 /C 94M.

## 2.5 ADMIXTURES

- A. **General:** Admixtures proposed shall be included on the latest version of RIDOT's List of Approved Materials.
- B. **Air-Entraining Admixture:** Shall be in accordance with ASTM C 260.
- C. **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.

## 2.6 CURING MATERIALS

- A. **Evaporation Retarder:** Waterborne, monomolecular film forming, manufactured for application to fresh concrete. Products are subject to compliance with requirements, shall be compatible with other items incorporated into the work and shall be submitted for approval.
- B. **Absorptive Cover:** AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz. / sq. yd. when dry.
- C. **Moisture-Retaining Cover:** ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. **Water:** Clean, potable water, in accordance with ASTM C 94 /C 94M.
- E. **Clear, Waterborne, Membrane Forming Curing Compound:** Shall be in accordance with ASTM C 309, Type I, Class B, dissipating. Products are subject to compliance with requirements, shall be compatible with other items incorporated into the work and shall be submitted for approval.
- F. **Clear, Waterborne, Membrane Forming Curing and Sealing Compound:** Shall be in Accordance with ASTM C 1315, Type I, Class A. Products are subject to compliance with requirements, shall be compatible with other items incorporated into the work and shall be submitted for approval.

## 2.7 CONCRETE MIXTURES

- A. 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.
  - b. Cementitious Material: Limit percentage by weight of cementitious materials other than Portland cement in concrete as follows: Fly Ash – 25 percent.
  - c. Admixtures: Use according to manufacturer's written instructions.
- B. The design of the exact proportions for the mix shall be the responsibility of the concrete supplier.
- C. Submit mix design to the Engineer at least 30 days prior to incorporating into the Work. Concrete production shall not commence until mix designs have been reviewed and approved by the Engineer.
- D. Design mix to provide normal weight concrete with the following properties:
  - a. 3,200 psi, 7-day compressive strength, 5,000 psi, 28-day compressive strength.
  - b. Minimum cement content of 705 lbs/cy.
  - c. Maximum aggregate size of ¾ inch (0.75 inch).
- E. Use mid-range water-reducing admixture in concrete as required for placement and workability.
- F. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 degrees Fahrenheit.
- G. Use air-entraining admixture in exterior exposed concrete. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having a total air content of 4.5 to 6.5 percent.
- H. Water/Cement Ratio = 0.45.
- I. Slump Limits: not less than 1 inch and not more than 3 inches.

## PART 3 - EXECUTION

### 3.1 PREPARATION OF SUB-GRADE

- A. Subgrade shall be **backfilled and compacted in 12" (twelve inch) lifts. Do not Disrupt or damage utilities.** prepared in accordance with the requirements of **Section 02 30 00 Sub-Surface Investigation.**

### 3.2 FORMS

- A. **General:** Design, erect, support, brace, and maintain formwork to support vertical, lateral, static, and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances and surface irregularities complying with the following ACI 347 limits.
  - a. Provide Class A tolerances for concrete surfaces exposed to view.
  - b. Provide Class C tolerances for other concrete surfaces.
- B. Construct forms to provide for openings, offsets, sinkages, keyways, recesses, moldings, chamfers, blocking, screeds, bulkheads, anchorages, and inserts, and other features required for the work. Use selected materials to obtain required finishes. Solidly butt joints and provide back- up at joints to prevent cement paste from leaking.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Kerfwood inserts for forming keyways, reglets, recesses, and other features for easy removal.
- D. Chamfer exposed corners and edges, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- E. Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before placing concrete. Re-tighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

### 3.3 CONCRETE PLACING

- A. Equipment, methods of mixing and placing, and precautions to be observed as to weather, and condition of base shall meet the requirements of the Rhode Island Standard Specifications and ACI 316R, whichever is more stringent.
- B. The Engineer shall be notified of scheduled concrete placement sufficiently in advance of start of operation to allow preliminary inspection of the work, including subgrade, forms, and reinforcing steel.
- C. Work shall not be performed during rainy weather or when temperature is less than 40°F (4.4°C.).
- D. Adjacent work shall be protected from stain and damage. Damaged and stained areas shall be replaced or repaired to equal their original conditions.
- E. Existing concrete, earth, and other water- permeable material against which new concrete is to be placed shall be thoroughly damp when concrete is placed. There shall be no free water on surface.
- F. Concrete which has set or partially set, before placing shall not be used. Re-tempering of concrete will not be permitted.
- G. Concrete shall be thoroughly vibrated, or otherwise consolidated to secure a solid and homogeneous mass, thoroughly worked around reinforcement and into corners of forms.
- H. When joining fresh concrete to concrete which has attained full set, latter shall be cleaned of foreign matter, and mortar laitance shall be removed by chipping and washing. Clean, roughened base surface shall be saturated with water, but shall have no free water on surface. A coat of 1:1 cement- sand grout, approximately 1/8 inch thick, shall be well scrubbed into the thoroughly dampened concrete base. New concrete shall be placed immediately, before grout has dried or set.

### 3.4 FINISHING

- A. Concrete surfaces shall be screeded and finished true to line and grade, and free of hollows and bumps. Surface shall be dense and smooth.

- a. Finished concrete surface for concrete subbases shall be wood floated to a slightly rough surface. Surface shall not deviate more than 1/4 inch in 10 feet.
- b. Finished concrete surfaces shall be wood floated and steel troweled, or broom finished, to a uniform surface. Surface shall not deviate more than 1/8 inch in 10 feet.
- B. Horizontal surfaces of concrete surfaces which will be exposed shall be given a light broomed finish, with direction of grooves in concrete surface perpendicular to length of concrete band, slab, or pad. After concrete has set sufficiently to prevent coarse aggregate from being torn from surface, but before it has completely set, brooms shall be drawn across the surface to produce a pattern of small parallel grooves. Broomed surface shall be uniform, with no smooth, unduly rough or porous spots, or other irregularities. Coarse aggregate shall not be dislodged by brooming operation.
- C. Immediately following finishing operations, rises at edges and both sides of expansion joints shall be rounded to a 1/4- inch radius. Control joints to be tooled shall be scored into slab surface with scoring tool. Adjacent edges of control joint shall at same time be finished to a 1/4- inch radius.
- D. Where finishing is performed before end of curing period, concrete shall not be permitted to dry out, and shall be kept continuously moist from time of placing until end of curing period, or until curing membrane is applied.

### 3.5 CURING

- A. Concrete shall be kept continuously damp from time of placement until end of specified curing period or cured by other methods. Water shall not be added to surface during floating and troweling operations, and not earlier than 24 hours after concrete placement. Between finishing operations, surface shall be protected from rapid drying by a covering of waterproofing paper. Surface shall be damp when the covering is placed over it, and shall be kept damp by means of a fog spray of water, applied as often as necessary to prevent drying, but not sooner than 24 hours after placing concrete. None of the water so applied shall be troweled or floated into surface.
- B. Concrete surfaces shall be cured by completely covering with curing paper or application of a curing compound.
  - a. Concrete cured using waterproof paper shall be completely covered with paper with seams lapped and sealed with tape. Concrete surface shall not be allowed to become moistened between 24 and 36 hours after placing concrete. During curing period, concrete surface shall be checked frequently, and sprayed with water as often as necessary to prevent drying, but not earlier than 24 hours after placing concrete.
  - b. Concrete cured with a curing compound shall have the compound applied at a rate of 200 square feet per gallon, in two applications perpendicular to each other.
- C. Curing period shall be seven (7) days minimum.
- D. Only if additional protection is absolutely required, the surface should remain uncovered after the seven (7) day period for at least four (4) days, after which time new and unwrinkled nonstaining reinforced waterproof Kraft curing paper may be used.

### 3.6 EXPANSION JOINTS

- A. Expansion joints shall be 1/2 inch wide and located where shown on the Drawings. Expansion joints shall be troweled in the concrete to required width with preformed joint filler in place. Joint filler shall extend the full depth of the slab and full length of the expansion joint.
  - a. For concrete walks, pavements, and pads, depth of joint filler shall be placed to form a 1- 1/4 inch deep recess for sealant and backer rod below finished concrete surface.
  - b. Use of multiple pieces to make up required depth and width of joint will not be permitted.

### 3.7 CONSTRUCTION JOINTS



- A. Construction joints shall be placed whenever placing of concrete is suspended for more than 30 minutes.
  - a. Butt joint with dowels or use a thickened edge joint if construction joints occur at control joint locations.
  - b. Keyed joints with tie- bars shall be used if the joint occurs at any other location.

### **3.8 CONTROL JOINTS**

- A. Control joints shall be tooled into the concrete slab, with 3- inch wide border and troweled edges, in pattern as shown on the Drawings. If no pattern is shown, then pattern shall result in square shape with a maximum area of 36 square feet. Joints shall be made after concrete is finished and when the surface is stiff enough to support the weight of workmen without damage to the slab, but before slab has achieved its final set.
- B. Scoring shall cut into slab surface at least 1 inch, but in no case not less than 25 percent of slab depth.

### **3.9 COLD WEATHER CONCRETING**

- A. Materials for concrete shall be heated when concrete is mixed, placed, or cured when the mean daily temperature is below 40°F or is expected to fall to below 40°F within 72 hours. The concrete, after placing, shall be protected by covering, heat, or both.
- B. Details of handling and protecting of concrete during freezing weather shall be subject to the approval and direction of the Engineer. Procedures shall be in accordance with provisions of ACI 306R.

### **3.10 HOT WEATHER CONCRETING**

- A. Concrete just placed shall be protected from the direct rays of the sun and the forms and reinforcement just prior to placing shall be sprinkled with cold water. Every effort shall be made to minimize delays which will result in excessive mixing of the concrete after its arrival on- site.
- B. During periods of excessively hot weather (95°F., or above), ingredients in the concrete shall be cooled with cold mixing water to maintain the temperature of the concrete at permissible levels in accordance with the provisions of ACI 305R. Any concrete with a temperature above 95°F., when ready for placement, will be rejected.
- C. Temperature records shall be maintained throughout the period of hot weather giving air temperature, general weather conditions (calm, windy, clear, cloudy, etc.) and relative humidity. Records shall include checks on temperature of concrete when delivered to Project site and after placing in forms. Data should be correlated with the progress of the work so that conditions surrounding the construction of any part of the structure can be ascertained.

### **3.11 TOLERANCES**

- A. Refer to Rhode Island Standard Specifications.

### **3.12 PROTECTION OF CONCRETE SURFACES**

- A. Concrete surfaces shall be protected from traffic or damage until surfaces have hardened sufficiently.

### **3.13 FIELD QUALITY CONTROL**

- A. Testing and Inspection: Refer to Section 01 45 00 for independent testing agency requirements.
- B. Inspections: Steel reinforcement placement, verification of use of design mixture, concrete placement (including conveyance and depositing), and curing procedures.
- C. Concrete Testing: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following:

- a. Frequency: Obtain one (1) composite sample for each day's pour of each concrete mixture exceeding five (5) cubic yards, but less than twenty (20) cubic yards, plus one (1) set for each additional twenty (20) cubic yards.
- b. Slump: In accordance with ASTM C 143 / C 143M; one (1) test at point of placement for each composite sample. Provide additional tests when concrete consistency appears to change.
- c. Air Content: In accordance with ASTM C 231, pressure method for normal-weight concrete; one (1) test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
- d. Concrete Temperature: In accordance with ASTM C 1064/C 1064M; one (1) test hourly when ambient temperature is below 40 deg. F, or above 80 deg. F, and one (1) test for each composite sample.
- e. Unit Weight: In accordance with ASTM C 567, fresh unit weight of structural lightweight concrete; one (1) test for each composite sample, but not less than one (1) test for each day's pour of each concrete mixture.
- f. Compressive Test Specimens: In accordance with ASTM C 31 / C 31M:
  - i. Cast and laboratory cure two (2) sets of two (2) standard cylinder specimens for each composite sample.
  - ii. Cast and field cure two (2) sets of two (2) standard cylinder specimens for each composite sample.
- g. Compressive Strength Tests: In accordance with ASTM C 39/C 39M; test one (1) set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days. A compressive strength test shall be considered the average compressive strength from a set of two specimens obtained from the same composite sample and tested at the age indicated.
- h. When strength of field-cured cylinders is less than 85 percent of companion laboratory cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- i. Strength for 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 values fall below specified compressive strength be more than 500 psi.
- j. Test results shall be reported in writing to the Engineer, concrete manufacturer and Contractor within 48 hours of testing. Reports shall include compressive strength test details, project name, project number, date of concrete placement, name of testing and inspection agency, location of concrete batch in the Work, design compressive strength, concrete mixture proportions and materials, compressive breaking strength and type of break for both 7-day and 28-day tests.
- k. Additional Tests: Testing and inspection agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths or other requirements have not been met. Testing and inspection agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods.
- l. Additional testing and inspection, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- m. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

**END OF SECTION 03 30 00**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 03 80 00

## CONCRETE CUTTING and BONDING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Furnish all labor, materials, equipment and incidentals required to cut, remove, repair or otherwise modify parts of existing concrete structures or appurtenances as shown on the Drawings and as specified herein as necessary to complete the work. Work under this Section shall also include bonding new concrete to existing concrete.

#### 1.2 RELATED SECTIONS

- A. Section 03 01 30 - Maintenance of Cast-in-Place Concrete.
- B. Section 03 30 00 - Cast-in-Place Concrete.

#### 1.3 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete, latest edition.
- B. ANSI/ASTM A1064 - Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- C. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- D. ANSI/AWS D1-4 - Structural Welding Code - Reinforcing Steel.
- E. CRSI - Concrete Reinforcing Steel Institute - Manual of Practice.
- F. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
- G. CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature. H. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- I. ASTM C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.

#### 1.4 PREINSTALLATION MEETINGS

- A. **Preinstallation Meeting:** Conduct Meeting at the Job Site with the Owner, Architect and General Contractor.
- B. No existing structure or concrete shall be shifted, cut, removed, or otherwise altered until authorization is given by the Owner and Architect.

## 1.5 SUBMITTALS

- A. Submit methods for saw cutting and concrete removal.
- B. Submit methods for bonding new reinforcement to old.
- C. Qualification Data: For Installer and testing agency.
- D. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Steel reinforcement and accessories.
  - 2. Bonding agents.
  - 3. Joint-filler strips.
- C. Material Test Reports: For the following, from a qualified testing agency:
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
  - 1. **Shoring and Reshoring:** Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- E. Field quality-control reports

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in original, unopened containers displaying the manufacturer's name, labels, product identification and batch numbers.
- B. Store products under conditions as recommended by the manufacturer.

## 1.7 PROJECT CONDITIONS

- A. Verify all data and existing conditions (electrical, plumbing gas, telecommunications/data, etc.).

## 1.8 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. **Testing Agency Qualifications:** An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- C. **Welding Qualifications:** Qualify procedures and personnel according to AWS D1.4/D 1.4M.

## 1.8 COORDINATION

- A. All work to be Coordinate with the Owner and Architect.

# PART 2 PRODUCTS

## 2.1 MATERIALS

- A. Materials shall comply with this Section and any state or local regulations.
- B. Bonding Agent: Bonding agent shall be Larsens "Weld-Crete" or equal. Installation shall be according to manufacturer's recommendations.

# PART 3 EXECUTION

## 3.1 EXAMINATION AND PREPARATION

- A. Cut, repair, remove, or otherwise modify parts of the existing structures or appurtenances, as indicated on the Drawings, specified, or necessary to complete the work. Finishes, joints, reinforcements, sealants, etc, are specified in their respective sections. All work shall comply with the requirements of this Section and as shown on the Contract drawings.

- B. All commercial products specified in this Section shall be stored, mixed and applied in strict compliance with the manufacturer's recommendations.
- C. In all cases where concrete is repaired in the vicinity of an expansion joint or control joint the repairs shall be made to preserve the isolation between components on either side of the joint.
- D. When drilling holes for dowels/bolts, drilling shall stop if rebar is encountered. As approved by the Owner and architect, the hole(s) location shall be relocated to avoid rebar if necessary. Rebar shall not be cut without prior approval by the owner and Architect. Where possible, rebar locations shall be identified prior to drilling using "rebar locators" so that drill hole locations may be adjusted to avoid rebar interference.

### 3.2 CONCRETE REMOVAL

- A. Concrete designated to be removed to specific limits as shown on the Contract drawings or directed by the Owner and Architect, shall be done by line drilling at limits of removal followed by chipping or jack-hammering as appropriate in areas where concrete is to be taken out. Remove concrete in such a manner that surrounding concrete and existing reinforcing to be left in place and existing in place equipment are not damaged. Saw cutting at limits of concrete to be removed shall only be done if indicated on the Drawings, specified herein, or after obtaining written approval from the City
- B. Where existing reinforcing is exposed due to saw cutting/core drilling and no new material is to be placed on the cut surface, a coating or surface treatment of epoxy paste shall be applied to the entire cut surface to a thickness of 1/4-in.
- C. In all cases where the joint between new concrete or grout and existing concrete will be exposed in the finished work, except as otherwise shown or specified, the edge of concrete removal shall be a 1-in deep saw cut on each exposed surface of the existing concrete.
- D. Concrete specified to be left in place which is damaged shall be repaired by approved means.
- E. The Architect may from time to time direct the Contractor to make additional repairs to existing concrete. These repairs shall be made as specified or by such other methods as may be appropriate. Such changes may require a Contract modification.

### 3.3 CONNECTION SURFACE PREPARATION

- A. Connection surfaces shall be prepared as specified below for concrete areas requiring patching, repairs or modifications as shown on the Drawings, specified, or as directed by the Architect.
- B. Remove all deteriorated materials, dirt, oil, grease, and all other bond inhibiting materials from the surface by dry or wet mechanical means, i.e. - sandblasting, chipping, water jetting, etc, as approved by the Architect. Uniformly roughen the concrete surface to approximately 1/4- in amplitude with pointed chipping tools. Thoroughly clean surface of loose or weakened material by sandblasting or air-blasting. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded into parent concrete.
- C. If reinforcing steel is exposed, it must be mechanically cleaned to remove all loose material, contaminants, rust, etc, as approved by the Architect. If half of the diameter of the reinforcing steel is exposed, chip out behind the steel. The distance chipped behind the steel shall be a minimum of 1-in. Reinforcing to be incorporated in new concrete shall not be damaged during the removal operation.
- D. Reinforcing from existing removed concrete which is shown to be incorporated in new concrete shall be cleaned by mechanical means to remove all loose material and products of corrosion before proceeding. It shall be cut, bent or lapped to new reinforcing as shown on the Drawings and provided with 1-in minimum cover all around.
- E. The following are specific concrete surface preparation "methods" to be used where called for on the Drawings, specified or as directed by the City.

1. **Method A** - After the existing concrete surface at connection has been roughened and cleaned, thoroughly saturate with water and maintain saturation for a period of at least 12 hours. Brush on a 1/16-in layer of cement and water mixed to the consistency of a heavy paste. Immediately after application of cement paste, place new concrete or grout mixture as detailed on the Drawings.

2. **Method B** - After the existing concrete surface has been roughened and cleaned, apply epoxy bonding agent at connection surface. The field preparation and application of the epoxy bonding agent shall comply strictly with the manufacturer's recommendations. Place new concrete or grout mixture to limits shown on the Drawings within time constraints recommended by the manufacturer to ensure bond.

3. **Method C** - Drill a hole 1/4-in larger than the diameter of the dowel or bolt. The hole shall be blown clear of loose particles and dust just prior to installing epoxy paste. The drilled hole shall first be filled with epoxy paste, and then the dowel/bolt shall be buttered with paste and inserted with a twisting motion. Unless otherwise shown on the Drawings, deformed bars shall be drilled and set to a depth of ten bar diameters and smooth bars shall be drilled and set to a depth of 15 bar diameters.

4. **Method D** - Combination of Method B and C.

### 3.4 GROUTING

A. Grouting shall be as specified in **Section 03 30 00** - Maintenance of Cast-in-Place Concrete.

**END OF SECTION 03 80 00**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 03 80 00

## CONCRETE CUTTING and BONDING

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Furnish all labor, materials, equipment and incidentals required to cut, remove, repair or otherwise modify parts of existing concrete structures or appurtenances as shown on the Drawings and as specified herein as necessary to complete the work. Work under this Section shall also include bonding new concrete to existing concrete.

#### 1.2 RELATED SECTIONS

- A. Section 03 01 30 - Maintenance of Cast-in-Place Concrete.
- B. Section 03 30 00 - Cast-in-Place Concrete.

#### 1.3 REFERENCES

- A. ACI 301 - Specifications for Structural Concrete, latest edition.
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- C. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- D. ANSI/AWS D1-4 - Structural Welding Code - Reinforcing Steel.
- E. CRSI - Concrete Reinforcing Steel Institute - Manual of Practice.
- F. CRSI 63 - Recommended Practice for Placing Reinforcing Bars.
- G. CRSI 65 - Recommended Practice for Placing Bar Supports, Specifications and Nomenclature. H. ASTM C881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
- I. ASTM C882 - Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.

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- A. **Preinstallation Meeting:** Conduct Meeting at the Job Site with the Owner, Architect and General Contractor.
- B. No existing structure or concrete shall be shifted, cut, removed, or otherwise altered until authorization is given by the Owner and Architect.



## 1.5 SUBMITTALS

- A. Submit methods for saw cutting and concrete removal.
- B. Submit methods for bonding new reinforcement to old.
- C. Qualification Data: For Installer and testing agency.
- D. Material Certificates: For each of the following, signed by manufacturers:
  - 1. Steel reinforcement and accessories.
  - 2. Bonding agents.
  - 3. Joint-filler strips.
- C. Material Test Reports: For the following, from a qualified testing agency:
- D. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer, detailing fabrication, assembly, and support of formwork.
  - 1. **Shoring and Reshoring:** Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- E. Field quality-control reports

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products in original, unopened containers displaying the manufacturer's name, labels, product identification and batch numbers.
- B. Store products under conditions as recommended by the manufacturer.

## 1.7 PROJECT CONDITIONS

- A. Verify all data and existing conditions (electrical, plumbing gas, telecommunications/data, etc.).

## 1.8 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. **Testing Agency Qualifications:** An independent agency, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- C. **Welding Qualifications:** Qualify procedures and personnel according to AWS D1.4/D 1.4M.

## 1.8 COORDINATION

- A. All work to be Coordinate with the Owner and Architect.

# PART 2 PRODUCTS

## 2.1 MATERIALS

- A. Materials shall comply with this Section and any state or local regulations.
- B. Bonding Agent: Bonding agent shall be Larsens "Weld-Crete" or equal. Installation shall be according to manufacturer's recommendations.

# PART 3 EXECUTION

## 3.1 EXAMINATION AND PREPARATION

- A. Cut, repair, remove, or otherwise modify parts of the existing structures or appurtenances, as indicated on the Drawings, specified, or necessary to complete the work. Finishes, joints, reinforcements, sealants, etc, are specified in their respective sections. All work shall comply with the requirements of this Section and as shown on the Contract drawings.

- B. All commercial products specified in this Section shall be stored, mixed and applied in strict compliance with the manufacturer's recommendations.
- C. In all cases where concrete is repaired in the vicinity of an expansion joint or control joint the repairs shall be made to preserve the isolation between components on either side of the joint.
- D. When drilling holes for dowels/bolts, drilling shall stop if rebar is encountered. As approved by the Owner and architect, the hole(s) location shall be relocated to avoid rebar if necessary. Rebar shall not be cut without prior approval by the owner and Architect. Where possible, rebar locations shall be identified prior to drilling using "rebar locators" so that drill hole locations may be adjusted to avoid rebar interference.

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- C. In all cases where the joint between new concrete or grout and existing concrete will be exposed in the finished work, except as otherwise shown or specified, the edge of concrete removal shall be a 1-in deep saw cut on each exposed surface of the existing concrete.
- D. Concrete specified to be left in place which is damaged shall be repaired by approved means.
- E. The Architect may from time to time direct the Contractor to make additional repairs to existing concrete. These repairs shall be made as specified or by such other methods as may be appropriate. Such changes may require a Contract modification.

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- B. Remove all deteriorated materials, dirt, oil, grease, and all other bond inhibiting materials from the surface by dry or wet mechanical means, i.e. - sandblasting, chipping, water jetting, etc, as approved by the Architect. Uniformly roughen the concrete surface to approximately 1/4- in amplitude with pointed chipping tools. Thoroughly clean surface of loose or weakened material by sandblasting or air-blasting. Irregular voids or surface stones need not be removed if they are sound, free of laitance, and firmly embedded into parent concrete.
- C. If reinforcing steel is exposed, it must be mechanically cleaned to remove all loose material, contaminants, rust, etc, as approved by the Architect. If half of the diameter of the reinforcing steel is exposed, chip out behind the steel. The distance chipped behind the steel shall be a minimum of 1-in. Reinforcing to be incorporated in new concrete shall not be damaged during the removal operation.
- D. Reinforcing from existing removed concrete which is shown to be incorporated in new concrete shall be cleaned by mechanical means to remove all loose material and products of corrosion before proceeding. It shall be cut, bent or lapped to new reinforcing as shown on the Drawings and provided with 1-in minimum cover all around.
- E. The following are specific concrete surface preparation "methods" to be used where called for on the Drawings, specified or as directed by the City.

1. **Method A** - After the existing concrete surface at connection has been roughened and cleaned, thoroughly saturate with water and maintain saturation for a period of at least 12 hours. Brush on a 1/16-in layer of cement and water mixed to the consistency of a heavy paste. Immediately after application of cement paste, place new concrete or grout mixture as detailed on the Drawings.

2. **Method B** - After the existing concrete surface has been roughened and cleaned, apply epoxy bonding agent at connection surface. The field preparation and application of the epoxy bonding agent shall comply strictly with the manufacturer's recommendations. Place new concrete or grout mixture to limits shown on the Drawings within time constraints recommended by the manufacturer to ensure bond.

3. **Method C** - Drill a hole 1/4-in larger than the diameter of the dowel or bolt. The hole shall be blown clear of loose particles and dust just prior to installing epoxy paste. The drilled hole shall first be filled with epoxy paste, and then the dowel/bolt shall be buttered with paste and inserted with a twisting motion. Unless otherwise shown on the Drawings, deformed bars shall be drilled and set to a depth of ten bar diameters and smooth bars shall be drilled and set to a depth of 15 bar diameters.

4. **Method D** - Combination of Method B and C.

### 3.4 GROUTING

A. Grouting shall be as specified in **Section 03 30 00** - Maintenance of Cast-in-Place Concrete.

**END OF SECTION 03 80 00**

## SECTION 04 22 00

# CONCRETE UNIT MASONRY

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### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Concrete masonry units for single wythe construction.
- B. Mortar for masonry units.
- C. Reinforcement, anchorage and accessories.
- D. Masonry flashings.
- E. Masonry sealer coating.
- F. Refer to Selective Demolition for additional scope requirements.

#### 1.02 RELATED SECTIONS

- A. Section 07 21 13 – Board Insulation.

#### 1.03 REFERENCES

- A. ANSI/ASTM A82 - Cold-Drawn Steel Wire for Concrete Reinforcement.
- B. ASTM A123 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- D. ASTM B370 - Copper Sheet and Strip for Building Construction.
- E. ASTM C129 – Non-Load Bearing Concrete Masonry Units.
- F. ASTM C90 - Hollow Load Bearing Concrete Masonry Units.
- G. ASTM C144 - Aggregate for Masonry Mortar.ASTM C150 - Portland Cement.
- H. ASTM C207 - Hydrated Lime for Masonry Purposes.
- I. ASTM C270 - Mortar for Unit Masonry.
- J. ASTM C387 - Packaged, Dry, Combined Materials, for Mortar and Concrete.
- K. ASTM C404 - Aggregates for Masonry Grout.
- L. ASTM C476 - Grout for Masonry.
- M. ASTM C780 – Pre-construction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- N. ASTM C1019 - Method of Sampling and Testing Grout.
- O. IMIAC - International Masonry Industry All-Weather Council: Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

- P. UL - Underwriters' Laboratories.

**1.04 SUBMITTALS**

- A. Submit product data under provisions of Section 01 33 00.
- B. Submit samples under provisions of Section 01 33 00.
- C. Submit four samples of masonry veneer units to illustrate color, texture and extremes of color range.
- D. Include mortar design mix; indicate Proportion or Property method used, required environmental conditions and admixture limitations.
- E. SAMPLES: Submit two ribbons of mortar color, illustrating color and color range.
- F. Submit manufacturer's certificate under provisions of Section 01 33 00 that products meet or exceed specified requirements.

**1.05 QUALIFICATIONS**

- A. INSTALLER: Company specializing in performing the work of this Section with minimum ten years documented experience.

**1.06 REGULATORY REQUIREMENTS**

- A. Conform to requirements for masonry construction.

**1.07 MOCK-UP (Not Used)**

**1.08 PRE-INSTALLATION CONFERENCE**

- A. Convene one week prior to commencing work of this Section.

**1.09 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products to site under provisions of Section 01 60 00.
- B. Store and protect products under provisions of Section 01 60 00.
- C. Accept masonry units on site. Inspect for damage.

**1.10 ENVIRONMENTAL REQUIREMENTS**

- A. Strictly comply with recommendations of the International Masonry Industry All-Weather Council – Recommended Practices and Guide Specifications for Cold (Hot) Weather Masonry Construction; the Brick Institute of America – Technical Notes on Brick Construction, Parts 1, 2 and 3; The Portland Cement Assoc.

**1.11 SEQUENCE AND SCHEDULING**

- A. Coordinate work under provisions of Section 01 31 13.
- B. Coordinate the masonry work with brick veneer and installation of window anchors.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS – CONCRETE MASONRY UNITS**

- A. Park Avenue Cement Block Company
- B. Consolidated Concrete Corp.
- C. Adamsdale Concrete
- D. J & G Masonry
- E. Anchor Concrete Products
- F. Spaulding Brick Company
- G. Victory Supply LLC
- H. Greeville Ready Mix

**2.02 CONCRETE MASONRY UNITS**

- A. HOLLOW NON-LOAD BEARING CMU: ASTM C90, Grade N, Type I - Moisture Controlled; normal weight, smooth face. Nominal modular sizes 4 x 16 x 8 inches, 6 x 16 x 8 inches and 8 x 16 x 8 inches as indicated on the Drawings. Provide special units for 90 degree corners, bond beams, lintels and control joints.
- B. HOLLOW LOAD BEARING CMU: ASTM C90 Grade N, Type I – Moisture Controlled; Normal Weight.

**2.03 MORTAR MATERIALS – CONCRETE MASONRY UNITS**

- A. PORTLAND CEMENT: ASTM C150, Type I.
- B. AGGREGATES: ASTM C144, standard masonry type; clean, dry, protected against dampness, freezing and foreign matter.
- C. HYDRATED LIME: ASTM C207, Type S.
- D. WATER: Clean and free from injurious amounts of oil, alkali, organic matter or other deleterious material.
- E. Use no admixtures unless written approval is obtained from Architect.
- F. COLOR: As selected by Architect.

**2.04 MORTAR MIXES – CONCRETE MASONRY UNITS**

- A. MORTAR FOR NON-LOAD BEARING WALLS AND PARTITIONS: ASTM C270, Type N, using the Property Method, 750 psi compressive strength.
- B. MORTAR FOR ENGINEERED MASONRY: ASTM C270, Type S using the Property Method, 1800 psi compressive strength.

**2.05 GROUT MIXES**

- A. GROUT: ASTM C476; consistency which will completely fill all spaces intended to receive grout.
- B. BOND BEAMS AND LINTELS: 3,000 psi strength at 28 days; 7-8 inches slump; premixed type in accordance with ASTM C94 or mixed in accordance with ASTM C476, fine and course grout.
- C. ENGINEERED MASONRY: 3,000 psi strength at 28 days; 7-8 inches slump; premixed type in accordance with ASTM C94 or mixed in accordance with ASTM C476, fine and course grout.

**2.06 MORTAR MIXING**

- A. Thoroughly mix mortar ingredients in quantities needed for immediate use in accordance with ASTM C270.
- B. Add mortar color, if required, in accordance with manufacturer's instructions. Provide uniformity of mix and coloration. Do not use anti-freeze compounds to lower the freezing point of mortar.
- C. If water is lost by evaporation, retemper only within two hours of mixing.
- D. Use mortar within two hours after mixing at temperatures of 80 degrees F, or two-and-one-half hours at temperatures under 50 degrees F.

## **2.07 ADMIXTURES**

- A. The use of air entraining, antifreeze compounds or calcium chloride admixtures or other substances is not allowed, unless otherwise approved by the Architect.

## **2.08 REINFORCEMENT AND ANCHORAGE**

- A. CMU PARTITIONS: Ladder type, welded wire units fabricated from 9 gage ASTM A82 cold-drawn steel wire with deformed side wire and smooth cross wire; ASTM A641 mill galvanized; Hohmann & Barnard, Inc. “Lox-All” Reinforcement #220.
- B. JOINT STABILIZING ANCHORS: To connect new masonry walls to existing masonry walls at vertical control joints; Cold-drawn steel; hot dip galvanized; spaced at 2’ –0” on center vertically; “D/A 2200,” manufactured by Dur- O-Wall, Inc.”
- C. REINFORCING STEEL: ASTM A615, 60 ksi 276, 414, 517 MpA yield grade, deformed billet bars, unprotected finish..

## **2.09 MASONRY FLASHINGS**

- A. THROUGH-WALL FLASHING: York Manufacturing, Inc.: “Flash-Vent” asphalt-free copper fabric flashing/drainage system; 3 ounce weight; plastic termination bars for use when vertical termination does not occur in mortar joint.
- B. GENERAL MASONRY FLASHING: York Manufacturing, Inc.: “Multi-Flash 500 Series” asphalt-free copper fabric flashing; 3 ounce weight.

## **2.10 ACCESSORIES**

- A. WALL CAP (Top of Kneewalls): Slumpstone Fence Wall Cap 8” x 2” x 16” - Angelus Block Co, Inc.
- B. CONTROL JOINTS (CMU BACK-UP): Hohmann & Barnard, Inc. VS Series – PVC Control Joint; ASTM D2287 (Type PVC 654-4); #VS-Standard.
- C. EXPANSION JOINTS (CMU VENEER): Hohmann & Barnard, Inc. NS-Closed Cell Neoprene Sponge; ASTM D1056, Grade 2A1; #NS-Standard; 3/8 inch x 3 inches.
- D. WEEP HOLES: Hohmann & Barnard, Inc. QV – Quadro-Vent; polypropylene tested in accordance with ASTM D2240, D790B, D638 and D1238B; standard size; color as selected by Architect.
- E. CLEANING SOLUTIONS: EaCo Chem “NMD 80 New Masonry Detergent”.

# **PART 3 EXECUTION**

## **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.
- B. Verify items provided by other Sections of work are properly sized and located.
- C. Verify that built-in items are in proper location, and ready for roughing into masonry work.
- D. Beginning of installation means installer accepts existing conditions.

## **3.02 PREPARATION**

- A. Direct and coordinate placement of metal anchors supplied to other Sections.
- B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

**3.03 COURSING**

- A. Establish lines, levels and coursing indicated; protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Lay concrete masonry units in running bond. Course one unit and one mortar joint to equal 8 inches. Form concave mortar joints.

**3.04 PLACING AND BONDING**

- A. Lay solid masonry units in full bed of mortar, with full head, bed and collar joints, uniformly jointed with other work.
- B. Lay hollow masonry units with face shell bedding on head and bed joints.
- C. Buttering courses of joints or excessive furrowing of mortar joints are not permitted.
- D. Remove excess mortar as Work progresses. Do not permit mortar to drop or accumulate into cavity air space or to plug weep holes
- E. Interlock intersections and external corners.
- F. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace. Perform jobsite cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
- G. Cut mortar joints flush where insulation bitumen damp proofing is applied.

**3.05 REINFORCEMENT AND ANCHORAGES – SINGLE WYTHE MASONRY**

- A. Install horizontal joint reinforcement at 16 inches on center vertically.
- B. Place masonry joint reinforcement in first horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
- C. Place joint reinforcement continuous in first joint below top of walls.
- D. Lap joint reinforcement ends minimum 6 inches. Extend minimum 16 inches each side of openings.
- E. Reinforce joint corners and intersections with prefabricated corner pieces 16 inches oc.

**3.06 MASONRY THROUGH-WALL FLASHINGS**

- B. Install through-wall flashing on top of masonry base course or at locations shown on the Drawings.
- C. Seal all joints in flashings as required.
- D. Install flashing in strict accordance with manufacturer's specifications.

**3.07 GENERAL MASONRY FLASHINGS**

- C. Install flashing under masonry sills or at locations shown on the Drawings.
- D. Provide 4 inch high end dams at all window sill locations. Seal all joints.
- E. Install flashings in strict accordance with manufacturer's specifications.



**3.08 WEEPS**

- C. Install weep holes in CMU veneer at 32 inches on center horizontally above through-wall flashing, above shelf angles and at top of walls.

**3.09 LINTELS**

- A. Install loose steel lintels over window openings and door openings.
- B. Install reinforced unit masonry lintels over openings where steel or precast concrete lintels are not scheduled.
- C. OPENINGS UP TO 42 INCHES WIDE: Place two, No. 4 reinforcing bars 1 inch from bottom web, unless noted otherwise.
- D. OPENINGS FROM 42 INCHES UP TO 78 INCHES WIDE: Place two, No. 5 reinforcing bars 1 inch from bottom web, unless noted otherwise.
- E. OPENINGS OVER 78 INCHES: Reinforce openings as detailed.
- F. Use single piece reinforcing bars only.
- G. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- H. Place and consolidate grout fill without displacing reinforcing.
- I. Allow masonry lintels to attain specified strength before removing temporary supports.
- J. Maintain minimum 8 inch bearing on each side of opening.

**3.10 GROUTED COMPONENTS**

- A. Reinforce bond beams as shown on Drawings, placed 1 inch from bottom of web.
- B. Lap splices minimum 24 bar diameters.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.

**3.11 ENGINEERED MASONRY**

- A. Lay masonry units with core cells vertically aligned and cavities between wythes clear of mortar and unobstructed.
- B. Place mortar in masonry unit bed joints back 1/4 inch from edge of unit grout spaces, bevel back and upward. Permit mortar to cure 7 days before placing grout.
- C. Reinforce masonry unit cores with reinforcement bars and grout as indicated.
- D. Retain vertical reinforcement in position at top and bottom of cells and at intervals not exceeding 192 bar diameters. Splice reinforcement in accordance with Section 03 30 00.
- E. Wet masonry unit surfaces in contact with grout just prior to grout placement.
- F. Grout spaces less than 2 inches in width with fine grout using low lift grouting techniques. Grout spaces 2 inches or greater in width with course grout using low lift grouting techniques.
- G. When grouting is stopped for more than one hour, terminate grout 1 1/2 inch below top of upper masonry unit to form a positive key for subsequent grout placement.
- H. LOW LIFT GROUTING: Place first lift of grout to a height of 16 inches and rod for grout consolidation. Place subsequent lifts in 8 inch increments and rod for grout consolidation.

### **3.12 CONTROL AND EXPANSION JOINTS**

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Install preformed joint devices in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- C. Provide control and expansion joints at 20 feet on center, maximum, unless noted otherwise.

### **3.13 BUILT-IN WORK**

- A. As work progresses, build in metal door frames, window frames, wood nailing strips, anchor bolts, plates, lintels and other items furnished by other Sections.
- B. Build in items plumb and level.
- C. Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
- D. Do not build in organic materials subject to deterioration.

### **3.14 TOLERANCES**

- A. MAXIMUM VARIATION FROM UNIT TO ADJACENT UNIT: 1/32 inch.
- B. MAXIMUM VARIATION FROM PLANE OF WALL: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- C. MAXIMUM VARIATION FROM PLUMB: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- D. MAXIMUM VARIATION FROM LEVEL COURSING: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.
- E. MAXIMUM VARIATION OF JOINT THICKNESS: 1/8 inch in 3 feet.
- F. MAXIMUM VARIATION FROM CROSS SECTIONAL THICKNESS OF WALLS: 1/4 inch.

### **3.15 CUTTING AND FITTING**

- A. Cut and fit for concealed items as required. Coordinate with other Sections of Work to provide correct size, shape and location.
- B. Obtain Architect approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

### **3.16 CLEANING**

- I. Clean work under provisions of Section 01 74 00.
- J. Remove excess mortar and mortar smears.
- K. Replace defective mortar. Match adjacent work.
- L. Clean soiled surfaces with cleaning solution.
- M. Use non-metallic tools in cleaning operations.
- N. Use of acid or acid base cleaners or abrasives are strictly prohibited.

### **3.17 PROTECTION OF FINISHED WORK**

- A. Protect finished installation under provisions of Section 01 52 00.
- B. Without damaging completed work, provide protective boards at exposed external corners which may be damaged by construction activities.

**END OF SECTION 04 22 00**



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**Bathroom Renovations**  
**Warwick, Rhode Island 02886**

**AA# 19158**

**SECTION 05 50 00**  
**METAL FABRICATIONS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Shop fabricated ferrous metal items, galvanized and prime painted.
- B. Refer to Schedule at end of this Section.

**1.02 RELATED SECTIONS**

- A. Section 04 20 00 – Unit Masonry.
- B. Section 06 10 00 – Rough Carpentry.

**1.03 REFERENCES**

- A. ASTM A992 – W Shapes.
- B. ASTM A36 - Structural Steel.
- C. ASTM A53 - Hot-Dipped, Zinc-coated Welded and Seamless Steel Pipe.
- D. ASTM A153 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- E. ASTM A307 - Low-Carbon Steel Externally and Internally Threaded Fasteners.
- F. ASTM A283 - Carbon Steel Plates, Shapes and Bars.
- G. ASTM A325 - High Strength Bolts for Structural Steel Joints.
- H. ASTM A386 - Zinc-Coating (Hot-Dip) on Assembled Steel Products.
- I. ASTM A500 - Cold-formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- J. AWS D1.1 - Structural Welding Code.
- K. AWS A2.0 - Standard Welding Symbols.
- L. SSPC - Steel Structures Painting Council.
- M. FS TT-P-641 - Primer Coating, Zinc Dust-Zinc Oxide (for Galvanized Surfaces).

**1.04 SUBMITTALS**

- A. Submit shop drawings under provisions of Section 01 33 00.

- B. Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners and accessories.
- C. Include erection drawings, elevations and details where applicable.
- D. Indicate welded connections using standard AWS A2.0 welding symbols. Indicate net weld lengths.
- E. Prepare shop drawings under direct supervision of a Professional Structural Engineer registered in the State of Rhode Island.

#### **1.05 QUALIFICATIONS**

- A. WELDERS' CERTIFICATES: Submit certificates certifying welders employed on the work, verifying AWS qualification within the previous 12 months.

### **PART 2 PRODUCTS**

#### **2.01 MATERIALS**

- A. STEEL SECTIONS: ASTM A36, A992.
- B. STEEL TUBING: ASTM A500, Grade B or ASTM A501.
- C. PIPE: ASTM A53, Grade B, Schedule 40.
- D. BOLTS, NUTS AND WASHERS: ASTM A307 or ASTM A325 galvanized to ASTM A153 for galvanized components.
- E. WELDING MATERIALS: AWS D1.1; type required for materials being welded.
- F. PLATES: ASTM A283.
- G. PRIMER: SSPC 15, Type 1, Red Oxide for shop application and field touch-up.
- H. TOUCH-UP PRIMER FOR GALVANIZED SURFACES: FS TT-P-641.

#### **2.02 FABRICATION**

- A. Verify dimensions on site prior to shop fabrication.
- B. Fabricate items with joints tightly fitted and secured.
- C. Fit and shop assemble in largest practical sections for delivery to site.
- D. Continuously seal joined members by continuous welds.
- E. Grind exposed welds flush and smooth with adjacent finished surfaces. Ease exposed edges to small uniform radius.
- F. EXPOSED MECHANICAL FASTENINGS:
  - 1. Flush countersunk screws or bolts, unobtrusively located;
  - 2. Consistent with design of component, except where specifically noted otherwise.
- G. Make exposed joints butt tight, flush and hairline.
- H. Supply components required for anchorage of metal fabrications. Fabricate anchorage and related components of same material and finish as metal fabrication, except where specifically noted otherwise.

**2.03 FINISH**

- A. Clean surfaces of rust, scale, grease and foreign matter prior to finishing.
- B. Do not prime surfaces in direct contact bond with concrete or where field welding is required.
- C. Prime paint items scheduled with one coat.
- D. Galvanize items to minimum 1.25 oz/sq. ft. zinc coating in accordance with ASTM A386.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and ready to receive work.
- B. Beginning installation means erector accepts existing conditions.

**3.02 PREPARATION**

- A. Obtain Architect approval prior to site cutting or making adjustments not scheduled.
- B. Clean and strip site primed steel items to bare metal where site welding is required.
- C. Make provision for erection loads with temporary bracing.
- D. Supply items required to be cast into concrete or embedded in masonry with setting templates to appropriate Sections.

**3.03 INSTALLATION**

- A. Install items plumb and level, accurately fitted, free from distortion or defects.
- B. Perform field welding in accordance with AWS D1.1.
- C. After installation, touch-up field welds, scratched or damaged surfaces and surfaces not shop primed with primer, except surfaces to be in contact with concrete.

**3.04 ERECTION TOLERANCES**

- A. MAXIMUM VARIATION FROM PLUMB: 1/4 inch per story, non-cumulative.
- B. MAXIMUM OFFSET FROM TRUE ALIGNMENT: 1/4 inch.

**3.05 SCHEDULE**

- A. The Schedule is a list of principal items only.
- B. Provide and install items listed in Schedule or required for the work with anchorage and attachments necessary for installation.
- C. LEDGE AND SHELF ANGLES, CHANNELS AND PLATES: Galvanized, primed and field paint finish.
- D. HANDRAILS: As shown on Drawings; Primed and field paint finish.
- E. Masonry lintels.
- E. Stairs.

**END OF SECTION 05 50 00**



## CCRI KNIGHT CAMPUS

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## SECTION 07 92 00

## JOINT SEALANTS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Preparing sealant substrate surfaces.
- B. Sealant and backing.

#### 1.02 RELATED SECTIONS

- A. Section 04 20 00 – Unit Masonry.

#### 1.03 REFERENCES

- A. ANSI/ASTM D1056 - Flexible Cellular Materials - Sponge or Expanded Rubber.
- B. ANSI/ASTM D1565 - Flexible Cellular Materials - Vinyl Chloride Polymers and Copolymers (Open-Cell Foam).
- C. ASTM C790 - Use of Latex Sealing Compounds.
- D. ASTM C834 - Latex Sealing Compounds.
- E. FS TT-S-00227 - Sealing Compound: Elastomeric Type, Multi-Component.
- F. SWI (Sealing and Waterproofers Institute) - Sealant and Caulking Guide Specification.

#### 1.04 SUBMITTALS

- A. Submit product data under provisions of Section 01 33 00.
- B. Submit product data indicating sealant chemical characteristics, performance criteria, limitations, color and availability.
- C. Submit samples under provisions of Section 01 33 00.
- D. Submit two samples 1/2 x 1/2 inches in size illustrating colors selected. Submit manufacturer's installation instructions under provisions of Section 01 33 00.

#### 1.05 QUALITY ASSURANCE

- A. MANUFACTURER: Company specializing in manufacturing the products specified in this Section with minimum ten years documented experience.
- B. APPLICATOR: Company specializing in applying the work of this Section with minimum ten years documented experience.
- C. Conform to Sealant and Waterproofers Institute requirements for materials and installation.

## **1.06 ENVIRONMENTAL REQUIREMENTS**

- A. Do not install solvent curing sealants in enclosed building specs.
- B. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

## **1.07 SEQUENCING AND SCHEDULING**

- A. Coordinate work under provisions of Section 01 31 13.
- B. Coordinate the work of this Section with all Sections referencing this Section.

# **PART 2 PRODUCTS**

## **2.01 MANUFACTURERS**

- A. SUBSTITUTIONS: Under provisions of Section 01 60 00.

## **2.02 SEALANTS**

- A. TYPE 1: Tremco Spectrem 1
  - 1. General purpose, high-performance, ultra-low modulus, one-part, moisture-curing, non-staining, construction grade silicone sealant.
  - 2. Conforms to ASTM C920 Type S, Grade NS, Class 100/50, Use NT, G, M, A and O, ASTM C-1382 and US Federal Specifications TT-S-001543A (COM-NBS) Class A and TT-S-00230C (COM-NBS) Class A, Type II, EIMA Test Method 300.01 ASTM C-1382.
  - 3. +100%/-50% joint movement capability in extension and compression.
- B. TYPE 2: Tremco Tremflex 834 Siliconized Acrylic Latex Sealant
  - 1. General purpose, interior, one-part, paintable, pure acrylic latex sealant.
  - 2. Conforms to ASTM C834.
  - 3. +/- 12 1/2% joint movement capability.
  - 4. Acceptable for use where an acoustical sealant is required.
- C. TYPE 3: Tremco Dymonic FC
  - 1. Low modulus, one-component, fast moisture-cure, non-staining, polyurethane hybrid sealant.
  - 2. Conforms to ASTM C920 Type S, Grade NS, Class 35, Use NT, M, A and O, and US Federal Specifications TT-S-00230C, Class A and TT-S-00230C (COM-NBS) Class A, Type II.
  - 3. +/- 35% joint movement capability; low VOC, paintable.

## **2.03 ACCESSORIES**

- A. PRIMER: Non-staining type, recommended by sealant manufacturer to suit application.
- B. JOINT CLEANER: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.



- C. JOINT BACKING: ANSI/ASTM D1056; round, closed cell polyethylene foam rod; oversized 30 to 50 percent larger than joint width, No. 92 Green Rod Closed Cell Polyurethane manufactured by Pecora Corporation.
- D. BOND BREAKER: Pressure sensitive tape recommended by sealant manufacturer to suit application.

## 2.04 COLORS

- A. Colors to be selected by Architect from sealant manufacturer's standard range.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that surfaces are ready to receive Work and are as shown on Drawings and as recommended by sealant manufacturer.
- B. Beginning of installation means installer accepts existing substrate.

### 3.02 PREPARATION

- A. Thoroughly clean joints in accordance with manufacturer's instructions. Remove loose materials and foreign matter which might impair adhesion of sealant.
- B. Verify that joint backing and release tapes are compatible with sealant.
- C. Protect elements surrounding the work of this Section from damage or disfiguration. Apply masking tape to each exposed surface of joints.

### 3.03 INSTALLATION

- A. Install sealant in strict accordance with manufacturer's instructions; ASTM C804 for solvent release sealants and ASTM C790 for latex base sealants.
- B. Measure joint dimensions and size materials to achieve a 2 to 1 width/depth ratio. Sealant depth shall not be more than 3/4 inch and not less than 3/8 inch.
- C. Joints in excess of 3/4 inch in depth that have no means of providing a backup for sealant, shall receive joint backing material. Place backing material in joints taking care to maintain a constant depth 1/8 inch greater than the sealant depth tolerances specified.
  - 1. Install joint backing to achieve a neck dimension no greater than 1/3 the joint width.
  - 2. Do not stretch backing into joints. Backing shall be continuous, no voids allowed.
- D. Install bond breaker where joint backing is not used.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
  - 1. Apply sealants using a hand caulking gun or power gun with a nozzle of proper size and sufficient power to completely fill joints.
- F. **Install sealant in neat manner in true lines free of air pockets, foreign embedded matter, ridges or sags.**
- G. Tool joints with a dry or water wet tool only. Do not use detergents or soapy water for tooling operations. **Tool joints slightly concave, creating an hourglass sealant profile within the joint.**
  - 1. **Fillet beads are not acceptable unless approved by the Architect or shown as such on the Drawings. Sealant shall not lap over the face of adjacent work being sealed.**

H. Remove masking tape immediately after tooling or before sealant has taken initial set.

**3.04 CLEANING AND REPAIRING**

A. Clean work under provisions of Section 01 60 00.

B. Clean adjacent soiled surfaces.

C. Repair or replace defaced or disfigured finishes caused by work of this Section.

**3.05 PROTECTION OF FINISHED WORK**

A. Protect finished installation under provisions of Section 01 60 00.

B. Protect sealants until cured.

**3.06 SEALANT SCHEDULE**

TYPE 1: All exterior conditions unless noted otherwise.

TYPE 2: All interior conditions unless noted otherwise; at countertop and wall intersections.

TYPE 3: All exterior expansion and control joint conditions unless noted otherwise.

**END OF SECTION 07 92 00**



## CCRI KNIGHT CAMPUS

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## SECTION 07 95 13

## INTERIOR EXPANSION JOINT COVERS

### PART 1 GENERAL

#### 1.1 QUALITY ASSURANCE

##### A. Fire-rated Joints:

1. Utilize Fire-rated as appropriate for conditions (refer to Plans for indication of fire ratings of walls, floors and ceilings).
2. Assemblies with fire resistance and cycling capability as been determined per UL-2079.
3. Fire rating not less than the rating of adjacent construction.
4. Minimum Loading Capacities:
  - a. Standard Floor Joints: 500 LBS
  - b. Wall Joints: Shall be designed to withstand a minimum impact load of without damage or permanent deformation. 75 LBS/Lineal FT

##### B. Single-Source Responsibility: Obtain expansion joint cover assemblies, including fire blankets, from one source from a single manufacturer.

#### 1.2 SUBMITTALS

##### A. Shop Drawings:

1. Layout drawings and details.

##### B. Samples:

1. Standard and premium metal finishes for color selection.
2. Standard preformed seal extrusion colors for selection.

#### 1.3 DELIVERY, STORAGE, AND HANDLING

- ##### A. Exercise proper care in the handling of all work so as not to injure the finished surface, and take proper precautions to protect the work from damage after it is in place.
- ##### B. Deliver materials to the job site ready for use, and fabricated in as large sections and assemblies as practical.
1. Assemblies shall be identical to submitted and reviewed shop drawings, samples and certificates.
- ##### C. Store materials under cover in a dry and clean location off the ground.
1. Remove materials that are damaged or otherwise not suitable for installation from the job site and replace with acceptable materials.

#### 1.4 PROJECT CONDITIONS

- ##### A. Check actual locations of walls and other construction to which work must fit, by accurate field measurements before fabrication.
1. Show recorded measurements on Shop Drawings and coordinate fabrication schedule with construction progress to avoid delay of work

### PART 2 PRODUCTS

#### 2.1 MATERIALS

A. Acceptable manufacturers:

1. Interior Expansion Joint Covers:
  - a. Base:
    - 1) C/S Group.
  - b. Optional:
    - 1) Balco/Metalines.
    - 2) MM Systems.
    - 3) InPro.
    - 4) Pittcon Industries.
2. Other manufacturers desiring approval comply with Section 00 26 00.

## 2.2 MATERIALS – GENERAL

A. General:

1. Continuous extruded aluminum frame assemblies with floating cover plate and seal.
2. Provide expansion joint cover assemblies of design, basic profile, materials, and operation indicated.
3. Furnish units in longest practicable lengths to minimize number of end joints.
4. Locate end joints in non-conspicuous areas; avoid locating in high-traffic areas such as corridors.
5. Provide hairline-mitered corners where joint changes directions or abuts other materials.
6. Include closure materials and transition pieces, tee-joints, corner, curbs, cross-connections, and other accessories as required to provide continuous joint cover assemblies.
7. Curved units: Provide factory-fabricated curved sections.
8. Wall Joints
9. Floor Joints:
  - a. ADA compliant.
  - b. Slab Edge Conditions:
    - 1) **Existing Floor slabs: Provide block-out requirements for new slab-edges prior to placement of concrete.**
    - 2) New floor slabs: Provide block-out requirements for new slab-edges prior to placement of concrete.

B. Aluminum Frames:

1. Extrusions: ASTM B221, alloy 6063-T5.
2. Sheet and Plate: ASTM B209, alloy 6061-T6.
3. Protect aluminum surfaces in contact with cementitious materials with heavy metal free high solids primer or chromate conversion coating.
4. Exposed surfaces: Manufacturer's full line of standard and premium finishes.

C. Extruded Preformed Seals:

1. Thermoplastic, extruded rubber: Classified under ASTM D2000 and formed to fit frames.
2. Rigid edges for positive attachment to frame and center plate.
3. Smooth surface; free from grooves or ridges.
4. Seals to have flexible core of shore hardness 73 to allow movement of joint width without gaps occurring between seal and cover assembly.
5. Replaceable without removal of center plate.
6. Color: To be selected from manufacturer's full line of colors by Architect.

D. Fire Barrier Systems:

1. Designed for indicated or required dynamic structural movement without material degradation or fatigue in accordance with ASTM E1399.
2. Prefabricated, for hourly rating of adjacent floors, walls or ceiling assemblies.
  - a. Tested in maximum joint width condition as a component of an expansion joint cover in accordance with UL-2079 including hose stream testing of wall assemblies at full-rated period by Underwriters Laboratories Inc.
3. Material to carry UL-labeled and be subject to Underwriters Laboratories follow-up service for quality assurance.
4. Systems to be installed strictly in accordance with manufacturer's installation instructions.
5. Supply in maximum lengths to minimize field splicing.
6. Fire barrier to consist of intumescent blankets layered to provide a flame and insulation barrier and to accommodate dynamic movement.
7. Expansion Joints in concealed spaces such as chase walls: Fire barrier system to include 0.032 IN
8. Base Products: thick galvanized steel cover in lieu of conventional (finished) expansion joint cover.
  - a. "Fire Barrier Model "4" Reflex Fire Barrier" by C/S.

- b. Select appropriate model number for joint width, fire rating required, and other joint conditions as applicable.

**E. Accessories:**

- 1. Manufacturer's standard anchors, fasteners, set screws, spacers, flexible vapor seals and filler materials, drain tubes, adhesive and other accessories compatible with material in contact, as indicated or required for complete installations.

**2.3 DESCRIPTION OF EJ-TYPES**

**A. General:**

- 1. Refer to schedule above to conditions and widths required for project.
- 2. Refer to Plans for locations.
- 3. Refer to the following for Base Products and further description of scheduled types.

**B. Floor Joints at Finished Floors:**

- 1. Base Products: a. 4 IN b. Floor-to-Wall Joints: Wide Joints: "SJPF-400 Series" by C/S. 1) Include floor-to-wall variations similar to above listed model.
- 2. Include fire barrier components required, when joint is used in fire-rated floors.

**C. Wall Joints:**

- 1. Base Product: a. 4 IN
- 2. Walls at intersecting angles: Include appropriate model variations for intersecting conditions. Wide Joints: "SFC-400 Series" by C/S.
- 3. Include fire barrier components required, when joint is used in fire-rated walls.

**D. Ceiling Joints:**

- 1. Base Product: a. 4 IN
- 2. Ceiling-to-Wall conditions: Include appropriate model variations. Wide Joints: "SFC-400" by C/S. 3. Include fire barrier components required, when joint is used in fire-rated ceilings/soffits

**2.4 OTHER EXPANSION JOINTS TYPES (SPECIFIED ELSEWHERE)**

**A. Expansion Joints at Roofing:**

- 1. Specified in Section 07 62 00 (and/or in applicable roofing section(s))

**PART 3 EXECUTION**

**3.1 INSPECTION**

- A. Verify suitability of substrate to accept installation.
- B. Do not install until deficiencies are corrected.
- C. Installation constitutes acceptance of responsibility for performance.

**3.2 PREPARATION**

- A. Insure the completeness of the work required under this Section.
- B. Verify all measurements and dimensions at the job site.
- C. Coordinate work with related trades, with particular attention given to the installation of items embedded in concrete and masonry so as not to delay job progress.
- D. Provide all templates, block-outs, and embedded items as required

**3.3 INSTALLATION**

- A. Install in accordance with manufacturer's instructions and recommendations.
- B. Set work level, true to line, plumb.
- C. Install fire barrier caulk as required for UL assembly specified.
- D. Comply with manufacturer's instructions and recommendations for all phases of work, including preparation of substrate, applying materials, and protection of installed units.
- E. Provide anchorage devices and fasteners where necessary for securing expansion joint cover assemblies to in-place construction, including threaded fasteners with drilled-in fasteners for masonry and concrete where anchoring members are not embedded in concrete.
  - 1. Provide fasteners of metal, type, and size to suit type of construction indicated and provide for secure attachment of expansion joint cover assemblies.
- F. Perform all cutting, drilling and fitting required for installation of expansion joint covers.

1. Install joint cover assemblies in true alignment and proper relationship to expansion joints and adjoining finished surfaces measured from established lines and levels.
- G. Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.
- H. Set floor covers at elevations to be flush with adjacent finished floor materials.
  1. If necessary, shim to level, but ensure base frames have continual support to prevent rocking and vertical deflection.
- I. Locate wall, ceiling, roof, and soffit covers in continuous contact with adjacent surfaces.
  1. Securely attach in place with all required accessories.
- J. Locate anchors at interval recommended by manufacturer, but not less than 3 IN from each end and not more than 24 IN
- K. Maintain continuity of expansion joint cover assemblies with end joints held to a minimum and metal members aligned mechanically using splice joints. on centers.
  1. Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames.
- L. Adhere flexible filler materials (if any) to frames with adhesive or pressure-sensitive tape as recommended by manufacturer.
- M. Installation of Extruded Preformed Seals:
  1. Install seals to comply with manufacturer's instruction and with minimum number of end joints.
  2. For straight sections provide preformed seals in continuous lengths.
  3. Vulcanize or heat-seal all field splice joints in preformed seal material to provide watertight joints using manufacturer's recommended procedure.
  4. Apply manufacturer's approved adhesive, epoxy, or lubricant-adhesive to both frame interfaces prior to installing preformed seal.
  5. Seal transitions in accordance with manufacturer's instruction.
- N. Installation of Fire Barrier:
  1. Install fire barrier in accordance with federal, state and Building Code as locally amended using manufacturer's recommended procedures.
  2. Install transition and end joints to provide continuous fire resistance and in accordance with manufacturer's instructions.

### **3.4 CLEANING AND PROTECTION**

- A. Do not remove strippable protective material until finish work in adjacent areas is complete.
- B. When protective material is removed, clean exposed metal surfaces to comply with manufacturer's instructions.

**END OF SECTION 07 95 13**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 08 11 13

## HOLLOW METAL DOORS AND FRAMES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Non-rated and rated rolled steel doors and frames.
- B. Interior lite frames.
- C. Louvers.

#### 1.02 RELATED SECTIONS

- A. Section 04 22 00 – Concrete Unit Masonry.
- B. Section 07 92 00 - Joint Sealants.
- C. Section 08 14 16 – Flush Wood Doors.
- D. Section 08 71 00 - Door Hardware.
- E. Section 09 21 16 - Gypsum Board Assemblies.
- F. Section 09 91 00 - Painting.

#### 1.03 REFERENCES

- A. ASTM A 366/A 366M - Standard Specification for Steel, Sheet, Carbon, Cold-Rolled, Commercial Quality.
- B. ASTM A 653/A 653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. ASTM A 924/A 924M - Standard Specification for General Requirements for Sheet Steel, Metallic-Coated by the Hot-Dip Process.
- D. ANSI A250.3 - Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames.
- E. ANSI A250.6 - Hardware on Standard Steel Doors (Reinforcement--Application).
- F. ANSI A250.7 - Nomenclature for Standard Steel Doors and Steel Frames.
- G. ANSI A250.8 - Recommended Specifications for Standard Steel Doors & Frames.
- H. ANSI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames. ANSI/DHI A115.1G - Installation Guide for Doors and Hardware.

- I. NFPA 80 - Standard for Fire Doors and Windows.
- J. SDI-105 - Recommended Erection Instructions for Steel Frames; Steel Door Institute.
- K. SDI-117 - Manufacturing Tolerances for Standard Steel Doors and Frames; Steel Door Institute.
- L. SDI-124 - Maintenance of Hollow Metal Doors and Frames; Steel Door Institute.
- M. UL 10B - Standard for Fire Tests of Door Assemblies; Underwriters Laboratories Inc.
- N. WHI - Intertek Testing Services Inc./Warnock Hersey International Inc.

#### **1.04 QUALITY ASSURANCE**

- A. Conform to requirements of SDI-100.

#### **1.05 SUBMITTALS**

- A. Submit shop drawings and product data under provisions of **Section 01 33 00**.
- B. Indicate frame configuration, anchor types and spacing, location of cutouts for hardware, reinforcement and finish.
- C. Indicate door elevations, internal reinforcement, closure method and cutouts for glazing and louvers.
- D. Submit manufacturer's installation instructions under provisions of **Section 01 33 00**.

#### **1.6 DELIVERY, STORAGE AND HANDLING**

- A. Protect products under provisions of Section 01 60 00.
- B. Protect doors and frames with resilient packaging sealed with heat shrunk plastic.
- C. Break seal on-site to permit ventilation.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Steelcraft.
- B. Ceco Corporation.
- C. Amweld.
- D. Curries
- E. Trudoor

#### **2.02 MATERIALS**

- A. COLD-ROLLED STEEL; ASTM A366 or ASTM A568, commercial quality carbon steel.
- B. ANCHORS AND FASTENERS; Manufacturer's standard units fabricated from not less than 18 gauge galvanized sheet steel or 18 gauge hot-dip galvanized steel complying with ASTM A153, Class C or D
- C. PRIMER: Thermosetting primer which is compatible with finish system.

#### **2.03 DOORS AND FRAMES**

- A. EXTERIOR DOORS: SDI-100 Grade II (Heavy duty), Model 4 (Seamless, composite construction).
- B. INTERIOR DOORS: SDI-100 Grade II (Heavy duty), Model 4 (Seamless, composite construction).
- C. EXTERIOR FRAMES: 16 gage thick material, core thickness; welded construction.
- D. INTERIOR FRAMES: 18 gage thick material, core thickness; welded construction.



**2.04 DOOR CORE**

- A. CORE: Impregnated cardboard honeycomb at interior doors; Polyurethane insulation at exterior doors; Mineral fiberboard at fire rated doors.
- B. INSULATED DOOR: Insulation value of R-10 minimum.

**2.05 ACCESSORIES**

- A. RUBBER SILENCERS: Resilient rubber.
- B. GLAZING STOPS: Rolled steel channel shape, mitered corners; prepared for countersink style screws.
- C. Prep door frames for electric strikes as noted within hardware schedule.

**2.06 PROTECTIVE COATINGS**

- A. BITUMINOUS COATING: Fibered asphalt emulsion.
- B. PRIMER: Zinc chromate type.

**2.07 FABRICATION**

- A. Fabricate frames as welded units at exterior and interior locations.
- B. Fabricate frames and doors with hardware reinforcement plates welded in place. Provide mortar guard boxes.
- C. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.
- D. Prepare frame for silencers. Provide three single rubber silencers for single doors [and mullions of double doors] on strike side, and two single silencers on frame head at double doors without mullions.
- E. Attach fire rated label to each frame and door unit.
- F. Close top edge of exterior door flush with inverted steel channel closure. Seal joints watertight.
- G. Fabricate frames for masonry wall coursing with 4 inch head member.

**2.07 FINISH**

- A. INTERIOR UNITS: A60 galvanized at wet locations only.
- B. EXTERIOR UNITS: A60 galvanized.
- C. PRIMER: Manufacturer's standard baked on type.
- D. FINISH: Field finish in accordance with Section 09 91 00; Color as selected by Architect.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install frames in accordance with SDI-105.
- B. Install doors in accordance with DHI.
- C. Coordinate with masonry and gypsum board systems wall construction for anchor placement.
- D. Coordinate installation of glass and glazing.
- E. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

**3.02 TOLERANCES**

- A. MAXIMUM DIAGONAL DISTORTION: 1/16 inch measured with straight edge, corner to corner.

**3.03 ADJUSTING AND CLEANING**

- A. Adjust hardware for smooth and balanced door movement.

**END OF SECTION 08 11 13**



## CCRI KNIGHT CAMPUS

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## SECTION 08 14 16

## FLUSH WOOD DOORS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Wood doors, rated and non-rated.

#### 1.02 RELATED SECTIONS

- A. Section 08 11 13 – Hollow Metal Doors and Frames.
- B. Section 08 71 00 - Door Hardware.
- C. Section 09 91 00 - Painting.

#### 1.03 REFERENCES

- A. ANSI/NWMA I.S.1 - Industry Standard For Wood Flush Doors (Includes Standards I.S.1.1. through I.S.1.7)
- B. AWI - Quality Standards of Architectural Woodwork Institute.
- C. ASTM E152 - Methods of Fire Tests of Door Assemblies.
- D. NFPA 80 - Fire Doors and windows.
- E. NFPA 252 - Standard Method of Fire Tests for Door Assemblies.
- F. UL 10B - Fire Tests of Door Assemblies.

#### 1.04 SUBMITTALS

- A. Submit simultaneously with submittals from Sections 08 11 13 and 08 71 00.
- B. Submit shop drawings and product data under provisions of Section 01 33 00.
- C. Indicate door elevations, stile and rail reinforcement, internal blocking for hardware attachment and cutouts for glazing.
- D. Submit samples under provisions of Section 01 33 00.
- E. Submit two samples 2-1/2 x 2-1/2 inch in size illustrating construction and veneer.

#### 1.05 QUALITY ASSURANCE

- A. Conform to requirements of AWI [WDMA] Quality Standard Section 1300 Premium Grade.
- B. FIRE DOOR AND PANEL CONSTRUCTION: Conform to ASTM E152, NFPA 252, UL 10B.
- C. INSTALLED DOORS AND PANELS: Conform to NFPA 80 for fire rated class indicated.

#### 1.06 REGULATORY REQUIREMENTS

- A. Conform to applicable building and codes for fire rated doors and panels.

**1.07 DELIVERY, STORAGE AND HANDLING**

- A. Protect products under provisions of Section 01 60 00.
- B. Package, deliver and store doors in accordance with AWI requirements.

**1.08 WARRANTY**

- A. Provide manufacturer's warranty under provisions of **Section 01 78 00.**

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A. Eggers Industries
- B. Fenestra Corporation.
- C. Marshfield Door Systems, Inc.
- D. Masonite Architectural
- E. Lux Doors

**2.02 DOOR TYPES**

- A. FLUSH INTERIOR DOORS: Solid core construction; wood veneer faces; fire rated as indicated on Drawings; Vision panels as shown on Drawings.

**2.03 DOOR CONSTRUCTION ( AWI QUALITY STANDARD )**

- A. SOLID, NON-RATED CORE: AWI Section 1300, PC-Particleboard.
- B. FIRE RATED CORE: AWI Section 1300, mineral core.
- C. Fully reinforced with inner blocking.

**2.04 DOOR FACING**

- A. FACING QUALITY: AWI [WDMA] premium grade.
- B. DOOR VENEER: Maple species wood, plain sliced with book matched grain. – or to match existing.

**2.05 FINISH**

- A. Factory finish system including polyurethane clear coat; Satin gloss top coat (3 coats).

**2.06 ADHESIVES**

- A. AWI Type II; AWI Type I in wet areas.

**2.7 ACCESSORIES**

- A. GLASS STOPS: Metal type.

**2.08 FABRICATION**

- A. Fabricate non-rated and rated doors in accordance with AWI Quality Standards requirements.
- B. Fabricate fire rated doors in accordance with AWI Quality Standards ANSI/NWMA I.S.1 and to UL requirements. Attach fire rating label to door edge.
- C. Provide flush doors with Triple-Ply, 1 1/2" laminated vertical stiles, 1 1/8" solid top and bottom rails.
- D. Side, top and bottom edge strips of wood species to match face veneer.
- E. Pre-machine doors for finish hardware.
- F. Provide 5-1/2 inch top and bottom blocking and 10 inch intermediate blocking.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install doors in accordance with manufacturer's instructions.
- B. Machine cut relief for hinges and closers and coring for handsets and cylinders.
- C. Trim door width by cutting equally on both jamb edges.
- D. Trim door height by cutting equally on top and bottom edges to a maximum of 3/4 inch.
- E. Pilot drill and bolt holes. Use threaded through bolts for half surface hinges.
- F. Prepare doors to receive finish hardware in accordance with AWI requirements.
- G. Conform to AWI requirements for fit tolerances.
- H. Coordinate installation of glass and glazing.

### **3.02 INSTALLATION TOLERANCES**

- A. MAXIMUM DIAGONAL DISTORTION: 1/16 inch measured with straight edge, corner to corner.

### **3.03 ADJUSTING AND CLEANING**

- A. Adjust for smooth and balanced door movement.
- B. Clean adjacent soiled surfaces.
- C. Repair or replace defaced or disfigured finishes caused by work of this Section.

### **3.04 PROTECTION**

- A. Protect finished installation under provisions of Section 01 60 00.

**END OF SECTION 08 14 16**



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### SECTION 08 71 00

## DOOR HARDWARE

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Hardware for doors.
- B. Thresholds and gasketing.

#### 1.02 SUMMARY

- A. Section Includes
  - 1. Furnishing and installation of all mechanical and electrical finish hardware necessary for all doors, and hardware as specified herein and as enumerated in hardware sets and as indicated and required by actual conditions at the building. The hardware shall include the furnishing of all necessary screws, bolts, expansion shields, drop plates, and all other devices necessary for the proper application of the hardware. Installation shall include field modification and preparation of existing doors and/or frames for new hardware being installed. Provide necessary fillers, Dutchmen, reinforcements and fasteners for mounting new hardware and to cover existing door/frame prep.

#### 1.03 REFERENCES

- A. Applicable state and local building codes and standards.
- B. FIRE/LIFE SAFETY
  - 1. NFPA – National Fire Protection Associations
    - a. NFPA 70- National Electric Code
    - b. NFPA 80 – Standard for Fire Doors and Fire Windows
    - c. NFPA 101 – Life Safety Code
    - d. NFPA 105 – Smoke and Draft Control Door Assemblies
- C. UL – Underwriters Laboratories
  - 1. UL 10B – Fire Test of Door Assemblies
  - 2. UL 10C – Positive Pressure Test of Fire Door Assemblies
  - 3. UL 1784 – Air Leakage Tests of Door Assemblies.
- D. Accessibility
  - 1. Ada – Americans with Disabilities Act.
  - 2. Rhode Island Accessibility Code – SBC 14, 15, 16
- E. DHI – Door and Hardware Institute
  - 1. Sequence and Format for the Hardware Schedule
  - 2. Recommended Locations for Builders Hardware.
- F. ANSI – American national Standards Institute
  - 1. ANSI/BHMA A156.1 – A156.29 and ANSI A156.31 – Standards for Hardware and Specialties.
- G. AWI - Architectural Woodwork Institute.

#### 1.04 COORDINATION

- A. Coordinate work of this Section with other directly affected Sections involving manufacturer of any internal reinforcement for door hardware.

**1.05 QUALITY ASSURANCE**

- A. **MANUFACTURERS:** Companies specializing in manufacturing door hardware with minimum ten years documented experience. **HARDWARE SUPPLIER:** Company specializing in supplying commercial institutional door hardware with ten years documented experience.
- B. **HARDWARE SUPPLIER PERSONNEL:** Employ an Architectural Hardware Consultant (AHC) to assist in the work of this Section; paid directly by General Contractor.

**1.06 CERTIFICATIONS**

- A. Architectural Hardware Consultant shall inspect complete installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's instructions.
- B. Provide two copies of certifications to Architect.

**1.07 REGULATORY REQUIREMENTS**

- A. Conform to the applicable sections of Chapter 5 of NFPA 101 and Rhode Island State Building Code.

**1.08 SUBMITTALS**

- A. Submit schedule, shop drawings and product data under provisions of Section 01 33 00.
- B. Indicate locations and mounting heights of each type of hardware.
- C. Provide product data on specified hardware.
- D. Submit manufacturer's parts lists, templates and installation instructions under provisions of Section 01 33 00.
- E. **Fire-Rated Openings:** Provide door hardware for fire-rated openings that complies with NFPA Standard NO. 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed and are identical to products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to the authorities having jurisdiction for use on types and sizes of doors indicated in compliance with requirements of fire-rated door and door frame labels.
- F. **Electronic Security Hardware:** When electrified hardware is included in the hardware specification, the hardware supplier must employ an individual knowledgeable in electrified components and systems, who is capable of producing wiring diagrams and consulting as needed. Coordinate installation of the electronic security hardware with the Architect and electrical engineers and provide installation and technical data to the Architect and other related subcontractors. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.

**1.09 OPERATION AND MAINTENANCE DATA**

- A. Submit operation and maintenance data under provisions of Section 01 78 00.
- B. Include data on operation of hardware, lubrication requirements and inspection procedures related to preventative maintenance.

**1.10 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products to site under provisions of Section 01 60 00.
- B. Store and protect products under provisions of Section 01 60 00.
- C. Package hardware items individually. Label and identify package with door opening code to match hardware schedule.
- D. Deliver keys to Owner by security shipment direct from hardware supplier.
- E. Protect hardware from theft by cataloging and storing in secure area.

**1.11 WARRANTY**

- A. Provide Manufacturer's Standard warranty under provisions of Section 01 78 00.

**1.12 MAINTENANCE MATERIALS**

- A. Provide special wrenches and tools applicable to each different or special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware component manufacturer.

## **PART 2 PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- A. BUTTS (Heavy Duty Ball Bearing)
  - 1. Hager Hinge Company
  - 2. Stanley Hardware
  - 3. Ives
- B. ELECTRO MECHANICAL AUTOMATIC DOOR OPERATOR
  - 1. Dorma
  - 2. Horton
  - 3. Stanley
- C. FIRE EXIT AND PANIC DEVICES
  - 1. Von Duprin Inc.

### **2.02 BUTTS**

- A. Full Mortise; 4-1/2 x 4-1/2; heavy duty ball bearing; 5 knuckle; square corners; non-removable pins.
- B. Provide three hinges per door leaf for door 90 inches or less in height and one additional hinge for each 30 inches of additional door height.
- C. Where new hinges are specified for existing doors and /or existing frames, the new hinge size must be identical to hinge preparation present in the existing door and/or existing frame.
- D. Stainless- Steel Doors shall utilize continuous hinges.

### **2.03 CONTINUOUS HINGES**

- A. Provide aluminum geared continuous hinges conforming to ANSI A156.25, Grade 2.
- B. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum, with .25 inch diameter Teflon coated stainless steel hinge pin.
- C. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
- D. Hinges shall be capable of supporting door weights up to 450 pounds, and shall be successfully tested for 1,500,000 cycles.
- E. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by a testing agency acceptable to the authority having jurisdiction.
- F. Provide aluminum geared continuous hinges with electrified option where specified. Provide with sufficient number and gage of concealed wires to accommodate electric function of specified hardware.
- G. Install hinges with fasteners supplied by manufacturer. Hole pattern shall be symmetrically patterned.
- H. Acceptable manufacturers and/or products: Ives, Select, Stanley.

### **2.04 MORTISE LOCKS**

- A. Provide mortise locks certified as ANSI A156.13, Grade 1 Operational, Grade 1 Security, and manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance. Lock case shall be multi-function and field reversible for handing without opening the case. Cylinders: Refer to 2.04 KEYING.
- B. Provide locks with a standard 2-3/4 inches backset with a full 3/4 inch throw stainless steel mechanical anti-friction latchbolt. Deadbolt shall be a full 1 inch throw, constructed of stainless steel.
- C. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
- D. Lever trim shall be solid brass, bronze, or stainless steel, cast or forged in the design specified, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle.
  - 1. Lever design shall be Schlage 06A.
  - 2. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
  - 3. Acceptable manufacturers and/or products: Schlage L9000 series, No Substitute.

## 2.05 Networked Wireless Lock

- A. Provide network wireless locks certified as ANSI A156.25. Cylinders: Refer to 2.04 KEYING.
- B. Provide locks with a standard 2-3/4 inches backset with a full 3/4 inch throw stainless steel mechanical anti-friction latchbolt.
- C. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
- D. Lever trim shall be solid brass, bronze, or stainless steel, cast or forged in the design specified, with wrought roses and external lever spring cages. Levers shall be thru-bolted to assure proper alignment, and shall have a 2-piece spindle.
  - 1. Lever design shall be Schlage Rhodes.
  - 2. Lever trim on the secure side of doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
- E. Acceptable manufacturers and/or products: Schlage AD400 series, No Substitute.
- F. GC shall be responsible for providing additional pims and control access panels in IT closets for all new Networked Wireless Locks. GC shall assume that existing system will need additional capacity.

## 2.06 Electric Strikes

- A. Provide electric strikes designed for use with the type locks shown at each opening.
- B. Provide electric strikes UL Listed as burglary-resistant electric door strikes and where required shall be UL Listed as electric strikes for fire doors and frames. Provide fail-secure type electric strikes, unless specified otherwise.
- C. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.
- D. Acceptable manufacturers and/or products: Von Duprin 6000 series, Folger Adam 300 series, HES 1006 series.

## 2.07 Door Closers (LCN: No Substitute)

- A. Provide door closers certified to ANSI/BHMA A156.4 Grade 1 requirements by a BHMA certified independent testing laboratory. Surface mounted mechanical closers shall be certified to exceed ten million (10,000,000) full load cycles by a recognized independent testing laboratory. Closers shall be ISO 9000 certified. Units shall be stamped with date of manufacture code.
- B. Door closers shall have fully hydraulic, full rack and pinion action with a high strength cast iron cylinder, and shall utilize full complement bearings at shaft. Cylinder body shall be 1-1/2 inch diameter, and double heat-treated pinion journal shall be 11/16 inch diameter.
- C. Provide hydraulic fluid requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F. Fluid shall be fireproof and shall pass the requirements of the UL10C "positive pressure" fire test.
- D. Spring power shall be continuously adjustable over the full range of closer sizes, and allow for reduced opening force as required by accessibility codes and standards. Hydraulic regulation shall be by tamper-proof, non-critical valves. Closers shall have separate adjustment for latch speed, general speed, and backcheck.
- E. Provide closers with a solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within a 6-inch top rail without the use of a mounting plate so that closer shall not be visible through vision panel from pull side.
- F. Closers shall not incorporate Pressure Relief Valve (PRV) technology
- G. Closer cylinders, arms, adapter plates, and metal covers shall have a powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, or shall have special rust inhibitor (SRI).
- H. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other finish hardware items interfering with closer mounting.



- I. Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Closers shall not be visible in corridors, lobbies and other public spaces unless approved by Architect.
- J. Door closers meeting this specification: LCN 4010/4110 series, No Substitute.

## **2.08 Door Trim**

- A. Provide push plates 4 inches wide x 16 inches high x 0.050 inch thick and beveled 4 edges. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.
- B. Provide push bars of solid bar stock, diameter and length as scheduled. Push bars shall be of sufficient length to span from center to center of each stile. Where required, mount back to back with pull.
- C. Provide offset pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
- D. Provide pulls of solid bar stock, diameter and length as scheduled. Where required, mount back to back with push bar.
- E. Provide pull plates 4 inches wide x 16 inches high x 0.050 inch thick, beveled 4 edges, and prepped for pull. Where width of door stile prevents use of 4 inches wide plate, adjust width to fit.
- F. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

## **2.09 Protection Plates**

- A. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch thick as scheduled. Furnish with machine or wood screws, finished to match plates. Sizes of plates shall be as follows:
  - 1. Kick Plates – 12 inches high x 2 inches less width of door on single doors, 1 inch less width of door on pairs
- B. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

## **2.10 Door Stops and Holders**

- A. Provide door stops for all doors in accordance with the following requirements:
  - 1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
  - 2. Where wall stops cannot be used, provide dome type floor stops of the proper height.
  - 3. At any opening where a wall or floor stop cannot be used, a medium duty surface mounted overhead stop shall be used.
- B. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

## **2.11 Silencers**

- A. Provide "Push-in" type silencers for each hollow metal or wood frame. Provide three for each single frame and two for each pair frame. Omit where gasketing is specified or required by code.
- B. Acceptable manufacturers and/or products: Ives, Burns, Rockwood.

## **2.12 Finishes (this section is currently listed as section 2.08 finishes. Please delete that section and replace with this.)**

- A. Finish of all hardware shall be US26D (BHMA 626/652) with the exceptions as follows:
  - 1. Continuous Hinges: Clear Anodized Aluminum.
  - 2. Push Plates, Pulls, and Push Bars: US32D (BHMA 630).
  - 3. Protection Plates: US32D (BHMA 630).
  - 4. Door Closers: Powder Coat to Match.

## **2.13 ELECTRIC POWER TRANSFER**

- A. Provide power transfer sufficient for number and gage of wires to accommodate electric function of specified hardware.
- B. Electric power transfer is to be located per manufacture's template and UL requirements, unless interference with operation of door or other hardware items.
- C. Acceptable manufacturers and/or products: Von Duprin, ABH.

## 2.14 EXIT DEVICES

- A. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit and/or Fire Exit hardware. Cylinders: Refer to KEYING.
- B. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel or aluminum, plated to the standard architectural finishes to match the balance of the door hardware.
- C. Exit devices shall incorporate a fluid damper or other device that eliminates noise associated with exit device operation. Touchpad shall extend a minimum of one half of the door width, but not the full length of the exit device rail. End-cap will have two-point attachment to door. Touch-pad shall match exit device finish, and shall be stainless steel for US26, US26D, US28, US32, and US32D finishes; for all other finishes, the touch-pad finish shall be of compatible finish to exit device. Only compression springs will be used in devices, latches, and outside trims or controls.
- D. Devices to incorporate a deadlatching feature for security and/or for future addition of alarm kits and/or other electrical requirements.
- E. Vertical rod devices shall be capable of being field modified to less bottom rod devices by removal of bottom rod and adding firing pin(s), if required at fire rated openings.
- F. Provide manufacturer's standard strikes.
- G. Provide exit devices cut to door width and height. Locate exit devices at a height recommended by the exit device manufacturer, allowable by governing building codes, and approved by the Architect.
- H. Mechanism case shall sit flush on the face of all flush doors, or spacers shall be furnished to fill gaps behind devices. Where glass trim or molding projects off the face of the door, provide glass bead kits.
- I. Removable mullions shall be a 2 inches x 3 inches steel tube. Where scheduled, mullion shall be of a type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
- J. Where lever handles are specified as outside trim for exit devices, provide heavy-duty lever trims with forged or cast escutcheon plates. Provide vandal-resistant levers that will travel to a 90-degree down position when more than 35 pounds of torque are applied, and which can easily be re-set.
  - 1. Lever style will match the lever style of the locksets.
  - 2. Lever trim on doors serving rooms considered by the authority having jurisdiction to be hazardous shall have a tactile warning.
- K. Exit devices for fire rated openings shall be UL labeled fire exit hardware.
- L. Provide electrical options as scheduled.
- M. Acceptable manufacturers and/or products: **Von Duprin 98/35 series, No Substitute.**

## 2.15 POWER SUPPLIES

- A. Provide power supplies, recommended and approved by the manufacturer of the electrified locking component, for the operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring a power supply.
- B. Provide the appropriate quantity of power supplies necessary for the proper operation of the electrified locking component and/or components as recommended by the manufacturer of the electrified locking components with consideration for each electrified component utilizing the power supply, the location of the power supply, and the approved wiring diagrams. Locate the power supplies as directed by the Architect.
- C. Provide a power supply that is regulated and filtered 24 VAC, or as required, and UL class 2 listed.
- D. Provide a power supply complete requiring on 120 VAC to the fused input and shall be supplied in an enclosure.
- E. Provide a power supply with emergency release terminals, where required, that allow the release of all devices upon activation of the fire alarm system complete with fire alarm input for initiating "no delay" exiting mode.
- F. Acceptable manufacturers and/or products: Von Duprin PS900 series, not substitute.

## **2.16 ELECTRO-MECHANICAL AUTOMATIC OPERATORS**

- A. **Provide low energy automatic operator units that are electro-mechanical design complying with ANSI A156.19 for the following doors,: 1002, 1008, 1102, 1108, 2004, 2008, 2102, 2105, 3002, 3008, 3109, 3115, 4002, 4008.**
- B. The operator shall be powered with a DC motor working through reduction gears. Closing shall be spring force. No manual hydraulic or chain drive closer will be acceptable. The motor is to be off when the door is in closing mode. The door can be manually operated with the power on or off without damage to the operator. The operator shall include variable adjustments, including opening and closing speed adjustment. Operator shall be mounted in an aluminum cover.
- C. Provide units with manual off/auto/hold-open switch, push and go, function to activate power operator, interface delay, electric lock delay, hold-open delay adjustable from 2 to 30 seconds, and logic terminal to interface with accessories, mats, and sensors.
- D. Provide drop plates, brackets or adapters for arms as required to suit details.
- E. Provide hard-wired motion sensors and/or actuator switches for operation as specified. Actuators shall be weather-resistant type at exterior applications.
- F. Provide key switches, with LED's recommended and approved by the manufacturer of the automatic operator as required for the function as described in the operation description of the hardware sets. Cylinders: Refer to 2.07 Keying.
- G. **Where automatic operators are scheduled, provide complete assemblies of controls, switches, power supplies, relays, and parts/material recommended and approved by the manufacturer of the automatic operator for each leaf. Final Location of the actuators, key switches, and other controls will be coordinated by the Contractor with the Architect and Owner for final approval.**
- H. Acceptable manufacturers and/or products: **Dorma ED-700, Stanley, Norton**

## **2.17 KEYING AND CORES**

- A. Provide construction cylinders and keys during construction period only.
- B. **DOOR LOCKS:** Keyed as directed by Owner.
- C. Supply 4 keys for each lock.
- D. Provide cores & cylinders to match existing used on this campus..

## **2.18 FINISHES**

- A. FINISHES: 626 (US26D), unless noted otherwise.

# **PART 3 EXECUTIONS**

## **3.01 EXAMINATION**

- A. Verify that doors and frames are ready to receive work and dimensions are as indicated on shop drawings.
- B. Verify that power supply is available to power operated devices.
- C. Beginning of installation means acceptance of existing conditions.

## **3.02 INSTALLATION**

- A. Install hardware in accordance with manufacturer's instructions and requirements of SDI, ANSI/NFPA 80, BHMA, DHI, NAMM and AWI.
- B. Use the templates provided by hardware item manufacturer.
- C. Conform to ANSI A117.1 for positioning requirements for the handicapped.

## **3.03 SCHEDULE**

- A. Each door shall receive the hardware as noted on Drawings, as herein specified or as required by applicable codes. Provide exterior grade and fire rated grade as required.

**B. HARDWARE SET: 1 - (NEW DOOR IN NEW FRAME - BATHROOM)**

1	EA	CONT. HINGE	054HD	628	IVES
1	EA	PUSH PLATE	8200 4" X 16"	630	IVES
1	EA	PULL PLATE	8303 10" 4" X 16"	630	IVES
1	EA	<b>**SURFACE CLOSER**</b>	4011	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW B4E	630	IVES
1	EA	WALL OR FLOOR STOP	WS406/WS407CVX OR FS439 AS REQUIRED	626	IVES
3	EA	SILENCER	SR64	GRY	IVES

VERIFY WHETHER A CLASSROOM DEADLOCK IS REQUIRED.

**\*\* SEE 2.16 FOR DOORS THAT REQUIRE AUTOMATIC OPERATORS TO TAKE THE PLACE OF SURFACE CLOSERS**

**F. HARDWARE SET: 2 - (NEW DOOR IN EXISTING FRAME WITH NEW WIRELESS LOCK AND CLOSER)**

1	EA	CONT. HINGE	054HD	628	IVES
1	EA	ELEC CLASSROOM LOCK	AD-400-MS-70-MT-RHO-PD	626	SCHLAGE
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW B4E	630	IVES
1	EA	WALL OR FLOOR STOP	WS406/WS407CVX OR FS439 AS REQUIRED	626	IVES
3	EA	SILENCER	SR64	GRY	IVES

FURNISH HINGE-PREP FILLERS BY DON-JO (OR SIMILAR) TO FILL EXISTING BUTT HINGE PREPS IN FRAME PRIOR TO INSTALLING THE CONTINUOUS HINGES.

AT RATED OPENINGS, FURNISH ZERO 488S SMOKE GASKETING IN LIEU OF SILENCERS.

**OPERATIONAL DESCRIPTION**

DOOR NORMALLY CLOSED AND LOCKED. VALID CARD TO UNLOCK LEVER, ALLOWING ENTRY. MECHANICAL ENTRY BY KEY. FREE EGRESS BY INSIDE LEVER.

**G. HARDWARE SET: 3 - (NEW DOOR IN NEW FRAME WITH NEW WIRELESS LOCK AND CLOSER)**

1	EA	CONT. HINGE	054HD	628	IVES
1	EA	ELEC CLASSROOM LOCK	AD-400-MS-70-MT-RHO-PD	626	SCHLAGE
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 12" X 2" LDW B4E	630	IVES
1	EA	WALL OR FLOOR STOP	WS406/WS407CVX OR FS439 AS REQUIRED	626	IVES
3	EA	SILENCER	SR64	GRY	IVES

AT RATED OPENINGS, FURNISH ZERO 488S SMOKE GASKETING IN LIEU OF SILENCERS.

**OPERATIONAL DESCRIPTION**

DOOR NORMALLY CLOSED AND LOCKED. VALID CARD TO UNLOCK LEVER, ALLOWING ENTRY. MECHANICAL ENTRY BY KEY. FREE EGRESS BY INSIDE LEVER.

**END OF SECTION 08 71 00**



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## SECTION 09 21 16

## GYPSUM BOARD ASSEMBLIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Cold-rolled metal framing.
- B. Acoustic insulation and sealant.
- C. Gypsum board and cement board.
- D. Taped and sanded joint treatment.

#### 1.02 RELATED SECTIONS

- A. Section 06 10 00 – Rough Carpentry: Wood blocking.
- B. Section 08 11 13 – Hollow Metal Doors and Frames.
- C. Section 09 91 00 - Painting.

#### 1.03 REFERENCES

- A. ANSI/ASTM C36 - Gypsum Wallboard.
- B. ANSI/ASTM C79 - Gypsum Sheathing Board
- C. ANSI/ASTM C442 - Gypsum Backing Board.
- D. ANSI/ASTM C475 - Joint Treatment Materials for Gypsum Wallboard Construction.
- E. ANSI/ASTM C630 - Water Resistant Gypsum Backing Board.
- F. ANSI/ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
- G. ANSI/ASTM C557 - Adhesive for Fastening Gypsum Wallboard to Wood Framing.
- H. ANSI/ASTM C646 - Steel Drill Screws for the Application of Gypsum Sheet Material to Light Gage Steel Studs.
- I. ANSI/ASTM C754 - Installation of Framing Members to Receive Screw Attached Gypsum Wallboard, Backing Board, or Water Resistant Backing Board.
- J. GA-201 - Gypsum Board for Walls and Ceilings.

- K. GA-21 - Recommended Specifications for Levels of Gypsum Board Finish.
- L. GA-216 - Recommended Specifications for the Application and Finishing of Gypsum Board.
- M. ANSI/ASTM C645 - Non-Load (Axial) Bearing Steel Studs, Runners (Track), and Rigid Furring Channels for Screw Application of Gypsum Board.
- N. ANSI/ASTM E90 - Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- O. ANSI/ASTM E119 - Fire Tests of Building Construction and Materials.
- P. ASTM C9977 – Gypsum Sheathing
- Q. ASTM D3273 – Gypsum Sheathing
- R. ASTM C79 – Gypsum Sheathing
- S. ASTM C 36 – Impact Resistant Gypsum Board.
- T. ASTM C 1396 – Impact Resistant Gypsum Board.
- U. ANSI A108.11, American National Standard for Interior Installation of Cementitious Backer Units.
- V. ASTM C 1325, Specification for Fiber-Mat Reinforced Non-Asbestos Cement Interior Substrate Sheets.

#### **1.04 SUBMITTALS**

- A. Submit product data under provisions of Section 01 33 00.
- B. Provide product data on metal framing, gypsum board, joint tape and edge trim.

#### **1.05 SYSTEM DESCRIPTION**

- A. Conform to applicable building and fire codes for fire rated assemblies.
- B. FIRE RATING REQUIREMENTS: As noted on Drawings, in accordance with UL or WHI listed assembly No's.

#### **1.06 QUALITY ASSURANCE**

- A. APPLICATOR: Company specializing in gypsum board systems work with 5 years documented experience.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS - GYPSUM BOARD SYSTEM**

- A. United States Gypsum Company.
- B. National Gypsum Company.
- C. Georgia-Pacific Corporation.

## **2.02 FRAMING MATERIALS**

- A. FRAMING AND TRACKS: ANSI/ASTM C645; galvanized sheet steel, 26 gage thick, 'C' shape, with serrated faces.
- B. FURRING AND ACCESSORIES: ANSI/ASTM C645.

## **2.03 GYPSUM BOARD MATERIALS**

- A. STANDARD GYPSUM BOARD: ANSI/ASTM C36; 5/8 inch thick, maximum permissible length; ends square cut, tapered edges.
- B. FIRE RATED GYPSUM BOARD: ANSI/ASTM C36; fire resistive type, UL rated; 5/8 inch thick, maximum permissible length; ends square cut, tapered edges.
- C. MOISTURE RESISTANT GYPSUM BOARD: ANSI/ASTM C630; 5/8 inch thick, maximum permissible length; ends square cut, tapered edges.
- D. GYPSUM BACKING BOARD: ANSI/ASTM C442; standard and fire rated type; 5/8 inch thick; square edges, ends square cut, maximum permissible length.
- E. Gypsum Sheathing Board: Dens Glass Gold Exterior Guard by G-P Gypsum; ANSI/ASTM C79; moisture resistant and fire resistant type, thickness as shown on Drawings; maximum permissible length, ends square cut, square edges; water resistant core, glass mat facings.
- F. CEMENT BACKER BOARD: PermaBase Cement Board by National Gypsum Company.
  - 1. Cementitious, water durable, board; surfaced with fiberglass reinforcing mesh on front and back; long edges wrapped.
  - 2. Complying with ANSI A118.9 and ASTM C 1325.
  - 3. Thickness as shown on Drawings; 4 ft. by 8 ft. sheets with tapered edges.
  - 4. COMPRESSIVE STRENGTH: Not less than 2250 lbs. per sq. in. when tested in accordance with ASTM D 2394.
  - 5. WATER ABSORPTION: Not greater than 8 percent when tested for 24 hours in accordance with ASTM C 473.

## **2.04 ACCESSORIES**

- A. ACOUSTICAL INSULATION BATTS: preformed fiberglass, friction fit type without integral vapor barrier membrane, thickness as indicated on Drawings.
- B. ACOUSTICAL SEALANT: Non-hardening, non-skinning, for use in conjunction with gypsum board; USG Acoustical Sealant manufactured by United States Gypsum Company.
- C. CORNER BEADS: Metal.
- D. EDGE TRIM: GA 201 and GA 216; Type L and J exposed reveal bead as indicated.
- E. JOINT MATERIALS: ANSI/ASTM C475; reinforcing tape, joint compound, adhesive, water, and fasteners.
- F. FASTENERS: ANSI/ASTM C646.
- G. ADHESIVE: ANSI/ASTM C557.

## **GYPSUM BOARD ASSEMBLIES**

- H. Provide all other miscellaneous metal framing and gypsum board components and accessory items as required to provide the wall systems as shown on the Drawings and as specified herein.

## **PART 3 EXECUTION**

### **3.01 INSPECTION**

- A. Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop Drawings.
- B. Beginning of installation means acceptance of existing surfaces.

### **3.02 METAL STUD INSTALLATION**

- A. Install studding in accordance with ANSI/ASTM C754 and GA 201 and GA 216.
- B. METAL FRAMING SPACING: 16 inches on center or as indicated on Drawings.
- C. PARTITION HEIGHTS: Full height to floor or roof construction above unless noted otherwise on drawings.
- D. Install additional bracing for partitions extending above ceiling.
- E. DOOR OPENING FRAMING: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height and between studs and adjacent studs.
- F. BLOCKING: Nail wood blocking to studs; bolt or screw steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware and shelves.
- G. Coordinate installation of bucks, anchors, blocking, electrical and mechanical work placed in or behind partition framing.

### **3.03 WALL FURRING INSTALLATION**

- A. Erect wall furring for direct attachment to concrete and concrete block walls.
- B. Erect furring channels vertically. Secure in place on alternate channel flanges at 16 inches on center or as noted on Drawings.
- C. Space furring channels maximum 16 inches on center, or as indicated on Drawings, not more than 4 inches from floor and ceiling lines.
- D. Install thermal insulation vertically and hold in place with Z-furring channels spaced maximum 24 inches on center, not more than 3 inches at external corners and 12 inches at internal corners.
- E. Erect free-standing metal stud framing tight to concrete and concrete masonry walls, attached by adjustable furring brackets in accordance with manufacturer's instructions.

### **3.04 FURRING FOR FIRE RATINGS**

- A. Install furring as required for fire resistance ratings indicated.

### **3.05 CEILING FRAMING INSTALLATION**

- A. Install in accordance with ANSI/ASTM C754, GA 201, GA 216 and manufacturer's instructions.
- B. Coordinate location of hangers with other work.



- C. Install ceiling framing independent of walls, columns and above-ceiling work.
- D. Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 24 inches past each end of openings.
- E. Laterally brace entire suspension system.

### **3.06 ACOUSTICAL ACCESSORIES INSTALLATION**

- A. Place acoustical insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions and tight to items passing through partitions.

### **3.07 GYPSUM BOARD INSTALLATION**

- A. Install gypsum board in accordance with GA 201 and GA 216.
- B. Erect single layer standard gypsum board in most economical direction, with ends and edges occurring over firm bearing.
- C. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
- D. DOUBLE LAYER APPLICATIONS: Use fire rated gypsum backing board for first layer, placed perpendicular to framing or furring members. Place second layer of fire rated gypsum board perpendicular to first layer. Offset joints of second layer from joints of first layer.
- E. Erect exterior gypsum sheathing horizontally, with edges butted tight and ends occurring over firm bearing.
- F. Use screws when fastening gypsum board to metal furring or framing.
- G. Use screws when fastening gypsum board to wood furring or framing.
- H. Treat cut edges and holes in moisture resistant gypsum board and exterior gypsum ceiling board with sealant.
- I. Place control joints consistent with lines of building spaces as indicated or as directed.
- J. Place corner beads at external corners as indicated. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials or as indicated.

### **3.08 CEMENT BOARD INSTALLATION**

- A. Install cement board in accordance with the following reference standards and manufacturer's recommendations: ANSI A108.11 and "PermaBase Cement Board Construction Guide," National Gypsum Co.

### **3.09 JOINT TREATMENT**

- A. Tape, fill and sand exposed joints, edges and corners to produce smooth surface ready to receive finishes.
- B. Perform taping operation in accordance with manufacturer's instructions.
- C. Feather coats onto adjoining surfaces so that camber is maximum 1/32 inch.
- D. Taping, filling and sanding is not required at surfaces behind adhesive applied ceramic tile.

E. Provide Level [4] finish.

**3.10 TOLERANCES**

A. MAXIMUM VARIATION FROM TRUE FLATNESS: 1/8 inch in 10 feet in any direction.

**END OF SECTION 09 21 16**



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## SECTION 09 51 00

## ACOUSTICAL CEILINGS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling systems.
- B. Acoustical panels.
- C. Non-fire rated and fire rated assemblies.
- D. Perimeter trim.

#### 1.02 RELATED SECTIONS

- A. Division 23 Sections: Mechanical Equipment.
- B. Division 26: Electrical.

#### 1.03 REFERENCES

- A. ASTM C635 - Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- B. ASTM C636 - Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
- C. ASTM A 1008 Standard Specification for Steel, Sheet, Cold Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability
- D. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
- E. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process
- F. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method
- G. ASTM D 3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
- H. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials
- I. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Material
- J. Armstrong Fire Guard Products
- K. ASTM E 580 Installation of Metal Suspension Systems in Areas Requiring Moderate Seismic Restraint
- L. ASTM E 1264 Classification for Acoustical Ceiling Products

#### **1.04 QUALITY ASSURANCE**

##### **A. TOLERANCES**

###### **1. DEFLECTION**

- a. Suspension system components, hangers and fastening devices supporting light fixtures, ceiling grilles and acoustical units shall have a maximum deflection 1/360 of the span.
- b. DEFLECTION TEST: ASTM C635.
- c. STRUCTURAL CLASSIFICATION: Intermediate duty.

###### **4. ALLOWABLE TOLERANCE OF FINISHED ACOUSTICAL CEILING SYSTEM: Level within 1/8" in 12'-0".**

#### **1.05 SUBMITTALS**

##### **A. Submit product data and samples under provisions of Section 01 33 00.**

##### **B. SAMPLES:**

- 1. Submit two 12" x 12" samples of each acoustical unit.
- 2. Submit two 6" long samples of main and cross runners and splines.

##### **C. MANUFACTURER'S LITERATURE: Manufacturer's recommendation for installation of suspension system.**

##### **D. MAINTENANCE MATERIAL: Furnish extra materials, two boxes of each acoustical material installed.**

#### **1.06 PRODUCT DELIVERY, STORAGE AND HANDLING**

##### **A. Deliver materials in original, unopened, protective packaging, with manufacturer's labels indicating brand name, pattern, size, thickness and fire rating as applicable, legible and intact.**

##### **B. Store materials in original protective packaging to prevent soiling, physical damage or wetting.**

##### **C. Store cartons open at each end to stabilize moisture content and temperature.**

##### **D. Do not begin installation until sufficient materials to complete a room are received.**

##### **E. Provide to Owner (8) two additional cases of ceiling tiles, used as Attic Stock.**

#### **1.07 ENVIRONMENTAL REQUIREMENTS**

##### **A. Maintain humidity of 65% - 75% in area where acoustical materials are to be installed, 24 hours before, during and 24 hours after installation.**

##### **B. Maintain a uniform temperature in the range of 55 F. - 70 F. prior to and during installation of materials.**

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

##### **A. SUSPENSION SYSTEMS: Armstrong.**

- B. ACOUSTICAL MINERAL UNITS: Armstrong World Industries, United States Gypsum Corp.
- C. SUBSTITUTIONS: Under provisions of Section 01 60 00.

## **2.02 SUSPENSION SYSTEMS**

- A. HANGERS: Wire hangers provided to be not less than 12 gauge galvanized soft annealed steel.
- B. SYSTEM:
  - 1. Exposed tee grid Armstrong Prelude Plus XL:
    - a. Web design: Double-web aluminum with pre-painted aluminum cap.
    - b. Baked Polyester paint
    - c. Exposed flange: 15/16 inch width.
    - d. Color: White

## **2.03 ACOUSTICAL UNITS**

- A. ACOUSTIC CEILING TILE:
  - a. PATTERN: Armstrong Cirrus Open Plan #556. – or to match existing.
  - b. SIZE: 24" x 24" x 5/8".
  - c. EDGE: Angled Tegular.
  - d. COLOR: White.

# **PART 3 EXECUTION**

## **3.01 CONDITION OF SURFACES**

- A. Examine surfaces scheduled to receive suspended acoustical units for unevenness, irregularities, and dampness that would affect quality and execution of work.

## **3.02 INSTALLATION**

### **A. SUSPENSION SYSTEM FOR TILE AND PANELS**

- 1. HANGERS
  - a. Select hanger wires 4 ft. o.c. each direction.
  - b. Install additional hangers at ends of each suspension member, 6 in. from vertical surface.
  - c. Do not splay wires more than 5 in. in a 4 ft. vertical drop.
  - d. Hang system independent of walls, columns, ducts, pipes and conduit. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hanger and related carrying channels to span the extra distance.
  - e. Wrap wire a minimum of three times horizontally, turning ends upward.
- 2. MAIN AND CROSS RUNNERS
  - a. Space main runners at 4 ft. or 5 ft. o.c.; as indicated.
- 3. Wrap wire minimum of three times.
- 4. Level and square to adjacent walls.
  - a. Space cross runners at 2 ft. o.c.

- b. Do not support lighting fixtures, other equipment or components on main runners or cross runners if light causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.

**5. WALL MOLDING**

- a. Install wall molding at intersection of suspended ceiling and vertical surfaces.
  - b. Miter corners where wall moldings intersect or install corner caps.
  - c. Attach to vertical surface with mechanical fasteners.
  - d. Install spring spacers at wall molding to hold acoustical unit snug on flange of wall molding.
6. Install hold down clips on all tiles within 10 feet of an exterior door.

**3.02 CLEANING**

- A. Clean soiled or discolored unit surfaces after installation.
- B. Touch up scratches, abrasions, voids, and other defects in painted surfaces.
- C. Remove and replace damaged, mismatched finish or improperly installed units.

**END OF SECTION 09 51 00**



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## SECTION 09 65 00

## RESILIENT FLOORING – VINYL SHEET FLOORING

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Section Includes:
  - 1. Flooring and accessories as shown on the drawings and schedules and as indicated by the requirements of this section.
- B. Related Documents
  - 1. Drawings and General Provisions of the Contract (including General and Supplementary Conditions and Division 1 sections) apply to the work of this section.
- C. Related Sections:
  - 1. Other Division 9 sections for floor finishes related to this section but not the work of this section
  - 2. Division 3 Concrete; not the work of this section
  - 3. Division 6 Wood and Plastics; not the work of this section
  - 4. Division 7 Thermal and Moisture Protection; not the work of this section

#### 1.02 REFERENCES

- A. Armstrong Flooring Technical Manuals
  - 1. Armstrong Flooring Guaranteed Installation Systems manual, F-5061
  - 2. Armstrong Flooring Maintenance Recommendations and Procedures, manual, F-8663
- B. ASTM International:
  - 1. ASTM E 648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source
  - 2. ASTM E 662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials
  - 3. ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring
  - 4. ASTM F 1303 Standard Specification for Sheet Vinyl Floor Covering with Backing
  - 5. ASTM F 1482, Standard Guide to Wood Underlayment Products Available for Use Under Resilient Flooring
  - 6. ASTM F 1861 Standard Specification for Resilient Wall Base
  - 7. ASTM F 1869 Standard Test Method for Measuring Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride
  - 8. ASTM F 2170 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes
- C. National Fire Protection Association (NFPA):
  - 1. NFPA 253 Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source
  - 2. NFPA 258 Standard Test Method for Measuring the Smoke Generated by Solid Materials
- D. Standards Council of Canada
  - 1. CAN/ULC-S102.2 Standard Test Method for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies

### 1.03 SYSTEM DESCRIPTION

- A. Performance Requirements: Provide flooring which has been manufactured, fabricated and installed to performance criteria certified by manufacturer without defects, damage, or failure.
- B. Administrative Requirements
  - 1. Pre-installation Meeting: Conduct an on-site pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions and manufacturer's warranty requirements. Comply with Division 1 Project Management and Coordination (Project Meetings) Section.
  - 2. Pre-installation Testing: Conduct pre-installation testing as follows: [Specify testing (i.e. moisture tests, bond test, pH test, etc)]
- C. Test Installations/ Mock-ups: Install at the project site a job mock-up using acceptable products and manufacturer approved installation methods, including concrete substrate testing. Obtain Owner's and Consultant's acceptance of finish color, texture and pattern, and workmanship standards.
  - 1. Mock-Up Size: 10 ft x 10 ft
  - 2. Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legally dispose of mock-up when no longer required.
  - 3. Incorporation: Mock-up may be incorporated into the final construction with Owner's approval.
- D. Sequencing and Scheduling
  - 1. Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.
  - 2. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond, moisture tests and pH test.

### 1.04 SUBMITTALS

- A. Submit shop drawings, seaming plan, coving details, and manufacturer's technical data, installation and maintenance instructions (latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061. for flooring and accessories.
- B. Submit the manufacturer's standard samples showing the required colors for flooring, welding rods, and applicable accessories.
- C. Submit Safety Data Sheets (SDS) available for adhesives, moisture mitigation systems, primers, patching/leveling compounds, floor finishes (polishes) and cleaning agents and Material Information Sheets for flooring products.
- D. If required, submit the manufacturer's certification that the flooring has been tested by an independent laboratory and complies with the required fire tests.
- E. Closeout Submittals: Submit the following:
  - 1. Operation and Maintenance Data: Operation and maintenance data for installed products in accordance with Division 1 Closeout Submittals (Maintenance Data and Operation Data) Section. Include methods for maintaining installed products, and precautions against cleaning materials and methods detrimental to finishes and performance.
  - 2. Warranty: Warranty documents specified herein

### 1.05 QUALITY ASSURANCE

- A. Single-Source Responsibility: provide types of flooring and accessories supplied by one manufacturer, including moisture mitigation systems, primers, leveling and patching compounds, and adhesives.
- B. Select an installer who is experienced and competent in the installation of Armstrong resilient sheet flooring using heat-welded seams.



1. Engage installers certified as Armstrong Commercial Flooring Certified Installers
  2. Confirm installer's certification by requesting their credentials
- C. Fire Performance Characteristics: Provide resilient vinyl sheet flooring with the following fire performance characteristics as determined by testing material in accordance with ASTM test methods indicated below by a certified testing laboratory or other testing agency acceptable to authorities having jurisdiction:
1. ASTM E 648 Critical Radiant Flux of 0.45 watts per sq. cm. or greater, Class I
  2. ASTM E 662 (Smoke Generation) Maximum Specific Optical Density of 450 or less
  3. CAN/ULC-S102.2 – Flame Spread Rating and Smoke Developed – Results as tested

#### **1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Comply with Division 1 Product Requirements Sections
- B. Comply with manufacturer's ordering instructions and lead time requirements to avoid construction delays.
- C. Deliver materials in good condition to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.
- D. Store materials in a clean, dry, enclosed space off the ground, protected from harmful weather conditions and at temperature and humidity conditions recommended by the manufacturer. Protect adhesives from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.

#### **1.07 PROJECT CONDITIONS**

- A. Maintain a minimum temperature in the spaces to receive the flooring and accessories of 65°F (18°C) and a maximum temperature of [100°F (38°C)][85°F (29°C)] for at least 48 hours before, during, and for not less than 48 hours after installation. Thereafter, maintain a minimum temperature of 55°F (13°C) in areas where work is completed. Protect all materials from the direct flow of heat from hot-air registers, radiators, or other heating fixtures and appliances. Refer to the Armstrong Flooring Guaranteed Installations Systems manual, F-5061 for a complete guide on project conditions.

#### **1.08 LIMITED WARRANTY**

- A. Resilient Flooring: Submit a written warranty executed by the manufacturer, agreeing to repair or replace resilient flooring that fails within the warranty period.
- B. Limited Warranty Period: 5 years
- C. The Limited Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.
- D. For the Limited Warranty to be valid, this product is required to be installed using the appropriate Armstrong Flooring Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.

#### **1.09 EXTENDED SYSTEM LIMITED WARRANTY**

- A. Resilient Flooring System: Submit a written warranty executed by the manufacturer, agreeing to repair or replace system (subfloor preparation products, adhesive, and floor covering) that fails within the warranty period.
- B. Limited Warranty Period: 10 years on top of the Resilient Flooring Limited Warranty
- C. [S-453 Level Strong™ cement based self-leveling compound] [S-456 Patch Strong™ flexible patching and smoothing compound] [S-454 Prime Strong™ acrylic primer for porous substrates] [S-455 Prime Strong™ acrylic primer for non-porous substrates] [S-452 Seal Strong™ two part moisture mitigation system]
- D. The installation of an Armstrong Flooring product along with the recommended Armstrong Flooring adhesive, as well as any one of the Strong System subfloor preparation products listed above, provides 10 additional years of limited warranty coverage. The Strong System limited warranty covers the installation integrity for the length of the flooring product warranty plus 10 years. In order to qualify for the Strong System Warranty, any subfloor preparation product needed for an installation must be an Armstrong Flooring product.
- E. For the System Limited Warranty to be valid, this product is required to be installed using the appropriate Armstrong Flooring Guaranteed Installation System. Product installed not using the specific instructions from the Guaranteed Installation System will void the warranty.
- F. When Armstrong Flooring Strong System subfloor preparation products are used with other manufacturers' floor coverings, adhesives, or other subfloor preparation products, Armstrong Flooring warrants our products to be free from manufacturing defects from the date of purchase through the limited warranty period of 15 years.

## 1.10 MAINTENANCE

- A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials from same production run as products installed. Packaged with protective covering for storage and identified with appropriate labels.
  - 1. Quantity: Furnish quantity of flooring units equal to 10% of amount installed.
  - 2. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra material.

## PART 2 PRODUCTS

### 2.01 MANUFACTURER

- A. Resilient sheet flooring, wall base, adhesives and subfloor preparation products and accessories:
  - 1. Armstrong Flooring Inc., 2500 Columbia Avenue, Lancaster, PA 17603, [www.armstrongflooring.com/commercial](http://www.armstrongflooring.com/commercial)
  - 2. Manufacturer must have a headquarters in the United States of America

### 2.02 RESILIENT SHEET FLOORING MATERIALS

- A. Provide Safety Zone™ Sheet Slip-retardant Flooring.
  - 1. Description: An unbacked, nonlayered, homogeneous consolidated vinyl chip sheet flooring. The colors and pattern detail are dispersed uniformly throughout the thickness of the product. Consisting of an embossed, slip-retardant wear layer with aluminum oxide mineral aggregate encapsulated in a polyurethane finish. Colors are insoluble in water and resistant to cleaning agents and light.
  - 2. Homogeneous slip retardant sheet flooring shall conform to the requirements of ASTM F1913 Standard Specification for Sheet Vinyl Floor Covering without Backing,

3. Pattern and Color: in [%COLOR%][color selected from the range currently available from Armstrong Flooring Inc.]
  4. Width: 6 ft. (1.83 m)
  5. Length: up to 66 lineal feet (20 meters)
  6. Thickness: 0.080 in. (2.0 mm)
  7. Slip Resistance: A minimum of R11 in accordance with AS 4586 Slip Resistance Classification of New Pedestrian Surface Materials Appendix D Oil/Wet Ramp Test.
- B. Vinyl Weld Rod:
1. Provide solid color vinyl weld rod as produced by Armstrong Flooring Inc., and intended for heat welding of seams. Color shall be compatible with field color of flooring or as selected by Architect to contrast with field color of flooring. Color selected from the range currently available from Armstrong Flooring Inc.

### 2.03 PRODUCT SUBSTITUTION

- A. Substitutions: No substitutions permitted because of the specific attributes listed in Section 2.02.

### 2.04 WALL BASE MATERIALS

- A. For integral flash cove base: Provide integral flash cove wall base by extending sheet flooring 4 in. up the wall using adhesive, welding rod, and accessories recommended and approved by the flooring manufacturer.

### 2.05 ADHESIVES

- A. Provide Armstrong [S-599 Vinyl Sheet Flooring Adhesive Premium Commercial] [S-240 Epoxy Flooring Adhesive] for field areas and Armstrong [S-580 Flash Cove Adhesive at flash coving][S-725 Wall Base Adhesive at the wall base] as recommended by the flooring manufacturer.
- B. [For Perimeter Plus Installation System, provide Armstrong [S-543 Premium Plus Commercial Sheet Flooring Adhesive] [S-599 Premium Vinyl-Back Flooring Adhesive] [Armstrong Flip™ Spray Adhesive] for field areas and S-240 Epoxy Adhesive at the perimeter and Armstrong [S-725 Wall Base Adhesive at the wall base] as recommended by the flooring manufacturer
- C. [For High-Moisture Installation Warranty, Full Spread: Provide Armstrong S-543 Commercial Sheet Flooring and LVT Adhesive for field areas and Armstrong [S-580 Flash Cove Adhesive at flash coving][S-725 Wall Base Adhesive at the wall base] as recommended by the flooring manufacturer].
- D. [For Spray Adhesive High-Moisture Installation Warranty, Full Spread: Provide Armstrong Flooring Flip™ Spray Adhesive for field areas and Armstrong [S-580 Flash Cove Adhesive at flash coving][S-725 Wall Base Adhesive at the wall base] as recommended by the flooring manufacturer].

### 2.06 ACCESSORIES

- A. For patching, smoothing, and leveling monolithic subfloors (concrete, terrazzo, quarry tile, ceramic tile, and certain metals), provide Armstrong [S-184 Fast-Setting Cement-Based Patch and Underlayment] [S-194 Cement-Based Patch, Underlayment and Embossing Leveler / S-195 Underlayment Additive] [S-453 Level Strong™ cement based self-leveling compound] [S-456 Patch Strong™ flexible patching and smoothing compound]. [For priming porous substrates to aid in adhesive bond strength and reducing subfloor porosity, provide S-454 Prime Strong™ acrylic primer for porous substrates. For non-porous substrates, provide S-455 Prime Strong™ acrylic primer for non-porous substrates].
- B. [For creating a moisture barrier, provide S-452 Seal Strong™ two part moisture mitigation system].

- C. For sealing joints between the top of wall base or integral cove cap and irregular wall surfaces such as masonry, provide plastic filler applied according to the manufacturer's recommendations.
- D. [Provide top edge trim caps of [plastic] [anodized aluminum] [plastic zero reducer] for integral flash cove as approved by the Architect.]
- E. [Provide a fillet support strip for integral cove base with a minimum radius of 1 in. (2.54 cm) of wood or plastic.]
- F. Provide transition/reducing strips tapered to meet abutting materials.
- G. Provide threshold of thickness and width as shown on the drawings.
- H. Provide resilient edge strips of width shown on the drawings, of equal gauge to the flooring, homogeneous vinyl or rubber composition, tapered or bullnose edge, with color to match or contrast with the flooring, or as selected by the Architect from standard colors available.
- I. Provide metal edge strips of width shown on the drawings and of required thickness to protect exposed edges of the flooring. Provide units of maximum available length to minimize the number of joints. Use butt-type metal edge strips for concealed anchorage, or overlap-type metal edge strips for exposed anchorage. Unless otherwise shown, provide strips made of extruded aluminum with a mill finish.

## **PART 3 - EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

- A. Compliance: Comply with manufacturer's product data, including technical bulletins, product catalog, installation instructions, and product carton instructions for installation and maintenance procedures as needed.

### **3.02 EXAMINATION**

- A. Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions (i.e. moisture tests, bond test, pH test, etc.).
- B. Visually inspect flooring materials, adhesives and accessories prior to installation. Flooring material with visual defects shall not be installed and shall not be considered as a legitimate claim.
- C. Examine subfloors prior to installation to determine that surfaces are smooth and free from cracks, holes, ridges, and other defects that might prevent adhesive bond or impair durability or appearance of the flooring material.
- D. Inspect subfloors prior to installation to determine that surfaces are free from curing, sealing, parting and hardening compounds; residual adhesives; adhesive removers; and other foreign materials that might prevent adhesive bond. Visually inspect for evidence of moisture, alkaline salts, carbonation, dusting, mold, or mildew.
- E. Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.
- F. Failure to call attention to defects or imperfections will be construed as acceptance and approval of the subfloor. Installation indicates acceptance of substrates with regard to conditions existing at the time of installation.

### **3.03 PREPARATION**

- A. Subfloor Preparation Moisture Mitigation: Smooth concrete surfaces, removing rough areas, projections, ridges, and bumps, and filling low spots, control or construction joints, review and if necessary correct level floors towards floor drains and other defects with Armstrong Flooring S-

453 Level Strong™ cement based self-leveling compound, S-456 Patch Strong™ flexible patching and smoothing compound and S-454 Prime Strong™ acrylic primer for porous substrates and S-455 Prime Strong™ acrylic primer for non-porous substrates as recommended by the flooring manufacturer. Refer to Armstrong Flooring Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.

- B. Subfloor Cleaning: The surface shall be free of dust, solvents, varnish, paint, wax, oil, grease, sealers, release agents, curing compounds, residual adhesive, adhesive removers and other foreign materials that might affect the adhesion of resilient flooring to the concrete or cause a discoloration of the flooring from below. Remove residual adhesives as recommended by the flooring manufacturer. Remove curing and hardening compounds not compatible with the adhesives used, as indicated by a bond test or by the compound manufacturer's recommendations for flooring. Avoid organic solvents. Spray paints, permanent markers and other indelible ink markers must not be used to write on the back of the flooring material or used to mark the concrete slab as they could bleed through, telegraphing up to the surface and permanently staining the flooring material. If these contaminants are present on the substrate they must be mechanically removed prior to the installation of the flooring material. Refer to the Armstrong Flooring Guaranteed Installation Systems manual, F-5061 and ASTM F 710 Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring for additional information on subfloor preparation.
- C. Moisture Testing: For High-Moisture Installation Warranty when using Armstrong Flooring S-543 Adhesive ), perform subfloor moisture testing in accordance with [ASTM F 2170, Standard Test Method for Determining Relative Humidity in Concrete Slabs Using *in-situ* Probes][ASTM F 1869, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride] and Bond Tests as described in publication F-5061, Armstrong Flooring Guaranteed Installation Systems, manual, to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. [Internal relative humidity of the concrete shall not exceed 90%.][MVER shall not exceed 5 lbs./1000 sq. ft./24 hrs.] On installations where both the Percent Relative Humidity and the Moisture Vapor Emission Rate tests are conducted, results for both tests shall comply with the allowable limits listed above. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained].
- D. Moisture Testing: [For Spray Adhesive High-Moisture Installation Warranty, using Armstrong Flooring Flip™ Spray Adhesive, perform subfloor moisture testing in accordance with ASTM F 2170, "Standard Test Method for Determining Relative Humidity in Concrete Slabs Using *in-situ* Probes" and Bond Tests as described in publication F-5061, "Armstrong Flooring Guaranteed Installation System," manual to determine if surfaces are dry; free of curing and hardening compounds, old adhesive, and other coatings; and ready to receive flooring. Internal relative humidity of the concrete shall not exceed 95%. Do not proceed with flooring installation until results of moisture tests are acceptable. All test results shall be documented and retained].
- E. Concrete pH Testing: Perform pH tests on concrete floors regardless of their age or grade level. All test results shall be documented and retained.

### 3.04 INSTALLATION OF FLOORING

- A. Install flooring in strict accordance with the latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061. Failure to comply may result in voiding the manufacturer's warranty listed in Section 1.08.
- B. Install flooring wall to wall before the installation of floor-set cabinets, casework, furniture, equipment, movable partitions, etc. Extend flooring into toe spaces, door recesses, closets, and similar openings as shown on the drawings.
- C. If required, install flooring on pan-type floor access covers. Maintain continuity of color and pattern within pieces of flooring installed on these covers. Adhere flooring to the subfloor around covers and to covers.

- D. Scribe, cut, and fit or flash cove to permanent fixtures, columns, walls, partitions, pipes, outlets, and built-in furniture and cabinets.
- E. Adhere flooring to the subfloor without cracks, voids, raising and puckering at the seams. Roll with a 100-pound (45.36 kilogram) roller in the field areas. Hand-roll flooring at the perimeter and the seams to assure adhesion. Refer to specific rolling instructions of the flooring manufacturer.
- F. Lay flooring to provide a minimum number of seams. Avoid cross seams, filler pieces, and strips. Match edges for color shading and pattern at the seams in compliance with the manufacturer's recommendations.
- G. Install flooring with adhesives, tools, and procedures in strict accordance with the manufacturer's written instructions. Observe the recommended adhesive trowel notching, open times, and working times.
- H. Prepare heat-welded seams with special routing tool supplied for this purpose and heat weld with vinyl welding rod in seams. Use methods and sequence of work in conformance with written instructions of the flooring manufacturer. Finish all seams flush and free from voids, recesses, and raised areas.
- I. Provide integral flash cove wall base where shown on the drawings, including cove fillet support strip and top edge cap trim. Construct flash cove base in accordance with the flooring manufacturer's instructions. Heat-weld seams as specified for those on the floor.

### **3.05 INSTALLATION OF ACCESSORIES**

- A. Apply top set wall base to walls, columns, casework, and other permanent fixtures in areas where top-set base is required. Install base in lengths as long as practical, with inside corners fabricated from base materials that are mitered or coped. Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.
- B. Fill voids with plastic filler along the top edge of the resilient wall base or integral cove cap on masonry surfaces or other similar irregular substrates.
- C. Place resilient edge strips tightly butted to flooring, and secure with adhesive recommended by the edge strip manufacturer. Install edge strips at edges of flooring that would otherwise be exposed.
- D. Apply [butt-type] [overlap] metal edge strips where shown on the drawings, [before] [after] flooring installation. Secure units to the substrate, complying with the edge strip manufacturer's recommendations.

### **3.06 CLEANING**

- A. Perform initial and on-going maintenance according to the latest edition of Armstrong Flooring Maintenance Recommendations and Procedures manual, F-8663.

### **3.07 PROTECTION**

- A. Protect installed flooring as recommended by the flooring manufacturer against damage from rolling loads, other trades, or the placement of fixtures and furnishings. (See Finishing The Job in the latest edition of Armstrong Flooring Guaranteed Installation Systems manual, F-5061.)

**END OF SECTION 09 65 16**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 09 91 00

### PAINTING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Surface finish schedule.

##### 1.02 REFERENCES

- A. ANSI/ASTM D16 - Definitions of Terms Relating to Paint, Varnish, Lacquer and Related Products.
- B. ASTM D2016 - Test Method for Moisture Content of Wood.

##### 1.03 DEFINITIONS

- A. Conform to ANSI/ASTM D16 for interpretation of terms used in this Section.

##### 1.04 QUALITY ASSURANCE

- A. PRODUCT MANUFACTURER: Company specializing in manufacturing quality paints and finish products with 20 years experience.
- B. APPLICATOR: Company specializing in commercial painting and finishing with 10 years documented experience.

##### 1.05 REGULATORY REQUIREMENTS

- A. Conform to applicable code for flame/fuel/smoke rating requirements for finishes.

##### 1.06 ENVIRONMENTAL REQUIREMENTS

- A. Low VOC Requirement (NE CHPS EQ7.0 Low Emitting Materials) – Affected Products - All Wall Paint, primers, coatings, sealers, Floor Sealers and coatings. 90% or more, of the total volumes of such products shall meet the applicable VOC content requirements of the California Air Resources Board (CARB) 2007, Suggested Control Measure (SCM) for architectural coatings, or the South Coast Air Quality Management District (SCAQMD) Rule 1113, Effective June 3, 2011. Compliance shall be documented by product data sheets or equivalent. Use definitions and table values in the selected VOC content standard and clearly identify the standard selected for each product.
- B. Provide continuous ventilation and heating facilities to maintain surface and ambient temperatures above 45 degrees F for 24 hours before, during and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.

- C. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent unless allowed or required otherwise by manufacturer's instructions. MINIMUM APPLICATION TEMPERATURES FOR LATEX PAINTS: 45 degrees F for interiors; 50 degrees F for exterior; unless allowed or required otherwise by manufacturer's instructions.
- D. MINIMUM APPLICATION TEMPERATURE FOR VARNISH AND URETHANE FINISHES: 65 degrees F for interior or exterior, unless allowed or required otherwise by manufacturer's instructions.
- E. Provide lighting level of 80 ft candles measured mid-height at substrate surface.

#### **1.07 SUBMITTALS**

- A. Submit product data under provisions of Section 01 33 00.
- B. Provide product data on all finishing products and special coatings.
- C. Submit samples under provisions of Section 01 33 00.
- D. Submit two samples 1 x 1 inch in size illustrating range of colors and textures available for each surface finishing product scheduled, for selection.
- E. Submit manufacturer's application instructions under provisions of Section 01 33 00.

#### **1.08 FIELD SAMPLES**

- A. Provide samples under provisions of Section 01 33 00.
- B. Provide one field sample panel for each type of coating, 4 feet square, illustrating coating color, texture and finish.
- C. Locate where directed by Architect.
- D. Accepted sample may not remain as part of the Work.

#### **1.09 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products to site under provisions of Section 01 60 00.
- B. Store and protect products under provisions of Section 01 60 00.
- C. Deliver products to site in sealed and labeled containers; inspect to verify acceptance.
- D. Container labeling to include manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation and instructions for mixing and reducing.
- E. Store paint materials at minimum ambient temperature of 45 degrees F and a maximum of 90 degrees F, in well ventilated area, unless required otherwise by manufacturer's instructions.
- F. Take precautionary measures to prevent fire hazards and spontaneous combustion.

#### **1.10 EXTRA STOCK**

- A. Provide a ten gallon container of each color and surface texture to Owner.
- B. Label each container with color, texture and room locations, in addition to the manufacturer's label.

### **PART 2 PRODUCTS**

#### **2.01 ACCEPTABLE MANUFACTURERS**

##### **PAINTING**



- A. Except as otherwise specified, materials shall be the first line products of the following manufacturers:
  - 1. Benjamin Moore.
  - 2. Pittsburgh Paints.
  - 3. Sherwin Williams.
- B. Materials selected for coating systems for each type surface shall be the product of a single manufacturer.

## **2.02 MATERIALS**

- A. Products specified are as manufactured by paint companies identified with manufacturers listed in Paragraph 2.01.
- B. Select primary products of the coating system from the products of a single manufacturer.
- C. Secondary products not specified by name and required for the job, such as shellac, thinners, putty, shall be "best grade" or "first line" products of a reputable manufacturer.
- D. COATINGS
  - 1. Ready mixed, except field catalyzed coatings; tile-like gloss finish.
  - 2. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
  - 3. Good flow and brushing properties; capable of drying or curing free of streaks or sags.
- E. ACCESSORY MATERIALS: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
- F. EPOXY FLOOR PAINT:
  - 1. Basis of Design: Sherwin-Williams: ArmorSeal™ or AQUARMOR™

## **2.03 FINISHES**

- A. Refer to schedule at end of Section for surface finish schedule.
- B. In addition to the finish systems specified in the painting schedule, materials shall be lead-free.

## **2.04 TINTING AND MIXING**

- A. Job mixing or tinting may be done only when approved by the Architect.

## **2.05 COLORS AND PATTERNS**

- A. Colors shall be as selected by the Architect from the manufacturer's standard range of colors.
- B. The Architect reserves the right to select, allocate and vary colors on different surfaces throughout the building.

# **PART 3 EXECUTION**

## **3.01 INSPECTION**

- A. Verify that surfaces or substrate conditions are ready to receive work as instructed by the product manufacturer.

- B. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
  - 1. CONCRETE UNIT MASONRY: 12 percent.
- D. Beginning of installation means acceptance of surfaces or substrate.

### **3.02 PREPARATION**

- A. Remove electrical plates, hardware, light fixtures trim and fittings prior to preparing surfaces or finishing.
- B. Correct minor defects and clean surfaces which affect work of this Section.
- C. IMPERVIOUS SURFACES: Remove mildew by scrubbing with solution of tri-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- D. UNIT MASONRY SURFACES SCHEDULED TO RECEIVE PAINT FINISH: Remove dirt, loose mortar, scale, salt or alkali powder and other foreign matter. Remove oil and grease with a solution of tri-sodium phosphate; rinse well and allow drying. Remove stains caused by weathering of corroding metals with a solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.

### **3.03 PROTECTION**

- A. Protect elements surrounding the work of this Section from damage or disfiguration.
- B. Repair damage to other surfaces caused by work of this Section.
- C. Furnish drop cloths, shields, and protective methods to prevent spray or droppings from disfiguring other surfaces.
- D. Remove empty paint containers from site.

### **3.04 APPLICATION**

- A. Apply products in accordance with manufacturer's instructions.
- B. Do not apply finishes to surfaces that are not dry.
- C. Apply each coat to uniform finish.
- D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.
- E. Sand lightly between coats to achieve required finish.
- F. Allow applied coat to dry before next coat is applied.
- G. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- H. Prime back surfaces of interior and exterior woodwork with primer paint.
- I. Prime back surfaces of interior woodwork scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with mineral spirits.

### 3.05 FINISHING MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Paint shop primed equipment.
- B. Remove unfinished louvers, grilles, covers and access panels on mechanical and electrical components and paint separately.
- C. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports except where items are prefinished.
- D. Replace identification markings on mechanical or electrical equipment when painted accidentally.
- E. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles and convector and baseboard cabinets to match face panels.
- F. Paint exposed conduit and electrical equipment occurring in finished areas.
- G. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
- H. Replace electrical plates, hardware, light fixture trim and fittings removed prior to finishing.

### 3.06 CLEANING

- A. As Work proceeds, promptly remove paint where spilled, splashed or spattered.
- B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials and debris.
- C. Collect cotton waste, cloths and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.
- D. Touch up and restore finish where damaged. Do not mar surface finish of item being cleaned.
- E. Leave storage space clean and in condition required for equivalent spaces in project.

### 3.07 SCHEDULE - INTERIOR SURFACES

- A. CONCRETE BLOCK
  - PRIME COAT: LATEX BLOCK FILLER
  - 1<sup>ST</sup> FINISH COAT: ALKYD SATIN ENAMEL
  - 2<sup>ND</sup> FINISH COAT: ALKYD SATIN ENAMEL
- B. STEEL PRIMED
  - PRIME COAT: ACRYLIC LATEX
  - 1<sup>ST</sup> FINISH COAT: ACRYLIC LATEX
  - 2<sup>ND</sup> FINISH COAT: ACRYLIC LATEX
- C. GYPSUM BOARD WALLS & CEILINGS
  - PRIME COAT: ACRYLIC LATEX
  - 1<sup>ST</sup> FINISH COAT: ACRYLIC LATEX
  - 2<sup>ND</sup> FINISH COAT: ACRYLIC LATEX

END OF SECTION 09 91 00



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 10 21 13

## TOILET COMPARTMENTS

### PART 1 GENERAL

#### 1.1 SECTION INCLUDES

- A. Stainless steel partitions.

#### 1.2 RELATED SECTIONS

- A. Section 05500 - Metal Fabrications: Concealed steel support members.
- B. Section 06110 - Wood Framing: Concealed wood framing and blocking for compartment support.
- C. Section 10800 - Toilet and Bath Accessories.

#### 1.3 REFERENCES

- A. ASTM International:
  - 1. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM D 1735 - Standard Practice for Testing Water Resistance of Coatings Using Water Fog Apparatus
  - 3. ASTM D 2247 - Standard Practice for Testing Water Resistance of Coatings in 100 percent Relative Humidity
- B. United States Green Building Council (USGBC): LEED Green Building Rating System.

#### 1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. [ Product Data ]: Manufacturer's data sheets on each product to be used, including:
  - 1. Literature indicating typical panel, pilaster, door, hardware and fastening.
  - 2. Preparation instructions and recommendations.
  - 3. Storage and handling requirements and recommendations.
  - 4. Installation methods.
- C. Shop Drawings:
  - 1. Dimensioned plans indicating layout of toilet compartments.
  - 2. Dimensioned elevations indicating heights of doors, pilasters, separation partitions, and other components; indicate locations and sizes of openings in compartment separation partitions for toilet and bath accessories to be installed in partitions; indicate floor and ceiling clearances.
  - 3. Details indicating anchoring components (bolt layouts) and methods for project conditions; indicate components required for installation, but not supplied by toilet compartment manufacturer.
- D. Selection Samples: For each finish product specified, one complete set of color selection

guides representing manufacturer's full range of available colors, textures and patterns.

- E. Verification Samples: For each finish product specified, two samples representing actual product, color, texture and pattern.
- F. LEED Green Building Rating System: Submit manufacturer's documentation of recycled content, in accordance with LEED credit calculations.
- G. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.
- B. Store products indoors in manufacturer's or fabricator's original containers and packaging, with labels clearly identifying product name and manufacturer. Protect from damage.
- C. Lay cartons flat, with adequate support to ensure flatness and to prevent damage to pre-finished surfaces.
- D. Do not store where ambient temperature exceeds 120 degrees F (49 degrees C).

#### 1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- B. Do not deliver materials or begin installation until building is enclosed, with complete protection from outside weather, and building temperature maintained at a minimum of 60 degrees F (15.6 degrees C).

#### 1.7 WARRANTY

- A. Manufacturers Standard Warranty: Provide warranty for Stainless Steel Material: Against corrosion or discoloration for 5 years, assuming proper maintenance according to manufacturer's recommendations.

#### 1.8 COORDINATION

- A. Coordinate Work with placement of support framing and anchors in walls and ceilings.

### PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Acceptable Manufacturer: ASI Global Partitions, which is located at: 900 Clary Connector; Eastanollee, GA 30538; Tel: 706-827-2700; Fax: 706-827-2710; Email: [request info](mailto:request%20info%20sales%40asi-globalpartitions.com) ([sales@asi-globalpartitions.com](mailto:sales@asi-globalpartitions.com)); Web: <http://asi-globalpartitions.com>
  - 1. Other Acceptable Manufacturer: ASI Accurate Partitions; Burr Ridge IL; Tel: 708-442-6800; Web: <http://www.asi-accuratepartitions.com>.
  - 2. No other manufacturer will be accepted without ASTM performance compliance.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01600 during the bidding period **only**.

#### 2.2 COMPARTMENTS AND SCREENS

- A. Toilet Compartments: Floor anchored/overhead braced.
  - 1. Compartment Depth and Width: As scheduled and indicated on Drawings.
  - 2. Door Width: As scheduled and indicated on Drawings.
  - 3. Height Above Floor: 9 inches (229 mm) - Ultimate Privacy.

4. Door/Panel Height: 72 inches (1829 mm) - Ultimate Privacy.
  5. Pilaster Height: 84 inches (2134 mm) - Ultimate Privacy 72, 9 inches (229 mm) above floor.
- B. Privacy and Urinal Screens: Wall hung.
1. Screen Panel Size: 18 inches (457 mm) wide by 42 inches (1067 mm) high.
  2. Height Above Floor: 18 inches (457 mm) for 42 inches (1067 mm) high.

## 2.3 STAINLESS STEEL TOILET COMPARTMENTS

- A. Doors, Panels, Screens, and Pilasters: Tension leveled stainless steel face sheet with number 4 finish, bonded under pressure to honeycomb core with non-toxic adhesive.
1. Doors, Screens, and Panels: 1 inch (25 mm) thick, 22 gage (0.793 mm) steel.
  2. Pilasters: Overhead Braced, Floor to Ceiling, 1-1/4 inches (32 mm) thick, 22 gage (0.793 mm) steel.
  3. Edge Moldings: Continuous roll-formed, interlocking 22 gage (0.793 mm) steel crown molding, welded and ground smooth at corners.
  4. Finish: Type 304 stainless steel No. 4 Satin finish.
- B. No-Sight System: Required.
1. Hinge and strike side filler, brushed finish to match partitions.
- C. Door Hardware:
1. Finish: Type 304 Stainless Steel, No. 4 satin finish attached with theft resistant barrel nuts and shoulder screws.
  2. Hinges: Top hinge recessed and interlocked in door, with nylon pin in the plane of the door, through-bolted. Bottom hinge recessed in door, with mating box and pintle nylon cams providing the bearing surface; adjustable to allow door to rest at any position within a 270 degree range; through-bolted.
  3. Strike and Keeper: With concealed latch assembly and provisions for external emergency access.
  4. Handicapped Access: ADA paddle handles on doors.
  5. Coat Hook and Bumper: Manufacturer's standard surface mounted. Tamper-resistant screws.
  6. Door Pull: Standard on ADA compartments. Two per ADA door.
  7. Fastening Hardware: Theft resistant heads.
- D. Mounting Brackets: Type 304 Stainless Steel, No. 4 satin finish continuous bracket with theft resistant screws.
- E. Mounting Channels: Ultimate Privacy. 4 inches (102 mm) deep. Type 304 stainless steel, No. 4 satin finish, continuous channel with theft resistant screws.
- F. Pilaster Shoes: Type 304 Stainless Steel, No. 4 satin finish. Minimum 4 inches (102 mm) high secured to floor w/internal clips for ceiling hung, floor to ceiling and floor mounted. For floor mounted overhead braced the shoe shall be 3 inches (76 mm) high.
- G. Headrail: Manufacturer's standard, Anodized Aluminum; with anti-grip profile.
- H. Pilaster Anchors: Floor Anchored/Overhead Braced.
1. Inverted stirrup with jack bolt for leveling during installation and permanent height adjustment.
  2. Welded to base of pilaster, with "L" brackets coupled to stirrup bracket and floor for full range adjustment; concealed by pilaster shoe after installation.

## PART 3 EXECUTION

### 3.1 EXAMINATION AND PREPARATION

- A. Inspect and prepare substrates using the methods recommended by the manufacturer for achieving best result for the substrates under project conditions. Clean surfaces thoroughly prior to installation.

- B. Do not proceed with installation until substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.
- C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.
  - 1. Verify dimensions of areas to receive compartments.
  - 2. Verify locations of built-in framing, anchorage, bracing, and plumbing fixtures.

### **3.2 INSTALLATION**

- A. Install in accordance with approved shop drawings and manufacturer's instructions.
- B. Fasten components to adjacent materials and to other components using purpose-designed fastening devices.
- C. Adjust pilaster anchors for substrate variations; conceal anchors with pilaster shoes.
- D. Equip each compartment door with hinges and door latch.
- E. Install door strike keeper on pilasters in alignment with door latch.
- F. Equip each compartment door with one coat hook and bumper.
- G. Installation Tolerances:
  - 1. Maximum variations from plumb or level: 1/8 inch (3 mm).
  - 2. Clearance between wall surface and panels or pilasters: 1-1/2 inch (38 mm) maximum.

### **3.3 ADJUSTING**

- A. Adjust and align hardware to uniform clearance at vertical edge of doors.
- B. Adjust adjacent components for consistency of line or plane.

### **3.4 PROTECTION**

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Remove factory protective coverings and clean finish surfaces in accordance with manufacturer's instructions before substantial completion.

**END OF SECTION**

**CCRI KNIGHT CAMPUS****Bathroom Renovations****Warwick, Rhode Island 02886****AA# 19158****SECTION 10 28 00****TOILET ACCESSORIES****PART 1 GENERAL****1 SECTION INCLUDES**

- .1.A. Cabinet-type toilet accessories.
- .1.B. Toilet accessories.
- .1.C. Grab bars.

**2 RELATED SECTIONS**

- .2.A. Section 042200 - Concrete Unit Masonry.
- .2.B. Section 102813 - Toilet Compartments.
- .2.C. Section 105100- Lockers
- .2.D. Section 102811 - Electric Hand Dryers.

**3 REFERENCES**

- .3.A. Americans with Disabilities Act Accessibility Guidelines (ADA).

**4 SUBMITTALS**

- .4.A. Submit under provisions of Section 01300.
- .4.B. Product Data: Manufacturer's product data for products specified, indicating selected options and accessories.
- .4.C. Shop Drawings:
  - .4.C.1. Plans: Locate each specified unit in project.
  - .4.C.2. Elevations: Indicate mounting height of each product.
  - .4.C.3. Details: Indicate anchoring and fastening details, required locations and types of anchors and reinforcement, and materials required for installation of specified products.
- .4.D. LEED Requirements: Provide products required by this section with attributes that contribute to the project sustainability goals:
  - .4.D.1. MR Credit 4.1 - Recycled Content (post-consumer).
  - .4.D.2. MR Credit 4.2 - Recycled Content (post-industrial).
- .4.E. Verification Samples: Two sample chips of each specified color and finish.
- .4.F. Quality Assurance Submittals:
  - .4.F.1. Manufacturer's printed installation instructions for each specified product.
  - .4.F.2. Documentation of Manufacturer's Qualifications, specified in 1.5 of this Section.



- .4.G. Closeout Submittals: Warranty, issued and executed by manufacturer, and countersigned by Contractor.
- 5 QUALITY ASSURANCE
  - .5.A. Manufacturer Qualifications: Minimum five years documented experience producing products specified.
  - .5.B. Source Limitations: To the greatest extent possible products shall be provided by a single manufacturer.
- 6 DELIVERY, STORAGE, AND HANDLING
  - .6.A. Ship products in manufacturer's standard protective packaging with vinyl coating on exposed surfaces.
  - .6.B. Storage and Protection: Store products in manufacturer's protective packaging until installation.
- 7 SEQUENCING
  - .7.A. Supply locations, dimensions, and other pertinent details to installing Contractor for coordination of blocking, support and recess size and locations required for accessory installation.
- 8 WARRANTY
  - .8.A. Manufacturer's standard warranty against defects in product workmanship and materials.
  - .8.B. Manufacturer's 15-year warranty against silver spoilage of mirrors.

## **PART 2 PRODUCTS**

- 9 MANUFACTURERS
  - .9.A. Acceptable Manufacturers: American Specialties, Inc.; 441 Saw Mill River Road, Yonkers NY 10701-4913. ASD. Tel: (914) 476-9000. Fax: (914) 476-0688. Email: info@americanspecialties.com. Web: <http://www.americanspecialties.com>.
  - .9.B. Requests for substitutions will be considered in accordance with provisions of Section 01600 during the bidding period **only (Scranton Products, Bobrick, Kingsway, Eclipse)**.
- 10 CABINET-TYPE TOILET ACCESSORIES (SIMPLICITY COLLECTION)
  - .10.A. Basic Construction Requirements:
    - .10.A.1. Doors: 18 ga stainless steel, formed 1/2 in (13 mm) return to wall.
    - .10.A.2. Cabinets: 20 ga stainless steel, formed 1 in (25 mm) wide flat perimeter trim four sides; joints welded, sight-exposed welds finished to match sheet finish.
    - .10.A.3. Hinges: Stainless steel piano hinge, 3/16 in (4.8 mm) dia barrel, full length of cabinet; hinge leaves spot-welded to door and cabinet body.
    - .10.A.4. Locks: Tumbler locks, keyed alike other toilet accessories, with two keys for ea lock.
    - .10.A.5. Cabinet and Door Finish: Satin finish.
    - .10.A.6. Accessories: Mounting collars.
  - .10.B. Paper Towel Dispensers: Simplicity Collection by ASI.
    - .10.B.1. Paper Towel Dispenser: Model 6452-9 (Surface Mounted): Dispenses 600 C-fold or 800 multi-fold paper towels with stainless steel collar for surface mounting.
- 11 CABINET-TYPE TOILET ACCESSORIES (TRADITIONAL COLLECTION)
  - .11.A. Basic Construction Requirements:

- .11.A.1. Doors: 22 ga stainless steel, double pan construction, with 1/4 in (6 mm) thick structural fiberboard core.
- .11.A.2. Cabinets: 22 ga stainless steel, formed perimeter trim with 1/4 in (6 mm) return to wall four sides; joints welded, sight-exposed welds finished to match sheet finish.
- .11.A.3. Hinges: Stainless steel piano hinge, 3/16 in (4.8 mm) dia barrel, full length of cabinet; hinge leaves spot-welded to door and cabinet body.
- .11.A.4. Locks: Tumbler locks, keyed like other toilet accessories, with two keys for each lock.
- .11.A.5. Cabinet and Door Finish: Satin finish.
- .11.B. Waste Receptacles: Traditional Collection by ASI.
  - .11.B.1. Free Standing Open Waste Receptacle: Model 0813. Fabricated of 22 ga type 304 stainless steel with satin finish. Vinyl wall bumpers - top and bottom, rubber feet. Hooks for liners. Without top. Capacity: 19 gal (72 L) receptacle.

## 12 TOILET ACCESSORIES

- .12.A. Basic Construction Requirements:
  - .12.A.1. Doors: 22 ga satin stainless steel, formed hems at sight-exposed edges.
  - .12.A.2. Cabinets: 22 ga satin stainless, formed hems at sight-exposed edges; joints welded.
  - .12.A.3. Hinges: Stainless steel piano hinge, 3/16 in (4.8 mm) dia barrel, full length of cabinet; hinge leaves spot-welded to door and cabinet body.
  - .12.A.4. Locks: Tumbler locks, keyed alike other toilet accessories, two keys for each lock.
- .12.B. Baby Changing Stations: As manufactured by ASI.
  - .12.B.1. Surface Mounted Horizontal Baby Changing Station shall be Model No 9014 as manufactured by American Specialties, Inc. Changing Station shall be horizontal format and shall protrude no more than 4 inches (102) from wall when in retracted position. Unit shall comply with 2010 ADA Accessibility Standards, ASTM F2285-04, and EN 12221-1. Unit shall support a static load of 300 lbs (136.1 kg) and be tested in excess of 350 lbs (158.8 kg). Unit shall be fabricated of non-porous plastic (FDA approved HDPE) tested according to ASTM G21 and ASTM G22. No parts of the operating mechanism shall be accessible when unit is open or
  - .12.B.2. closed to provide a tamper resistant and pinch proof user environment. Unit shall have a damped gas spring to assist user in opening and closing bed tray with the use of one hand. Unit shall be provided with one integral heavy-duty bag hook. Unit shall provide a bed-liner dispenser that may be easily converted to a multi-fold towel dispenser with no adapters. Unit shall provide graphics and instructions in four languages on interior back. Unit shall be provided with an adjustable two-part vinyl coated child protection safety-strap mounted with concealed fasteners on high walls of cradle. Entire unit shall be assembled of completely sealed components to provide easy cleaning and no penetration zones to harbor microbes or bacteria. Unit shall mount on standard stud wall dimensions and with proper anchoring may mount on all suitable wall constructions. Mounting fasteners shall be concealed after installation using color matched recess plug-covers supplied. Unit shall be light grey in color and shall be recyclable at end of usable life. Unit shall be warranted for five years against defects in material or workmanship.
- .12.C. Feminine Hygiene Disposals: As manufactured by ASI.
  - .12.C.1. 0852 - Surface Mounted Sanitary Napkin Disposal: Model 0852. Sloping cover has full length piano hinge.
- .12.D. Feminine Hygiene Vendors: As manufactured by ASI.
  - .12.D.1. Recessed Sanitary Napkin/Tampon Vendor: Model 0864. Dispenser includes 2 dispensing mechanisms, one for 27 tampons, the other for 30 feminine napkins.
- .12.E. Mirrors: As manufactured by ASI.
  - .12.E.1. Tilt Mirror: Model 0535. Offers visibility for wheelchair patients. Frame: 20 ga satin stainless. Tapered from 4 in (102 mm) at top to 1 in (25 mm) at bottom. Size as

- scheduled or indicated on Drawings.
- .12.E.2. Tilt Mirror with Shelf: Model 0537. Offers visibility for wheelchair patients. Frame: 20 ga satin stainless steel. Tapered from 4 in (102 mm) at top to 1 in (25 mm) at bottom. Shelf: 6 in (152 mm) deep from wall. Size as scheduled or indicated on Drawings.
- .12.E.3. Channel Frame Mirror: Model 620. 1/2 in x 1/2 in x 1/2 in (13 mm x 13 mm x 13 mm) 20 ga type 304 satin stainless channel, one piece roll formed member; installed on two wall brackets, held secure by theft resistant screw.
- .12.E.4. Stainless Steel Channel Frame Mirror with Shelf: Model 625. 1/2 in x 1/2 in x 1/2 in (13 mm x 13 mm x 13 mm) 20 ga type 304 satin stainless channel, one piece roll formed member. Installed on two wall brackets and held secure by theft resistant screw. Shelf of 18 ga satin stainless and edges returned and hemmed for maximum rigidity and safety. Shelf is welded to face frame, 5 in (127 mm) wide.
- .12.F. Shower Curtains: As manufactured by ASI.
  - .12.F.1. Shower Curtain Hook: Model 1200-SHU. Stainless steel hook for rods 1 in (25 mm) and 1-1/4 in (32 mm) dia.
  - .12.F.2. Vinyl Shower Curtain: Model 1200-V. Flame resistant, anti-bacterial, 8 ga vinyl fabric. Curtain shall be 6 in (150 mm) wider than opening up to 48 in (1220 mm) and 12 in (305 mm) wider than openings exceeding 48 in (1220 mm). Sizes and colors as scheduled or indicated on Drawings.
  - .12.F.3. Extra Heavy-Duty Shower Curtain Rod: Model 1204. Flanges 3 in (75 mm) dia, 20 ga type 304 satin stainless. 1-1/4 in (32 mm) dia rod, 18 ga type 304 satin stainless tubing. Available in lengths up to 96 in (2440 mm).
- .12.G. Shower Seats: As manufactured by ASI.
  - .12.G.1. Folding Shower Seat (Handed): Model 8205. Meets ADA Accessibility Guidelines and needs of physically disabled or elderly. Seat is sponge cushion covered with off-white Naugahyde mounted on 1/2 in (13 mm), marine-grade plywood. Frame, support legs, flanges, bracket are type 304 satin stainless. Reversible self-locking mechanism.
- .12.H. Soap Dispenser: As manufactured by ASI.
  - .12.H.1. Surface Mounted Soap Dispenser Model 0345 – 40 fl. Oz.
- .12.I. Soap Dish: As manufactured by ASI.
  - .12.I.1 Surface Mounted Soap Dish w/ drain holes Model 0720-Z chrome plated zamarc.
- .12.J. Toilet Tissue Dispensers/Holders: As manufactured by ASI.
  - .12.J.1. Low Profile Surface Mounted Jumbo-Roll Toilet Tissue Dispenser: Model 0039.
  - .12.J.2. Surface Mounted Toilet Seat Cover Dispenser: Model 6477-9. Door has tumbler lock, dispenses 500 single or half-fold seat covers.
- .12.K. Free standing waste receptacle: As manufactured by ASI.
  - .12.K.1. Stainless steel waste receptacle Model 0813.
- .12.L. Coat hook and bumper: As manufactured by ASI.
  - .12.L.1. Chrome plated brass with a black neoprene bumper Model 0714.

### 13 GRAB BARS

- .13.A. Grab Bars:
  - .13.A.1. Covers: Snap over flange to conceal screws; type 304 stainless steel, 22 ga, 3-3/16 in (81 mm) dia.
  - .13.A.2. Concealed Mounting Flanges: 3-1/8 in (79 mm) O.D. dia with two screw holes and three locking dimples; 1/8 in (3 mm) thick, type 304 stainless steel.
  - .13.A.3. Series: 3700 Series by ASI; 1-1/4 in (32 mm) dia handrail with snap-on flange covers.
    - .13.A.3.a. Product: Model 3700-P, with peened surface.

## **PART 3 EXECUTION**

### **14 EXAMINATION**

- .14.A. Inspect and prepare substrates using the methods recommended by the manufacturer for achieving best result for the substrates under project conditions.
  - .14.A.1. Verify reinforcement and anchoring devices are correct type and are located in accordance with shop drawings.
- .14.B. Do not proceed with installation until substrates have been prepared using the methods recommended by the manufacturer and deviations from manufacturer's recommended tolerances are corrected. Commencement of installation constitutes acceptance of conditions.
- .14.C. If preparation is the responsibility of another installer, notify Architect in writing of deviations from manufacturer's recommended installation tolerances and conditions.

### **15 INSTALLATION**

- .15.A. Install toilet accessories plumb and level in accordance with shop Drawings and manufacturer's printed installation instructions.
- .15.B. Locate toilet accessories at heights and locations required for compliance with local accessibility regulations and the Americans with Disabilities Act.

### **16 CLEANING**

- .16.A. Remove manufacturer's protective vinyl coating from sight-exposed surfaces 24 hours before final inspection.
- .16.B. Clean surfaces in accordance with manufacturer's recommendations.

### **17 PROTECTION OF INSTALLED PRODUCTS**

- .17.A. Protect products from damage caused by subsequent construction activities.
- .17.B. Field repair of damaged product finishes is prohibited; replace products having damaged finishes caused by subsequent construction activities.

**END OF SECTION 10 28 00**



## SECTION 10 28 13

### ELECTRIC HAND DRYERS

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#### PART 1 GENERAL

##### 1 SECTION INCLUDES

- 1.1. Electric hand dryers.

##### 2 RELATED SECTIONS

- 2.1. Division 26 - Electrical: Electrical systems and components.

##### 3 SUBMITTALS

- 3.1. Submit under provisions of Section 01 33 00 Submittal Procedures.
- 3.2. Product Data: Provide construction details, dimensions, anchoring and mounting requirements, material and finish descriptions, electrical requirements, and manufacturer's warranty.
- 3.3. Operation and Maintenance Data: Provide for electric hand dryers to include in maintenance manuals.
- 3.4. Warranty: Provide sample of manufacturer's standard warranty for parts and labor.

##### 4 DELIVERY, STORAGE, AND HANDLING

- 4.1. Deliver, store, and handle electric hand dryers in manufacturer's protective packaging.
- 4.2. Store electric hand dryers off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

##### 5 QUALITY ASSURANCE

- 5.1. Product Certification: ETL listed in accordance with UL507. National Sanitation Foundation (NSF) Protocol P335 "Hygienic Commercial Hand Dryers" compliant.
- 5.2. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA70, by a qualified testing agency, and marked for intended location and application.

##### 6 WARRANTY

- 6.1. Manufacturer's Maximum extended warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective electric hand dryer components and labor within specified warranty period.  
Warranty Period: Five (5) years limited for labor and five (5) years for parts, minimum. Extended warranty up to 10 years shall be provided if available from manufacturer.

##### 7 COORDINATION

- 7.1. Coordinate locations of electric hand dryers with other work to prevent interference with clearances required for access, and for proper installation, adjustment, operation, cleaning, and servicing of electric hand dryers.

##### 8 ATTIC STOCK

Attic stock shall be provided for all hand dryers. 5% attic stock shall be provided to the owner for future use.

## **PART 1 PRODUCTS**

### **9 MANUFACTURERS**

- 9.1. Basis-of-Design Product: Subject to compliance with requirements, provide the electric Dyson Airblade V hand dryers manufactured by Dyson Inc., 1330 W. Fulton St., Floor 5, Chicago, IL 60607; 888-397-6622, [www.dyson.com/Airblade](http://www.dyson.com/Airblade) or comparable product acceptable to the Architect.
- 9.2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 during the bidding period **only**.
- 9.3. Accepted Substitutions are as follows:
  - a. Thinair Model No.TA-ABS/TA-SB manufactured by Excel Dryer, Inc. 357 Chestnut Street, East Longmeadow, MA 01028; 786-374-1554.
  - b. VERDEdri Model No. Q-973A2 manufactured by World Dryer 340 County Line Road, Bensenville, IL 60106; 847-350-3259

### **10 ELECTRIC HAND DRYERS**

- 10.1. Electric Hand Dryers: The electric Dyson Airblade V Electric hand dryer (Model HU02); Item No. 307172-01 (sprayed nickel HV)
- 10.2. Mounting: Surface mounted on ABS/PBT plastic back plate/mounting bracket; protrudes four inches from wall, no recessing required; ADA compliant.

### **11 CONSTRUCTION**

- 11.1. Polycarbonate casing with anti-microbial additive in paint. Anti-microbially integrated external plastics and seals. Anti-tamper M4 exterior pin-hex screws. Water ingress protection to IP24.

### **12 COLOR FINISH**

- 12.1. Sprayed nickel finish.

### **13 FILTRATION**

- 13.1. 99.97 percent particulate efficiency HEPA filter with anti-microbial coating.

### **14 OPERATION**

- 14.1. Touch-free capacitive sensor activation.
  - a. Hand dry time: 12 seconds
  - b. Airspeed at nozzle: 420 mph
  - c. Operating Airflow: Up to 5.28 gal/sec.
  - d. Rated Operating Noise Power: 79 db(A)

- e. Motor: Dyson Digital Motor (DDM), V4 switched reluctance brushless DC type; 92,000 rpm motor speed; less than 0.5 watt standby power consumption.

13.2 Electrical Requirements:

1. 200-240 V AC, 10 A, 1000 W] Dyson recommends 15 amp circuit.
2. Operating Temperature Range: 0 - 40 degrees C.
3. Standby Power Consumption: Less than 0.5 W.

## **PART 2 EXECUTION**

### **15 EXAMINATION**

- 15.1. Verify availability and characteristics of electrical power. Drill minimum two (2) inch diameter holes for electrical service entrance through back plate.
- 15.2. Do not begin installation until substrates are complete and ready for installation of electric hand dryers.

### **16 INSTALLATION**

- 16.1. Locate and install mounting bracket in accordance with manufacturer's written instructions. Use minimum 0.25-inch anchors to mount bracket. Mount electric hand dryer at height above finished floor recommended by manufacturer.
- 16.2. Install electric hand dryer in accordance with manufacturer's written instructions, using fasteners appropriate to substrate indicated and recommended by manufacturer. Install electric hand dryers level, plumb, and firmly anchored in locations and at heights indicated.

### **17 CLEANING AND PROTECTION**

- 17.1. Adjust electric hand dryers for smooth operation. Replace damaged or defective components.
- 17.2. Remove protective coverings from finished surfaces.
- 17.3. Clean exposed surfaces using materials and methods recommended by manufacturer.

END OF SECTION



## SECTION 10 28 13

### ELECTRIC HAND DRYERS - Revised

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#### PART 1 GENERAL

##### 1 SECTION INCLUDES

- 1.1. Electric hand dryers.

##### 2 RELATED SECTIONS

- 2.1. Division 26 - Electrical: Electrical systems and components.

##### 3 SUBMITTALS

- 3.1. Submit under provisions of Section 01 33 00 Submittal Procedures.
- 3.2. Product Data: Provide construction details, dimensions, anchoring and mounting requirements, material and finish descriptions, electrical requirements, and manufacturer's warranty.
- 3.3. Operation and Maintenance Data: Provide for electric hand dryers to include in maintenance manuals.
- 3.4. Warranty: Provide sample of manufacturer's standard warranty for parts and labor.

##### 4 DELIVERY, STORAGE, AND HANDLING

- 4.1. Deliver, store, and handle electric hand dryers in manufacturer's protective packaging.
- 4.2. Store electric hand dryers off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

##### 5 QUALITY ASSURANCE

- 5.1. Product Certification: ETL listed in accordance with UL507. National Sanitation Foundation (NSF) Protocol P335 "Hygienic Commercial Hand Dryers" compliant.
- 5.2. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA70, by a qualified testing agency, and marked for intended location and application.

##### 6 WARRANTY

- 6.1. Manufacturer's Maximum extended warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective electric hand dryer components and labor within specified warranty period.  
Warranty Period: Five (5) years limited for labor and five (5) years for parts, minimum. Extended warranty up to 10 years shall be provided if available from manufacturer.

##### 7 COORDINATION

- 7.1. Coordinate locations of electric hand dryers with other work to prevent interference with clearances required for access, and for proper installation, adjustment, operation, cleaning, and servicing of electric hand dryers.

##### 8 ATTIC STOCK



Attic stock shall be provided for all hand dryers. 5% attic stock shall be provided to the owner for future use.

## **PART 1 PRODUCTS**

### **9 MANUFACTURERS**

- 9.1. Basis-of-Design Product: Subject to compliance with requirements, provide the electric Dyson Airblade V hand dryers manufactured by Dyson Inc., 1330 W. Fulton St., Floor 5, Chicago, IL 60607; 888-397-6622, [www.dyson.com/Airblade](http://www.dyson.com/Airblade) or comparable product acceptable to the Architect.
- 9.2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 during the bidding period **only**.
- 9.3. Accepted Substitutions are as follows:
  - a. Thinair Model No. TA-SB manufactured by Excel Dryer, Inc. 357 Chestnut Street, East Longmeadow, MA 01028; 786-374-1554., All unit options, warranty and filtration requirements as listed in this section shall apply to the substitution of this product.
  - b. VERDEdri Model No. Q-973A2 manufactured by World Dryer 340 County Line Road, Bensenville, IL 60106; 847-350-3259. All unit options, warranty and filtration requirements as listed in this section shall apply to the substitution of this product.

### **10 ELECTRIC HAND DRYERS**

- 10.1. Electric Hand Dryers: The electric Dyson Airblade V Electric hand dryer (Model HU02); Item No. 307172-01 (sprayed nickel HV)
- 10.2. Mounting: Surface mounted on ABS/PBT plastic back plate/mounting bracket; protrudes four inches from wall, no recessing required; ADA compliant.

### **11 CONSTRUCTION**

- 11.1. Polycarbonate casing with anti-microbial additive in paint. Anti-microbially integrated external plastics and seals. Anti-tamper M4 exterior pin-hex screws. Water ingress protection to IP24.

### **12 COLOR FINISH**

- 12.1. Sprayed nickel finish.

### **13 FILTRATION**

- 13.1. 99.97 percent particulate efficiency HEPA filter with anti-microbial coating.

### **14 OPERATION**

- 14.1. Touch-free capacitive sensor activation.
  - a. Hand dry time: 12 seconds
  - b. Airspeed at nozzle: 420 mph
  - c. Operating Airflow: Up to 5.28 gal/sec.
  - d. Rated Operating Noise Power: 79 db(A)

- e. Motor: Dyson Digital Motor (DDM), V4 switched reluctance brushless DC type; 92,000 rpm motor speed; less than 0.5 watt standby power consumption.

13.2 Electrical Requirements:

1. 200-240 V AC, 10 A, 1000 W] Dyson recommends 15 amp circuit.
2. Operating Temperature Range: 0 - 40 degrees C.
3. Standby Power Consumption: Less than 0.5 W.

13.3 Options:

1. Provide Stainless Steel wall guard

## **PART 2 EXECUTION**

### **15 EXAMINATION**

- 15.1. Verify availability and characteristics of electrical power. Drill minimum two (2) inch diameter holes for electrical service entrance through back plate.
- 15.2. Do not begin installation until substrates are complete and ready for installation of electric hand dryers.

### **16 INSTALLATION**

- 16.1. Locate and install mounting bracket in accordance with manufacturer's written instructions. Use minimum 0.25-inch anchors to mount bracket. Mount electric hand dryer at height above finished floor recommended by manufacturer.
- 16.2. Install electric hand dryer in accordance with manufacturer's written instructions, using fasteners appropriate to substrate indicated and recommended by manufacturer. Install electric hand dryers level, plumb, and firmly anchored in locations and at heights indicated.

### **17 CLEANING AND PROTECTION**

- 17.1. Adjust electric hand dryers for smooth operation. Replace damaged or defective components.
- 17.2. Remove protective coverings from finished surfaces.
- 17.3. Clean exposed surfaces using materials and methods recommended by manufacturer.

END OF SECTION



## SECTION 10 28 13

### ELECTRIC HAND DRYERS –

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#### **PART 1 GENERAL**

##### 1 SECTION INCLUDES

- 1.1. Electric hand dryers.

##### 2 RELATED SECTIONS

- 2.1. Division 26 - Electrical: Electrical systems and components.

##### 3 SUBMITTALS

- 3.1. Submit under provisions of Section 01 33 00 Submittal Procedures.
- 3.2. Product Data: Provide construction details, dimensions, anchoring and mounting requirements, material and finish descriptions, electrical requirements, and manufacturer's warranty.
- 3.3. Operation and Maintenance Data: Provide for electric hand dryers to include in maintenance manuals.
- 3.4. Warranty: Provide sample of manufacturer's standard warranty for parts and labor.

##### 4 DELIVERY, STORAGE, AND HANDLING

- 4.1. Deliver, store, and handle electric hand dryers in manufacturer's protective packaging.
- 4.2. Store electric hand dryers off of ground, under cover, and in a dry location. Handle according to manufacturer's written recommendations to prevent damage, deterioration, or soiling.

##### 5 QUALITY ASSURANCE

- 5.1. Product Certification: ETL listed in accordance with UL507. National Sanitation Foundation (NSF) Protocol P335 "Hygienic Commercial Hand Dryers" compliant.
- 5.2. Electrical Components, Devices, and Accessories: Listed and labeled in accordance with NFPA70, by a qualified testing agency, and marked for intended location and application.

##### 6 WARRANTY

- 6.1. Manufacturer's Maximum extended warranty: Manufacturer's standard form in which manufacturer agrees to repair, restore, or replace defective electric hand dryer components and labor within specified warranty period.  
Warranty Period: Five (5) years limited for labor and five (5) years for parts, minimum. Extended warranty up to 10 years shall be provided if available from manufacturer.

##### 7 COORDINATION

- 7.1. Coordinate locations of electric hand dryers with other work to prevent interference with clearances required for access, and for proper installation, adjustment, operation, cleaning, and servicing of electric hand dryers.

## 8 ATTIC STOCK

Attic stock shall be provided for all hand dryers. **5 electric hand dryers as** attic stock shall be provided to the owner for future use. **Attic stock should be new in box.**

## PART 2 PRODUCTS

## 9 MANUFACTURERS

- 9.1. Basis-of-Design Product: Subject to compliance with requirements, provide the electric Dyson Airblade V hand dryers manufactured by **Dyson Inc.**, 1330 W. Fulton St., Floor 5, Chicago, IL 60607; 888-397-6622, [www.dyson.com/Airblade](http://www.dyson.com/Airblade) or comparable product acceptable to the Architect.
- 9.2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 during the bidding period **only**.
- 9.3. Accepted Substitutions are as follows:
  - a. Thinair Model No. TA-SB manufactured by **Excel Dryer**, Inc. 357 Chestnut Street, East Longmeadow, MA 01028; 786-374-1554., All unit options, warranty and filtration requirements as listed in this section shall apply to the substitution of this product.
  - b. VERDEdri Model No. Q-973A2 manufactured by **World Dryer** 340 County Line Road, Bensenville, IL 60106; 847-350-3259. All unit options, warranty and filtration requirements as listed in this section shall apply to the substitution of this product.
  - c. **High Velocity Vertical Automatic Hand Dryer w/HEPA filter Model No. T9F640955 Manufactured by Global Industries, 11 Harbor Park Dr., Port Washington, NY 11050 1-888-978-7759 All unit options, warranty and filtration requirements as listed in this section shall apply to the substitution of this product.**

## 10 ELECTRIC HAND DRYERS

- 10.1. Electric Hand Dryers: The electric Dyson Airblade V Electric hand dryer (Model HU02); Item No. 307172-01 (sprayed nickel HV)
- 10.2. Mounting: Surface mounted on ABS/PBT plastic back plate/mounting bracket; protrudes four inches from wall, no recessing required; ADA compliant.

## 11 CONSTRUCTION

- 11.1. Polycarbonate casing with anti-microbial additive in paint. Anti-microbially integrated external plastics and seals. Anti-tamper M4 exterior pin-hex screws. Water ingress protection to IP24.

## 12 COLOR FINISH

- 12.1. Sprayed nickel finish or equivalent

## 13 FILTRATION

- 13.1. 99.97 percent particulate efficiency HEPA filter with anti-microbial coating.

## 14 OPERATION

- 14.1. Touch-free capacitive sensor activation.
  - a. Hand dry time: 12 seconds

- b. Airspeed at nozzle: 420 mph
- c. Operating Airflow: Up to 5.28 gal/sec.
- d. Rated Operating Noise Power: 79 db(A)
- e. Motor: Dyson Digital Motor (DDM) **or equivalent to**, V4 switched reluctance brushless DC type; 92,000 rpm motor speed; less than 0.5 watt standby power consumption.

13.2 Electrical Requirements:

- 1. 200-240 V AC, 10 A, 1000 W] Dyson recommends 15 amp circuit.
- 2. Operating Temperature Range: 0 - 40 degrees C.
- 3. Standby Power Consumption: Less than 0.5 W.

13.3 Options:

- 1. Provide Stainless Steel wall guard

## **PART 3 EXECUTION**

### **15 EXAMINATION**

- 15.1. Verify availability and characteristics of electrical power. Drill minimum two (2) inch diameter holes for electrical service entrance through back plate.
- 15.2. Do not begin installation until substrates are complete and ready for installation of electric hand dryers.

### **16 INSTALLATION**

- 16.1. Locate and install mounting bracket in accordance with manufacturer's written instructions. Use minimum 0.25-inch anchors to mount bracket. Mount electric hand dryer at height above finished floor recommended by manufacturer.
- 16.2. Install electric hand dryer in accordance with manufacturer's written instructions, using fasteners appropriate to substrate indicated and recommended by manufacturer. Install electric hand dryers level, plumb, and firmly anchored in locations and at heights indicated.

### **17 CLEANING AND PROTECTION**

- 17.1. Adjust electric hand dryers for smooth operation. Replace damaged or defective components.
- 17.2. Remove protective coverings from finished surfaces.
- 17.3. Clean exposed surfaces using materials and methods recommended by manufacturer.

**END OF SECTION 10 28 13**

## SECTION 10 51 00

### LOCKERS

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#### PART 1 GENERAL

##### 1 SECTION INCLUDES

- 1.A. Lockers of the following types:
  - 1.A.1. Heavy duty metal lockers.
  - 1.A.2. Locker accessories.
  - 1.A.3. Benches.

##### 2 RELATED SECTIONS

- 2.A. Section 03300 - Cast-In-Place Concrete: Concrete base.
- 2.B. Section 06100 - Rough Carpentry: Furring, blocking, and shims.

##### 3 REFERENCES

- 3.A. ADAAG - American with Disabilities Act, Accessibility Guidelines.
- 3.B. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
- 3.C. ASTM International (ASTM):
  - 3.C.1. ASTM A 1008 - Standard Specification for Steel Sheet, Carbon, Cold-Rolled, Commercial Quality.
  - 3.C.2. ASTM D 4976 - Standard Specification for Polyethylene Plastics Molding and Extrusion Materials.
  - 3.C.3. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

##### 4 SUBMITTALS

- 4.A. Submit under provisions of Section 01300.
- 4.B. [ Product Data ]: Manufacturer's data sheets on each product to be used, including:
  - 4.B.1. Preparation instructions and recommendations.
  - 4.B.2. Storage and handling requirements and recommendations.
  - 4.B.3. Installation methods.
- 4.C. Shop Drawings: Provide layout and elevations of lockers with overall dimensions.
- 4.D. LEED Requirements: Provide products required by this section with attributes that contribute to the project sustainability goals:
  - 4.D.1. MR 4.1 and MR 4.2: Recycled Content.
  - 4.D.2. EQ 4.1, EQ 4.2, EQ 4.4: Low Emitting Materials.
- 4.E. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms.
- 4.F. Verification Samples: For finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product and color selected.

## 5 QUALITY ASSURANCE

5.A. Provide all lockers from a single manufacturer.

## 6 DELIVERY, STORAGE, AND HANDLING

6.A. Inspect lockers upon receipt for visible damage. Further inspection if necessary for hidden damage.

6.B. Store products in manufacturer's unopened packaging until ready for installation.

6.C. Sequence deliveries to avoid project delays, but minimize on-site storage.

## 1.7 WARRANTY

A. Locker Warranty: Locker manufacturer shall warranty the lockers for a minimum of one year. Contact manufacturer for more details.

# PART 1 PRODUCTS

## 7 MANUFACTURERS

7.A. Acceptable Manufacturer: ASI Storage Solutions, which is located at: 900 Clary Connector; Eastanollee, GA 30538; Tel: 706-827-2720; Fax: 706-827-2710; Email: [request info \(info@asi-storage.com\)](mailto:info@asi-storage.com); Web: <http://asi-storage.com>

7.B. Requests for substitutions will be considered in accordance with provisions of Section 01600 during the bidding period **only**.

## 8 HEAVY DUTY METAL LOCKERS

8.A. Heavy Duty Metal Lockers: ASI Storage Solutions Angle Frame Collection.

### B. Materials

1. Sheet Steel: All steel parts shall be of high-grade cold-rolled milled steel free from surface imperfections.
2. Finish: All material shall be pre-washed and phosphate-treated for maximum finish coating adhesion. All components shall be finished with a 2mm hybrid epoxy/polyester powder coat, electrostatically applied to ensure uniform thickness and baked to manufacturer's specifications.

### C. Fabrication:

1. General Construction: All lockers shall be built on a welded frame, free from burrs, with common intermediate uprights separating units.
2. Framing System: Frames shall be made of continuous 1 x 1 x 1/8 pretreated, pickled, angle iron steel.
3. Sides And Intermediate Partitions: 14 gauge diamond-perforated. Expanded metal or solid sides available on request.
4. Formed Door: Single, double and six-tier doors shall be constructed of 14 gauge perforated, cold-rolled steel with double bends on vertical sides and a single bend on

horizontal sides.

5. Tops, Bottom and Shelves: Shall be made of solid 16 gauge cold-rolled steel free of surface defects.

D. LATCHING OPTIONS SINGLE, DOUBLE AND SIX TIER

1. Single Point: 11 gauge latch welded to locker frame, extending no more than 1¼" into the locker opening. Handle protrudes into a 20 gauge stainless steel deep-drawn recessed cup with integral formed handle. Latch has a padlock eye for use with a 932" padlock shackle. Rubber silencers shall be firmly secured to the door frame. Latch is equipped with an integral anti-pry feature.
2. Multi Point: 20 gauge stainless steel drawn recessed handle with integral 12 gauge lift trigger attached to the latching channel. Doors to have latch clip engaging the frame at three points on doors over 42" high and two points on all other doors. Locking device to be positive slam-lock-type, whereby locker door may be locked when open, then closed without unlocking.
3. Cremone Latch: Latching rods 3/8" in diameter engage top and bottom edge of locker frame with a 1/8" thick center latch that engages the locker frame attached to an 11 gauge steel handle.
4. Box Lockers: 11 gauge latch welded to locker frame and an 18 gauge door pull with integral friction catch.
5. Ventilation: All body parts and doors to have diamond shaped perforations 3/4" wide x 1½" high.
6. Number Plates: Each locker shall have a polished aluminum number plate riveted to the door face with black numerals ½" high. Hinges: Shall be full length 16 gauge continuous piano-type rived to both the door and frame.
7. Interior Equipment: Single-tier lockers 48" or higher shall have a shelf. If under 18" deep locker shall have three wall hooks and one ceiling hook. Single-tier lockers 18" deep or more shall have coat rod instead of ceiling hook. Double-tier lockers shall have three wall hooks and one ceiling hook.

E. LOCKER ACCESSORIES

1. Locks: Built-in combination or padlocks.
2. Tops: Continuous slope top shall be 18 gauge sheet steel, powder coated to match the color of the lockers. Hoods are 72 inches (1.828 m) in length by depth of locker. For longer lengths, slip joints without visible fasteners at splice locations shall be provided. End closures shall be provided. The slope shall have a rise equal to 1/3 of the locker depth, plus a 1 inch (25 mm) vertical rise at the front.
3. Base: Zee base shall be 14 gauge sheet steel, powder coated to match the color of the lockers. Appropriate size end bases are provided.
4. Fillers: Vertical Fillers shall be 20 gauge sheet steel, powder coated to match color of lockers. The fillers shall be formed in an angle, and designed to be used with wall angle slip joints to conceal raw edges caused by field cutting and to create a solid smooth finish.



5. Trim: Recess Trim shall be 18 gauge sheet steel, powder coated to match the color of the lockers. Trim shall have a 3 inch face and shall be attached to the lockers with concealed clips. Finished cap and end caps shall be provided as required.

## 2.3 BENCHES

### F. Benches Top: As manufactured by ASI Global Partitions.

1. Benches shall be hardwood. All corners shall be rounded and sanded. All surfaces shall be finished with two coats of clear lacquer.
2. Bench Top Dimensions: As indicated on the Drawings.

### G. Bench Pedestal: As manufactured by ASI Global Partitions.

1. Bench pedestals shall be 1-1/2" diameter steel tubing with 10 gauge steel flanges welded to each end. The bottom and top flange shall be 8" in diameter with three (3) holes for anchoring in each flange. The pedestal shall be 16-1/4" high and shall be powder coated to match lockers. Pedestals shall be spaced no more than 60" apart.

## PART 2 EXECUTION

### 9 EXAMINATION

- 9.A. Do not begin installation until substrates and bases have been properly prepared.
- 9.B. If substrate and bases are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

### 10 INSTALLATION

- 10.A. Install lockers and accessories at locations shown in accordance with manufacturer's instructions.
- 10.B. Install lockers level and plumb with flush surfaces and rigid attachment to anchoring surfaces.
- 10.C. Anchor lockers to floor and wall at 48 inches (1.219 m) or less, as recommended by the manufacturer.
- 10.D. Fasten adjoining locker units together to provide rigid installation.
- 10.E. Install sloping tops and metal fillers using concealed fasteners. Provide flush hairline joints against adjacent surfaces.
- 10.F. Install front bases between legs without overlap or exposed fasteners. Provide end bases on exposed ends.
- 10.G. Install benches by fastening bench tops to pedestals and securely anchoring to the floor using appropriate anchors for the floor material.

### 11 ADJUSTING AND CLEANING

- 11.A. Adjust doors and latches to operate without binding. Verify that latches are operating satisfactorily.
- 11.B. Touch-up factory-finish and repair or replace damaged products before Substantial Completion.

## 12 PROTECTION

12.A. Protect installed products until completion of project.

END OF SECTION



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

## **SECTION 22 05 16**

### **EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.
- C. Pipe loops, offsets, and swing joints.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 221005 - Plumbing Piping.
- B. Section 232113 - Hydronic Piping.

##### **1.03 REFERENCE STANDARDS**

- A. EJMA (STDS) - EJMA Standards Tenth Edition.
- B. UL (DIR) - Online Certifications Directory Current Edition.

#### **PART 2 PRODUCTS**

##### **2.01 REGULATORY REQUIREMENTS**

- A. Comply with UL (DIR) requirements.

#### **PART 3 EXECUTION**

##### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.
- C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
- D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- E. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
- F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.
- G. Substitute grooved piping for vibration isolated equipment instead of flexible connectors. Grooved piping need not be anchored.

**A. END OF SECTION**



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

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## **SECTION 22 05 17**

## **SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Pipe sleeves.
- B. Manufactured sleeve-seal systems.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 220523 - General-Duty Valves for Plumbing Piping.
- C. Section 220553 - Identification for Plumbing Piping and Equipment: Piping identification.
- D. Section 220719 - Plumbing Piping Insulation.

#### **1.03 REFERENCE STANDARDS**

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type) 2016.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

### **PART 2 PRODUCTS**

#### **2.01 PIPE SLEEVES**

- A. Vertical Piping:
  - 1. Sleeve Length: 1 inch above finished floor.
  - 2. Provide sealant for watertight joint.
  - 3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
  - 4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Below Grade Exterior Walls:
  - 1. Zinc coated or cast iron pipe.
  - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
  - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
  - 2. Connect sleeve with floor plate except in mechanical rooms.
- E. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
  - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
  - 2. Connect sleeve with floor plate except in mechanical rooms.

- F. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Architect.
- G. Clearances:
  - 1. Provide allowance for insulated piping.
  - 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
  - 3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

## **2.02 MANUFACTURED SLEEVE-SEAL SYSTEMS**

- A. Modular/Mechanical Seal:
  - 1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.
  - 2. Provide watertight seal between pipe and wall/casing opening.
  - 3. Elastomer element size and material in accordance with manufacturer's recommendations.
  - 4. Glass reinforced plastic pressure end plates.

## **PART 3 EXECUTION**

### **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

### **3.02 INSTALLATION**

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Inserts:
  - 1. Provide inserts for placement in concrete formwork.
  - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- E. Structural Considerations:
  - 1. Do not penetrate building structural members unless indicated.
- F. Provide sleeves when penetrating footings, floors, walls, partitions, and similar. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
  - 1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
  - 2. Aboveground Piping:
    - a. Pack solid using mineral fiber complying with ASTM C592.
    - b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
  - 3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
  - 4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- G. Manufactured Sleeve-Seal Systems:
  - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.

2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  3. Locate piping in center of sleeve or penetration.
  4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  5. Tighten bolting for a water-tight seal.
  6. Install in accordance with manufacturer's recommendations.
- H. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

**3.03 CLEANING**

- A. Upon completion of work, clean all parts of the installation.
- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.
- C. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

**A. END OF SECTION**



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

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## **SECTION 22 05 23**

### **GENERAL-DUTY VALVES FOR PLUMBING PIPING**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Applications.
- B. General requirements.

##### **1.02 RELATED REQUIREMENTS**

#### **PART 2 PRODUCTS**

##### **2.01 APPLICATIONS**

- A. Provide the following valves for the applications if not indicated on drawings:
- B. Sanitary Waste and Hot Water Valves:

##### **2.02 GENERAL REQUIREMENTS**

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
- D. Valve-End Connections:
- E. General ASME Compliance:

#### **PART 3 EXECUTION**

##### **3.01 INSTALLATION**

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

**END OF SECTION**



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

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## **SECTION 22 05 29**

# **HANGERS AND SUPPORTS FOR PLUMBING PIPING EQUIPMENT**

### **PART 1 GENERAL**

#### **1.01 RELATED REQUIREMENTS**

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

#### **1.02 REFERENCE STANDARDS**

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping 2014.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2018).
- F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- I. MFMA-4 - Metal Framing Standards Publication 2004.
- J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.
- K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

#### **1.03 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.



- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

#### **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

#### **1.05 QUALITY ASSURANCE**

- A. Comply with applicable building code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

### **PART 2 PRODUCTS**

#### **2.01 SUPPORT AND ATTACHMENT COMPONENTS**

- A. General Requirements:
  - 1. Comply with MSS SP-58.
  - 2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
  - 3. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
  - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of [\_\_\_\_\_]. Include consideration for vibration, equipment operation, and shock loads where applicable.
  - 5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Metal Channel (Strut) Framing Systems:
  - 1. Comply with MFMA-4.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
  - 1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch diameter.
    - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
    - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
    - d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.
- D. Thermal Insulated Pipe Supports:
  - 1. General Construction and Requirements:
    - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
    - b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
    - c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch iron pipes.
    - d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by a 360 degree, PVC jacketing.
  - 2. PVC Jacket:
    - a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
    - b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
    - c. Thickness: 60 mil.
    - d. Connections: Brush on welding adhesive.
  - 3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.
- E. Pipe Supports:

1. Liquid Temperatures Up To 122 degrees F:
  - a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
  - b. Support From Below: MSS SP-58 Types 35 through 38.
- F. Pipe Stanchions: For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.
  1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
- G. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
  1. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
  2. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- H. Riser Clamps:
  1. Provide copper plated clamps for copper tubing support.
  2. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
- I. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.
- J. Strut Clamps: Two-piece pipe clamp.
- K. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.
- L. Pipe Hangers: For a given pipe run, use hangers of the same type and material.
  1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
- M. Nonmetallic Pipe Hangers:
- N. Intermediate Pipe Guides: Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.
  1. Pipe Diameter 6 inches and Smaller: Provide minimum clearance of 0.16 inch.
  2. Pipe Diameter 8 inches: Provide U-bolts with double nuts providing minimum clearance of 0.28 inch.
  3. Pipe Diameter 8 inches: 0.625 inch U-bolt.
  4. Pipe Diameter 10 inches: 0.75 inch U-bolt.
  5. Pipe Diameter 12 to 16 inches: 0.875 inch U-bolt.
  6. Pipe Diameter 18 to 30 inches: 1 inch U-bolt.
- O. Pipe Alignment Guides: Galvanized steel.
  1. Pipe Diameter 8 inches and Smaller: Spider or sleeve type.
  2. Pipe Diameter 10 inches and Larger: Roller type.
  3. Pipe Diameter 18 to 30 inches: 1 inch U-bolt.
- P. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
- Q. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
  1. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
  2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
  3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
  4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
- R. Pipe Shields for Insulated Piping:
  1. General Construction and Requirements:
    - a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
    - b. Shields Material: UV-resistant polypropylene with glass fill.
    - c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.

- d. Minimum Service Temperature: Minus 40 degrees F.
  - e. Maximum Service Temperature: 178 degrees F.
  - f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
- S. Anchors and Fasteners:
- 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  - 2. Hammer-driven anchors and fasteners are not permitted.
  - 3. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    - a. Comply with MFMA-4.
    - b. Channel Material: Use galvanized steel.
    - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
- T. Pipe Installation Accessories:
- 1. Overhead Pipe Supports:
  - 2. Plenum Pipe Supports:
  - 3. Telescoping Pipe Supports:
  - 4. Inserts and Clamps:

## **2.02 RETROFIT PIPING COVER SYSTEM**

- A. General Requirements:
- 1. Surface Burning Characteristics: Flame spread index/smoke developed index of 20/250, maximum, when tested in accordance with ASTM E84 or UL 723.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- G. Equipment Support and Attachment:
- 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

**END OF SECTION**



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

## **SECTION 22 05 33**

## **HEAT TRACING FOR PLUMBING PIPING**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Self-regulating parallel resistance electric heating cable.
- B. Cable outer jacket markings.
- C. Connection kits.

#### **1.02 REFERENCE STANDARDS**

- A. IEEE 515.1 - IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications 2012.
- B. ITS (DIR) - Directory of Listed Products current edition.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL (DIR) - Online Certifications Directory Current Edition.

#### **1.03 QUALITY ASSURANCE**

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

#### **1.04 WARRANTY**

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

### **PART 2 PRODUCTS**

#### **2.01 SELF-REGULATING PARALLEL RESISTANCE ELECTRIC HEATING CABLE**

- A. Manufacturers:
  - 1. Chromalox, Inc; HWM (HOT WATER MAINTENANCE @ 10W/FT 208-277V: [www.chromalox.com/#sle](http://www.chromalox.com/#sle).
  - 2. Pentair; MATCH CHROMALOX SPEC: [www.pentairthermal.com/#sle](http://www.pentairthermal.com/#sle).
- B. Provide products listed, classified, and labeled by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction (AHJ).
- C. Factory Rating and Testing: Comply with IEEE 515.1.
- D. Heating Element:
  - 1. Provide pair of parallel No.16 tinned or nickel coated stranded copper bus wires embedded in cross linked conductive polymer core with varying heat output in response to temperature along its length.

2. Terminations: Waterproof, factory assembled, non-heating leads with connector at one end and water-tight seal at opposite end.
3. Capable of crossing over itself without overheating.
- E. Insulated Jacket: Flame retardant polyolefin.
- F. Cable Cover: Provide tinned copper and polyolefin outer jacket with UV inhibitor.
- G. Maximum Power-On Operating Temperature: 150 degrees F.
- H. Maximum Power-Off Exposure Temperature: 185 degrees F.
- I. Electrical Characteristics:
  1. 208-277 volts, single phase, 60 Hz.

**2.02 CABLE OUTER JACKET MARKINGS**

- A. Name of manufacturer, trademark, or other recognized symbol of identification.
- B. Catalog number, reference number, or model.
- C. Month and year of manufacture, date coding, applicable serial number, or equivalent.
- D. Agency listing or approval.

**2.03 CONNECTION KITS**

- A. Provide power connection, splice/tee, and end seal kits compatible with the heating cable and without requiring cutting of the cable core to expose bus wires.
- B. Provide with NEMA 4X rating for prevention of corrosion and water ingress.

**END OF SECTION**



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

## **SECTION 22 07 19**

### **PLUMBING PIPING INSULATION**

#### **PART 1 GENERAL**

##### **1.01 REFERENCE STANDARDS**

- A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- B. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

#### **PART 2 PRODUCTS**

##### **2.01 REGULATORY REQUIREMENTS**

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

#### **PART 3 EXECUTION**

##### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.

##### **3.02 SCHEDULES**

- A. Plumbing Systems:
  - 1. Domestic Hot Water Supply:
    - a. Cellular Melamine Foam Insulation:
  - 2. Domestic Hot Water Recirculation:
    - a. Cellular Melamine Foam Insulation:

**END OF SECTION**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 22 10 05

## PLUMBING PIPING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Domestic water.
  - 3. Flanges, unions, and couplings.
  - 4. Pipe hangers and supports.
  - 5. Valves.
  - 6. Flow controls.
  - 7. Check.
  - 8. Water pressure reducing valves.
  - 9. Relief valves.
  - 10. Strainers.

#### 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 083100 - Access Doors and Panels.
- C. Section 099113 - Exterior Painting.
- D. Section 099123 - Interior Painting.
- E. Section 220516 - Expansion Fittings and Loops for Plumbing Piping.
- F. Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- G. Section 330110.58 - Disinfection of Water Utility Piping Systems.

#### 1.03 REFERENCE STANDARDS

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems 2015.
- B. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250 2016.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.
- E. ASME B31.9 - Building Services Piping 2017.
- F. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers 2019.
- G. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications 2019.

- H. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems 2009.
- I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.
- J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2020.
- K. ASTM B32 - Standard Specification for Solder Metal 2008 (Reapproved 2014).
- L. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.
- M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.
- N. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.
- O. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.
- P. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.
- Q. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2015.
- R. AWWA C550 - Protective Interior Coatings for Valves and Hydrants 2017.
- S. AWWA C606 - Grooved and Shouldered Joints 2015.
- T. AWWA C651 - Disinfecting Water Mains 2014.
- U. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications 2017 (Revised 2018).
- V. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2012 (Revised 2018).
- W. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements 2015.
- X. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements 2016.
- Y. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.
- Z. NSF 61 - Drinking Water System Components - Health Effects 2019.
- AA. NSF 372 - Drinking Water System Components - Lead Content 2016.

**1.04 QUALITY ASSURANCE**

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- D. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

**2.02 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING**

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.



1. Fittings: Cast iron.
2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

**2.03 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A. Cast Iron Pipe: CISPI 301, hubless.
1. Fittings: Cast iron.
  2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

**2.04 SANITARY SEWER PIPING, ABOVE GRADE**

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
1. Fittings: Cast iron.
  2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

**2.05 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING**

**2.06 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  2. Joints: ASTM B32, alloy Sn95 solder.
- B. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized, using one of the following joint types:
1. Threaded Joints: ASME B16.4 cast iron fittings.
  2. Grooved Joints: AWWA C606 grooved pipe, cast iron fittings, and mechanical couplings.

**2.07 PIPE HANGERS AND SUPPORTS**

- A. Provide hangers and supports that comply with MSS SP-58.
1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  3. Trapeze Hangers: Welded steel channel frames attached to structure.
  4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  4. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
  5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
  4. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
  5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
  7. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
  8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  9. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.

10. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
  1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
  2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
  3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
  4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
  5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

## **2.08 PIPING SPECIALTIES**

- A. Flow Controls:
  1. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.
  2. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

## **2.09 WATER PRESSURE REDUCING VALVES**

- A. Up to 2 Inches:
  1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
- B. Over 2 Inches:
  1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.

## **2.10 RELIEF VALVES**

- A. Pressure:
  1. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
- B. Temperature and Pressure:
  1. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME BPVC-IV certified and labelled.

## **2.11 STRAINERS**

- A. Size 2 Inches and Under:
  1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
  2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- B. Size 1-1/2 inch to 4 inches:
  1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.
- C. Size 5 inch and Larger:
  1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that excavations are to required grade, dry, and not over-excavated.

### **3.02 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.

- C. Prepare piping connections to equipment with flanges or unions.

**3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 220516.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Establish elevations of buried piping outside the building to ensure not less than code min of cover.
- J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; refer to Arch spec.
- K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- L. Provide support for utility meters in accordance with requirements of utility companies.
- M. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
- N. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- O. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- P. Sleeve pipes passing through partitions, walls, and floors.
- Q. Inserts:
  - 1. Provide inserts for placement in concrete formwork.
  - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- R. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Support horizontal piping as indicated.
  - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches of each horizontal elbow.
  - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - 8. Provide copper plated hangers and supports for copper piping.
  - 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
    - a. Painting of interior plumbing systems and components is specified in Section 099123.

- b. Painting of exterior plumbing systems and components is specified in Section 099113.
- 10. Provide hangers adjacent to motor-driven equipment with vibration isolation; refer to Section 220548.
- 11. Support cast iron drainage piping at every joint.
- S. Manufactured Sleeve-Seal Systems:
  - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
  - 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  - 3. Locate piping in center of sleeve or penetration.
  - 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  - 5. Tighten bolting for a watertight seal.
  - 6. Install in accordance with manufacturer's recommendations.
- T. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

### 3.04 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install globe valves for throttling, bypass, or manual flow control services.
- F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- G. Provide spring-loaded check valves on discharge of water pumps.
- H. Provide flow controls in water recirculating systems where indicated.

### 3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

### 3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Section 330110.58.
- B. Prior to starting work, verify system is complete, flushed, and clean.
- C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

### **3.07 SERVICE CONNECTIONS**

- A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
  - 1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
  - 2. Provide 18 gage, 0.0478-inch galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

### **3.08 SCHEDULES**

- A. Pipe Hanger Spacing:
  - 1. Metal Piping:
    - a. Pipe Size: 1/2 inches to 1-1/4 inches:
      - 1) Maximum Hanger Spacing: 6.5 ft.
      - 2) Hanger Rod Diameter: 3/8 inches.
    - b. Pipe Size: 1-1/2 inches to 2 inches:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 3/8 inch.
    - c. Pipe Size: 2-1/2 inches to 3 inches:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 1/2 inch.
    - d. Pipe Size: 4 inches to 6 inches:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 5/8 inch.
    - e. Pipe Size: 8 inches to 12 inches:
      - 1) Maximum hanger spacing: 14 ft.
      - 2) Hanger Rod Diameter: 7/8 inch.
    - f. Pipe Size: 14 inches and Over:
      - 1) Maximum Hanger Spacing: 20 ft.
      - 2) Hanger Rod Diameter: 1 inch.
  - 2. Plastic Piping:
    - a. All Sizes:
      - 1) Maximum Hanger Spacing: 6 ft.
      - 2) Hanger Rod Diameter: 3/8 inch.

#### **A. END OF SECTION**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 22 10 06

## PLUMBING PIPING SPECIALTIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Drains.
- B. Cleanouts.
- C. Hose bibbs.
- D. Refrigerator valve and recessed box.
- E. Backflow preventers.
- F. Water hammer arrestors.
- G. Sanitary waste interceptors.
- H. Mixing valves.
- I. Catch basins and manholes.
- J. Exterior penetration accessories.
- K. Fire-rated enclosures.

#### 1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.6.3 - Floor and Trench Drains 2019.
- C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers 2017.
- D. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers 2011.
- E. NSF 61 - Drinking Water System Components - Health Effects 2019.
- F. NSF 372 - Drinking Water System Components - Lead Content 2016.
- G. PDI-WH 201 - Water Hammer Arresters 2017.

### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

#### 2.02 DRAINS

- A. Floor Drains:
- B. Floor Drain (FD-1):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.

- C. Floor Drain (FD-2):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable round nickel bronze strainer with removable perforated sediment bucket.
- D. Floor Drain (FD-3):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer with polished bronze funnel or anti-splash rim.
- E. Floor Drain (FD-4):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze extra heavy duty strainer.
- F. Floor Drain (FD-5):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze extra heavy duty strainer with hinged grate and sediment bucket.
- G. Floor Drain (FD-6):
  - 1. Lacquered cast iron or stainless steel, two piece body with drainage flange, heavy duty grate 6 inches wide, 12 inches long, dome strainer, end plates with gaskets.

## **2.03 CLEANOUTS**

- A. Cleanouts at Exterior Surfaced Areas (CO-1):
  - 1. Round cast nickel bronze access frame and non-skid cover.
- B. Cleanouts at Exterior Unsurfaced Areas (CO-2):
  - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.
- C. Cleanouts at Interior Finished Floor Areas (CO-3):
  - 1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- D. Cleanouts at Interior Finished Wall Areas (CO-4):
  - 1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.
- E. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

## **2.04 HOSE BIBBS**

- A. Interior Hose Bibbs:
  - 1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with handwheel, integral vacuum breaker in compliance with ASSE 1011.
- B. Interior Mixing Type Hose Bibbs:
  - 1. Bronze or brass, wall mounted, double service faucet with hose thread spout, integral stops, chrome plated where exposed with handwheels, and vacuum breaker in compliance with ASSE 1011.

## **2.05 BACKFLOW PREVENTERS**

- A. Reduced Pressure Backflow Preventers:
  - 1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

**2.06 WATER HAMMER ARRESTORS**

**A. Water Hammer Arrestors:**

1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

**2.07 SANITARY WASTE INTERCEPTORS**

**2.08 MIXING VALVES**

**A. Thermostatic Mixing Valves:**

1. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
2. Accessories:
  - a. Check valve on inlets.
  - b. Volume control shut-off valve on outlet.
  - c. Stem thermometer on outlet.
  - d. Strainer stop checks on inlets.
3. Cabinet: 16 gage, 0.0598 inch prime coated steel, for recessed mounting with keyed lock.

**2.09 RELIEF VALVES**

- A.** Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

**2.10 AIR VENTS**

- A.** Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
- B.** Float Type:
1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
  2. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.
- C.** Washer Type:
1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

**2.11 FLOOR DRAIN TRAP SEALS**

- A.** Description: Push-fit EPDM or silicone fitting with a one-way membrane.

**2.12 DOMESTIC WATER DISTRIBUTION MANIFOLDS**

- A.** Description: Domestic water distribution system with integrated quarter-turn shutoff valves for each plumbing fixture.

**2.13 EXTERIOR PENETRATION ACCESSORIES**

- A.** Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- B.** Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for piping, cables, and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- C.** Plumbing Ventilation Thru Roof Accessories - Retrofit:
1. Plumbing Pipe Extension Kit: Extends roof plumbing pipes above minimum clearance from roof surface per local codes and Authority Having Jurisdiction (AHJ).
  2. Retrofit Cap: Spun aluminum cap for use with aluminum or PVC plumbing stack.



3. Vandal Resistant Cap: Spun aluminum cap for use with aluminum or PVC plumbing stack. Cap designed to be secured with pop-rivets to prevent removal.

#### **2.14 FIRE-RATED ENCLOSURES**

- A. Provide as required to preserve fire resistance rating of building elements.

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.
- F. Pipe relief from backflow preventer to nearest drain.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks, washing machine outlets, or where required by Code.
- H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

#### **A. END OF SECTION**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 22 40 00

## PLUMBING FIXTURES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Water closets.
- B. Waterless urinals.
- C. Lavatories.
- D. All-in-one lavatory system.
- E. Sinks.
- F. Service sinks.
- G. Mop sinks.
- H. Under-lavatory pipe supply covers.
- I. Showers.

#### 1.02 RELATED REQUIREMENTS

- A. Section 221005 - Plumbing Piping.
- B. Section 221006 - Plumbing Piping Specialties.
- C. Section 223000 - Plumbing Equipment.
- D. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

#### 1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2017).
- C. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping 2015.
- D. FM (AG) - FM Approval Guide current edition.
- E. ASME A112.18.1 - Plumbing Supply Fittings 2018, with Errata.
- F. ASME A112.19.2 - Ceramic Plumbing Fixtures 2018.
- G. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks 2017.
- H. ASME A112.19.14 - Six Liter Water Closets Equipped with Dual Flushing Device 2013 (Reaffirmed 2018).
- I. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers 2005.
- J. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices 2015.
- K. NSF 61 - Drinking Water System Components - Health Effects 2019.
- L. NSF 372 - Drinking Water System Components - Lead Content 2016.

#### **1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Waterless Urinals: Submit recommended frequency of maintenance and parts replacement, methods of cleaning, sources of replacement supplies and parts.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Faucet Washers: One set of each type and size.
  - 3. Extra Lavatory Supply Fittings: One set of each type and size.
  - 4. Extra Shower Heads: One of each type and size.
  - 5. Extra Toilet Seats: One of each type and size.
  - 6. Flush Valve Service Kits: One for each type and size.
  - 7. Extra Waterless Urinal Trap Seals/Supplies: Provide one year's worth of replacement trap seal parts or supplies, based on normal, expected use of facility of this type.
  - 8. Extra Waterless Urinal Trap Seals/Supplies: One year's worth, based on normal, expected use of facility of this type.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL REQUIREMENTS**

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

#### **2.02 FLUSH VALVE WATER CLOSETS (P-1)**

- A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
  - 1. Bowl: ASME A112.19.2; 16.5 inches high with elongated rim.
  - 2. Flush Valve: Exposed (top spud).
  - 3. Flush Operation: Sensor operated.
  - 4. Handle Height: 44 inches or less.
  - 5. Supply Size: 1-1/2 inches.
  - 6. Outlet Size: 2 inches.
  - 7. Manufacturers:
    - a. American Standard, Inc; AFWALL FLOWISE ADA RETROFIT TOILET W/SENSOR - OPERATED FLUSHOMETER: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - b. SLOAN MODEL # ROYAL 111-1.28 FLUSHOMETER.
    - c. TOTO TOILET MODEL CT 708U #01
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
  - 1. Sensor-Operated Type: Solenoid or motor-driven operator, low voltage hard-wired, infrared sensor with mechanical over-ride or over-ride push button.
  - 2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
  - 3. Manufacturers:
    - a. SLOAN MODEL EBV-500-A SIDE MOUNTED SINGLE FLUSH TOILET/URINAL FLUSH VALVE RETROFIT KIT.

#### **2.03 WATERLESS URINALS (P-3)**

- A. Manufacturers:
  - 1. American Standard, Inc; FLOWISE FLUSH FREE WATERLESS URINAL MODEL 6150.100: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).

- B. Urinal P-3: Wall-hung, vitreous china, complying with ASME A112.19.2; one piece bowl and shields, with integral trap, back outlet, carrier, and all necessary fittings.
  - 1. Trap Assembly: Siphon trap type not requiring additional water for drainage of urine; liquid trap seal that is lower specific gravity than water or urine and is biodegradable; completely enclosed cartridge intended to be replaced periodically or refillable liquid trap seal; tamperproof but removable for cleaning and replacement.
  - 2. Projection From Wall: Approximately 14 inches.
  - 3. Width: Approximately 19 inches.
  - 4. Color: White.

**2.04 LAVATORIES (P-2A, P-2B, P-2C)**

- A. Lavatory Manufacturers:
  - 1. SLOAN GRADIENT SERIES- P-2A (ELGR-8100, ELGR-8200, ELGR-8300).
- B. Supply Faucet Manufacturers:
  - 1. TOTO FAUCET SPOUT ASSEMBLY 21-16-94C, CONTROLLER 21-16-58B, MIXING VALVE 21-20-03A AND THERMOSTAT 21-16-96D.
- C. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.
- D. Provide lavatory with combination stop and strainer.

**2.05 SHOWERS (P-4)**

- A. Shower Manufacturers:
  - 1. SHOWER TRIM KIT- MOEN COMMERCIAL MODEL M-DURA COMMERCIAL SINGLE HANDLE POSI-TEMP HANDHELD SHOWER SYSTEM T9346GBM
  - 2. SHOWER BASE P-5A, KOHLER MODEL K-9055 60"X 36" ENAMELED CAST IRON SHOWER BASE W/ SAFEGUARD SLIP RESISTANT SURFACE ON BATH FLOOR, SINGLE THRESHOLD FOR ALCOVE INSTALLATION WITH CENTER DRAIN
  - 3. SHOWER BASE P-5B, KOHLER MODEL K-9396 36" X 36" ACRYLIC SHOWER BASE, SINGLE THRESHOLD FOR ALCOVE INSTALLATION, CENTER DRAIN W/ COVERED DRAIN (REMOVABLE COVER)
- B. -- To specify the shower and valve separately, use the paragraphs below. --
- C. Shower Valve:
  - 1. Comply with ASME A112.18.1.
  - 2. Provide two handle in wall diverter valve body with integral thermostatic mixing valve to supply 1.5 gpm.
- D. Hand-Held Shower Head:
  - 1. ASME A112.18.1, adjustable spray hand-held shower head with swivel fitting, with ASSE 1014 backflow preventer.
  - 2. Provide pushbutton flow control.
  - 3. Include 60 inch minimum flexible polished stainless steel hose and in-line vacuum breaker
  - 4. Provide wall bracket to mount hand spray, allowing use of the unit as either a hand-held spray or a fixed shower head.
  - 5. Hand-Held Shower Head Manufacturers:
    - a. SYMMONS SINGLE HANDLE SHOWER VALVE
- E. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

**2.06 MOP SINKS (P-6)**

- A. Mop Sink Manufacturers:
  - 1. FIAT PRODUCTS-ACRANE PLUMBING COMPANY MOLDED STONE MOP BASIN MSB 2424/ SERVICE SINK FAUCET 830-AA.
- B. Dimensions: As indicated on drawings.

- C. Accessories:
  - 1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
  - 2. Hose clamp hanger.
  - 3. Mop hanger.

## 2.07 SERVICE SINKS

- A. Accessories:
  - 1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
  - 2. Hose clamp hanger.
  - 3. Mop hanger.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

### 3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

### 3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

### 3.04 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

### 3.05 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

### 3.06 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
  - 1. Water Closet:
    - a. Standard: 15 inches to top of bowl rim.
    - b. Accessible: 18 inches to top of seat.
  - 2. Water Closet Flush Valves:
    - a. Standard: 11 inches min. above bowl rim.
    - b. Recessed: 10 inches min. above bowl rim.
  - 3. Urinal:
    - a. Standard: 22 inches to top of bowl rim.
    - b. Accessible: 17 inches to top of bowl rim.
  - 4. Lavatory:
    - a. Standard: 31 inches to top of basin rim.
    - b. Accessible: 34 inches to top of basin rim.
  - 5. Drinking Fountain:

- a. Child: 30 inches to top of basin rim.
  - b. Standard Adult: 40 inches to top of basin rim.
  - c. Accessible: 36 inches to top of spout.
- B. Fixture Rough-In
- 1. Water Closet (Flush Valve Type): P-1
    - a. Cold Water: 1 Inch.
    - b. Waste: 4 Inch.
    - c. Vent: 2 Inch.
  - 2. Urinal, Waterless: P-3
    - a. Waste: 2 Inch.
    - b. Vent: 1-1/2 Inch.
  - 3. Lavatory:
    - a. Hot Water: 1/2 Inch.
    - b. Cold Water: 1/2 Inch.
    - c. Waste: 1-1/2 Inch.
  - 4. Sink:
    - a. Hot Water: 1/2 Inch.
    - b. Cold Water: 1/2 Inch.
    - c. Waste: 1-1/2 Inch.
    - d. Vent: 1-1/4 Inch.
  - 5. Service Sink: P-6
    - a. Hot Water: 1/2 Inch.
    - b. Cold Water: 1/2 Inch.
    - c. Waste: 2 Inch.
    - d. Vent: 1-1/2 Inch.
  - 6. Service Sink: P-6
    - a. Hot Water: 1/2 Inch.
    - b. Cold Water: 1/2 Inch.
    - c. Waste: 3 Inch.
    - d. Vent: 1-1/2 Inch.
  - 7. Drinking Fountain: DF
    - a. Cold Water: 1/2 Inch.
    - b. Waste: 1-1/4 Inch.
    - c. Vent: 1-1/4 Inch.
  - 8. Shower: P-5A AND P-5B
    - a. Hot Water: 1/2 Inch.
    - b. Cold Water: 1/2 Inch.
    - c. Waste: 1-1/2 Inch.
    - d. Vent: 1-1/4 Inch.

**END OF SECTION**

## **PART 1 GENERAL**

### **1.01 SECTION INCLUDES**

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jackets and accessories.

### **1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.

### **1.03 REFERENCE STANDARDS**

- A. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
- B. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
- C. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
- D. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
- E. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2013).
- F. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.
- G. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2016.
- H. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.
- I. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation 2017, with Editorial Revision (2018).
- J. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
- K. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).
- L. ASTM C1695 - Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service 2019.
- M. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber 2014.
- N. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
- O. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- P. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

## **PART 2 PRODUCTS**

### **2.01 REGULATORY REQUIREMENTS**

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

### **2.02 GLASS FIBER**

- A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  - 1. K Value: ASTM C177, 0.24 at 75 degrees F.
  - 2. Maximum Service Temperature: 850 degrees F.
  - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- B. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
  - 1. K Value: ASTM C177, 0.23 at 75 degrees F.
  - 2. Maximum Service Temperature: 220 degrees F.

3. Maximum Moisture Absorption: 0.2 percent by volume.
- C. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
  1. K Value: ASTM C177, 0.24 at 75 degrees F.
  2. Maximum Service Temperature: 650 degrees F.
  3. Maximum Moisture Absorption: 0.2 percent by volume.
- D. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- E. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- F. Vapor Barrier Lap Adhesive: Compatible with insulation.
- G. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- H. Fibrous Glass Fabric:
  1. Cloth: Untreated; 9 oz/sq yd weight.
  2. Blanket: 1.0 lb/cu ft density.
  3. Weave: 5 by 5.
- I. Indoor Vapor Barrier Finish:
  1. Cloth: Untreated; 9 oz/sq yd weight.
  2. Vinyl emulsion type acrylic, compatible with insulation, black color.
- J. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
- K. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

## **2.03 FLEXIBLE REMOVABLE AND REUSABLE BLANKET INSULATION**

- A. Insulation: ASTM C553 Type V; flexible, noncombustible.
  1. Comply with ASTM C1695.
  2. K Value: 0.37 at 100 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
  3. Minimum Service Temperature: 32 degrees F.
  4. Maximum Service Temperature: 500 degrees F.
  5. Maximum Water Vapor Absorption: Less than 5.0 percent by weight.
  6. Color: Green.
  7. Effective Thickness: 1.25 plus/minus 0.25 inch.

## **2.04 CELLULAR GLASS**

- A. Insulation: ASTM C552, Type II, Grade 6.
  1. K Value: 0.35 at 100 degrees F.
  2. Service Temperature Range: From 250 degrees F to 800 degrees F.
  3. Water Vapor Permeability: 0.005 perm inch maximum per inch.
  4. Water Absorption: 0.5 percent by volume, maximum.

## **2.05 POLYETHYLENE**

- A. Insulation: Flexible closed-cell polyethylene tubing, slit lengthwise for installation, complying with applicable requirements of ASTM D1056.
  1. K Value: ASTM C177; 0.25 at 75 degrees F.
  2. Maximum Service Temperature: 200 degrees F.
  3. Density: 2 lb/cu ft.
  4. Maximum Moisture Absorption: 1.0 percent by volume.
  5. Moisture Vapor Permeability: 0.05 perm inch, when tested in accordance with ASTM E96/E96M.
  6. Connection: Contact adhesive.

## **2.06 FLEXIBLE ELASTOMERIC CELLULAR INSULATION**

- A. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
  1. Minimum Service Temperature: Minus 40 degrees F.
  2. Maximum Service Temperature: 220 degrees F.
  3. Connection: Waterproof vapor barrier adhesive.



## **2.07 JACKETS**

- A. PVC Plastic:
  - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: 0 degrees F.
    - b. Maximum Service Temperature: 150 degrees F.
    - c. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
    - d. Thickness: 10 mil.
    - e. Connections: Brush on welding adhesive.
- B. ABS Plastic:
  - 1. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - a. Minimum Service Temperature: Minus 40 degrees F.
    - b. Maximum Service Temperature: 180 degrees F.
    - c. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
    - d. Thickness: 30 mil.
    - e. Connections: Brush on welding adhesive.
- C. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
  - 1. Lagging Adhesive: Compatible with insulation.
- D. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
  - 1. Thickness: 0.016 inch sheet.
  - 2. Finish: Smooth.
  - 3. Joining: Longitudinal slip joints and 2 inch laps.
  - 4. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
  - 5. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
- E. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel.
  - 1. Thickness: 0.010 inch.
  - 2. Finish: Smooth.
  - 3. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that piping has been tested before applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- C. Exposed Piping: Locate insulation and cover seams in least visible locations.
- D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- E. Glass fiber insulated pipes conveying fluids below ambient temperature:
  - 1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  - 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- F. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- G. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- H. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- I. Inserts and Shields:
1. Application: Piping 1-1/2 inches diameter or larger.
  2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  3. Insert Location: Between support shield and piping and under the finish jacket.
  4. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  5. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.
- K. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
- L. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
- M. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

### **3.03 SCHEDULES**

- A. Plumbing Systems: SIZES AND THICKNESS PER RISBC FOR R-VALUE ENERGY COMPLIANCE
1. Domestic Hot Water Supply:
    - a. Glass Fiber Insulation:
    - b. Cellular Glass Insulation:
  2. Domestic Hot Water Recirculation:
    - a. Glass Fiber Insulation:
    - b. Polyethylene Insulation:
  3. Tempered Domestic Water Supply:
  4. Tempered Domestic Water Recirculation:
  5. Domestic Cold Water:
- B. Heating Systems:
1. Heating Water Supply and Return:
  2. Glycol Heating Supply and Return:
  3. Gravity Steam Condensate:
- C. Cooling Systems:
1. Chilled Water:
  2. Condenser Water:
  3. Glycol Cooling Supply and Return:
  4. Condensate Drains from Cooling Coils:
  5. Refrigerant Suction:
  6. Refrigerant Hot Gas:

**END OF SECTION**

**SECTION 224000  
PLUMBING FIXTURES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Water closets.
- B. Waterless urinals.
- C. Lavatories.
- D. All-in-one lavatory system.
- E. Sinks.
- F. Service sinks.
- G. Mop sinks.
- H. Under-lavatory pipe supply covers.
- I. Showers.
- J. Eye and face wash fountains.
- K. Emergency showers.

**1.02 RELATED REQUIREMENTS**

- A. Section 221005 - Plumbing Piping.
- B. Section 221006 - Plumbing Piping Specialties.
- C. Section 223000 - Plumbing Equipment.
- D. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

**1.03 REFERENCE STANDARDS**

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2017).
- C. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping 2015.
- D. FM (AG) - FM Approval Guide current edition.
- E. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment 2014.
- F. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use 1997 (Reaffirmed 2017).
- G. ASME A112.18.1 - Plumbing Supply Fittings 2018, with Errata.
- H. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures 2018.
- I. ASME A112.19.2 - Ceramic Plumbing Fixtures 2018.
- J. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks 2017.
- K. ASME A112.19.14 - Six Liter Water Closets Equipped with Dual Flushing Device 2013 (Reaffirmed 2018).
- L. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers 2005.
- M. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices 2015.
- N. NSF 61 - Drinking Water System Components - Health Effects 2019.
- O. NSF 372 - Drinking Water System Components - Lead Content 2016.

**1.04 SUBMITTALS**

- A. See Section 013000 - Administrative Requirements, for submittal procedures.
- B. Waterless Urinals: Submit recommended frequency of maintenance and parts replacement, methods of cleaning, sources of replacement supplies and parts.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 016000 - Product Requirements, for additional provisions.
  2. Extra Faucet Washers: One set of each type and size.
  3. Extra Lavatory Supply Fittings: One set of each type and size.
  4. Extra Shower Heads: One of each type and size.
  5. Extra Toilet Seats: One of each type and size.
  6. Flush Valve Service Kits: One for each type and size.
  7. Extra Waterless Urinal Trap Seals/Supplies: Provide one year's worth of replacement trap seal parts or supplies, based on normal, expected use of facility of this type.
  8. Extra Waterless Urinal Trap Seals/Supplies: One year's worth, based on normal, expected use of facility of this type.

## **PART 2 PRODUCTS**

### **2.01 GENERAL REQUIREMENTS**

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

### **2.02 FLUSH VALVE WATER CLOSETS (P-1)**

- A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
1. Bowl: ASME A112.19.2; 16.5 inches high with elongated rim.
  2. Flush Valve: Exposed (top spud).
  3. Flush Operation: Sensor operated.
  4. Handle Height: 44 inches or less.
  5. Supply Size: 1-1/2 inches.
  6. Outlet Size: 2 inches.
  7. Manufacturers: (SUGGESTIONS ARE LISTED BELOW. SUBMIT TO ENGINEER OF RECORD FOR APPROVAL)
    - a. Advanced Modern Technologies Corporation: [www.amtcorporation.com/#sle](http://www.amtcorporation.com/#sle).
    - b. American Standard, Inc; AFWALL FLOWISE ADA RETROFIT TOILET W/SENSOR - OPERATED FLUSHOMETER: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - c. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
    - d. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
    - e. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
    - f. SLOAN MODEL # ROYAL 111-1.28 FLUSHOMETER.
    - g. TOTO TOILET MODEL CT 708U #01
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
1. Sensor-Operated Type: Solenoid or motor-driven operator, low voltage hard-wired, infrared sensor with mechanical over-ride or over-ride push button.
  2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
  3. Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT TO EOR FOR APPROVAL
    - a. Advanced Modern Technologies Corporation; AEF-800 Series, Automatic Flush Valve: [www.amtcorporation.com/#sle](http://www.amtcorporation.com/#sle).
    - b. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - c. Delany Products: [www.delanyproducts.com/#sle](http://www.delanyproducts.com/#sle).
    - d. Sloan Valve Company: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
    - e. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
    - f. SLOAN MODEL EBV-500-A SIDE MOUNTED SINGLE FLUSH TOILET/URINAL FLUSH VALVE RETROFIT KIT.
- C. Seats:
1. Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT TO EOR FOR APPROVAL
    - a. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).

- b. Bemis Manufacturing Company: [www.bemismfg.com/#sle](http://www.bemismfg.com/#sle).
  - c. Church Seat Company: [www.churchseats.com/#sle](http://www.churchseats.com/#sle).
  - d. DXV by American Standard, Inc: [www.dxv.com/#sle](http://www.dxv.com/#sle).
  - e. Olsonite: [www.olsonite.com/#sle](http://www.olsonite.com/#sle).
  - f. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- 2. Solid black plastic, open front, extended back, self-sustaining hinge, brass bolts, with cover.
- D. Water Closet Carriers:
  - 1. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

### **2.03 WATERLESS URINALS (P-3)**

- A. Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT FOR APPROVAL TO EOR.
  - 1. American Standard, Inc; FLOWISE FLUSH FREE WATERLESS URINAL MODEL 6150.100: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  - 2. Falcon Waterfree Technologies: [www.falconwaterfree.com/#sle](http://www.falconwaterfree.com/#sle).
  - 3. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  - 4. Sloan Valve: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
  - 5. Waterless Co: [www.waterless.com/#sle](http://www.waterless.com/#sle).
  - 6. Zero Flush: [www.zeroflush.com/#sle](http://www.zeroflush.com/#sle).
  - 7. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. Urinal UR- [\_\_\_\_]: Wall-hung, vitreous china, complying with ASME A112.19.2; one piece bowl and shields, with integral trap, back outlet, carrier, and all necessary fittings.
  - 1. Trap Assembly: Siphon trap type not requiring additional water for drainage of urine; liquid trap seal that is lower specific gravity than water or urine and is biodegradable; completely enclosed cartridge intended to be replaced periodically or refillable liquid trap seal; tamperproof but removable for cleaning and replacement.
  - 2. Projection From Wall: Approximately 14 inches.
  - 3. Width: Approximately 19 inches.
  - 4. Color: White.

### **2.04 LAVATORIES (P-2A, P-2B, P-2C)**

- A. Lavatory Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
  - 1. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  - 2. DXV by American Standard, Inc: [www.dxv.com/#sle](http://www.dxv.com/#sle).
  - 3. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
  - 4. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  - 5. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - 6. SLOAN GRADIENT SERIES- P-2A (ELGR-8100, ELGR-8200, ELGR-8300).
- B. Supply Faucet Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
  - 1. Advanced Modern Technologies Corporation; AEF-300 Series, Wall Mounted: [www.amtcorporation.com/#sle](http://www.amtcorporation.com/#sle).
  - 2. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  - 3. DXV by American Standard, Inc: [www.dxv.com/#sle](http://www.dxv.com/#sle).
  - 4. Grohe America, Inc: [www.grohe.com/us/#sle](http://www.grohe.com/us/#sle).
  - 5. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  - 6. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  - 7. TOTO FAUCET SPOUT ASSEMBLY 21-16-94C, CONTROLLER 21-16-58B, MIXING VALVE 21-20-03A AND THERMOSTAT 21-16-96D.
- C. Sensor Operated Faucet: Cast brass, chrome plated, wall mounted with sensor located on neck of spout.
  - 1. Spout Style: Standard.
  - 2. Mixing Valve: None, single line for tempered water.
  - 3. Water Supply: 3/8 inch compression connections.
  - 4. Aerator: Vandal resistant, 0.5 GPM, laminar flow device.
  - 5. Finish: Polished chrome.

6. Sensor Operated Faucet Manufacturers:
  - a. Advanced Modern Technologies Corporation; AEF-300 Series, Deck Mounted: [www.amtcorporation.com/#sle](http://www.amtcorporation.com/#sle).
  - b. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  - c. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
  - d. Grohe America, Inc: [www.grohe.com/us/#sle](http://www.grohe.com/us/#sle).
  - e. The Chicago Faucet Company: [www.chicagofaucets.com/#sle](http://www.chicagofaucets.com/#sle).
  - f. Moen Incorporated: [www.moen.com/#sle](http://www.moen.com/#sle).
  - g. Powers Controls: [www.powerscontrols.com/#sle](http://www.powerscontrols.com/#sle).
  - h. Sloan Valve Company: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
  - i. Toto USA: [www.totousa.com/#sle](http://www.totousa.com/#sle).
  - j. Watts: [www.watts.com/#sle](http://www.watts.com/#sle).
  - k. Zurn Industries, Inc; AquaSense Z6913: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- D. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.
- E. Provide lavatory with combination stop and strainer.

## **2.05 SHOWERS (P-4)**

- A. Shower Manufacturers:
  1. SHOWER TRIM KIT- MOEN COMMERCIAL MODEL M-DURA COMMERCIAL SINGLE HANDLE POSI-TEMP HANDHELD SHOWER SYSTEM T9346GBM
  2. SHOWER BASE P-5A, KOHLER MODEL K-9055 60"X 36" ENAMELED CAST IRON SHOWER BASE W/ SAFEGUARD SLIP RESISTANT SURFACE ON BATH FLOOR, SINGLE THRESHOLD FOR ALCOVE INSTALLATION WITH CENTER DRAIN
  3. SHOWER BASE P-5B, KOHLER MODEL K-9396 36" X 36" ACRYLIC SHOWER BASE, SINGLE THRESHOLD FOR ALCOVE INSTALLATION, CENTER DRAIN W/ COVERED DRAIN (REMOVABLE COVER)
- B. Shower Valve:
  1. Comply with ASME A112.18.1.
  2. Provide two handle in wall diverter valve body with integral thermostatic mixing valve to supply 1.5 gpm.
- C. Wall Mounted Shower Valve:
  1. Comply with ASME A112.18.1.
  2. Provide two handle in wall diverter valve body with integral thermostatic mixing valve to supply 1.5 gpm.
  3. Shower Valve Manufacturers:
- D. Shower Head:
  1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 2.5 gpm flow control.
- E. Low-Flow Shower Head:
  1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 1.5 gpm flow control.
- F. Hand-Held Shower Head:
  1. ASME A112.18.1, adjustable spray hand-held shower head with swivel fitting, with ASSE 1014 backflow preventer.
  2. Provide pushbutton flow control.
  3. Include 60 inch minimum flexible polished stainless steel hose and in-line vacuum breaker
  4. Provide wall bracket to mount hand spray, allowing use of the unit as either a hand-held spray or a fixed shower head.
- G. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

## **2.06 MOP SINKS (P-6)**

- A. Mop Sink Manufacturers: SUGGESTIONS LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
  1. Acorn Engineering Company: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).

2. Just Manufacturing Company: [www.justmfg.com/#sle](http://www.justmfg.com/#sle).
  3. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  4. FIAT PRODUCTS-ACRANE PLUMBING COMPANY MOLDED STONE MOP BASIN MSB 2424/ SERVICE SINK FAUCET 830-AA.
- B. Material: Stainless steel.
- C. Type: Rectilinear.
- D. Tiling Flange Construction: Galvanized steel.
- E. Grid Strainer: Stainless steel; integral; removable.
- F. Accessories:
1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
  2. Hose clamp hanger.
  3. Mop hanger.
- G. Terrazzo Mop Sink Manufacturers: SUGGESTIONS LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
1. Acorn Engineering Company; [\_\_\_\_]: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  2. Just Manufacturing Company; [\_\_\_\_]: [www.justmfg.com/#sle](http://www.justmfg.com/#sle).
  3. Zurn Industries, Inc; [\_\_\_\_]: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- H. Material: Precast terrazzo composed of marble chips cast in Portland cement.
- I. Type: Rectilinear, standard height.
- J. Tiling Flange Construction: Galvanized steel.
- K. Grid strainer: Stainless steel; integral; removable.
- L. Dimensions: As indicated on drawings.
- M. Accessories:
1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
  2. Hose clamp hanger.
  3. Mop hanger.

## **2.07 SERVICE SINKS**

- A. Bowl: ASME A112.19.1; 22 by 18 by 12 inch deep, porcelain enamelled (inside only) cast iron roll-rim sink, with 12 inch high back, concealed hanger, chrome plated strainer, stainless steel rim guard, cast iron P-trap with adjustable floor flange.
- B. Bowl: 36 by 24 by 10 inch high white molded stone, floor mounted, with one inch wide shoulders, vinyl bumper guard, stainless steel strainer.
- C. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.
- D. Accessories:
1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
  2. Hose clamp hanger.
  3. Mop hanger.

## **2.08 EMERGENCY EYE AND FACE WASH**

- A. Emergency Wash Manufacturers: SUGGESTIONS LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
1. Haws Corporation; [\_\_\_\_]: [www.hawesco.com/#sle](http://www.hawesco.com/#sle).
  2. Therm-Omega-Tech, Inc; [\_\_\_\_]: [www.thermomegatech.com/#sle](http://www.thermomegatech.com/#sle).
- B. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

## **2.09 EMERGENCY SHOWERS**

- A. Emergency Shower: ANSI Z358.1; wall-mounted, self-cleaning, non-clogging 8 inch diameter stainless steel deluge shower head with elbow, one inch full flow valve with pull chain and 8 inch diameter ring, one inch interconnecting fittings.

- B. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

### **3.02 PREPARATION**

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

### **3.03 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

### **3.04 ADJUSTING**

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

### **3.05 PROTECTION**

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

### **3.06 SCHEDULES**

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
  - 1. Water Closet:
    - a. Standard: 15 inches to top of bowl rim.
    - b. Accessible: 18 inches to top of seat.
  - 2. Water Closet Flush Valves:
    - a. Standard: 11 inches min. above bowl rim.
    - b. Recessed: 10 inches min. above bowl rim.
  - 3. Urinal:
    - a. Standard: 22 inches to top of bowl rim.
    - b. Accessible: 17 inches to top of bowl rim.
  - 4. Lavatory:
    - a. Standard: 31 inches to top of basin rim.
    - b. Accessible: 34 inches to top of basin rim.
  - 5. Drinking Fountain:
    - a. Child: 30 inches to top of basin rim.
    - b. Standard Adult: 40 inches to top of basin rim.
    - c. Accessible: 36 inches to top of spout.
  - 6. Shower Heads:
    - a. Adult Male: 69.5 inches to bottom of head.
    - b. Adult Female: 64.5 inches to bottom of head.
    - c. Child: 58.5 inches to bottom of head.
  - 7. Emergency Eye and Face Wash:
    - a. Standard: 38 inches to receptor rim.
  - 8. Emergency Shower:
    - a. Standard: 84 inches to bottom of head.



**B. Fixture Rough-In**

1. Water Closet (Flush Valve Type): P-1
  - a. Cold Water: 1 Inch.
  - b. Waste: 4 Inch.
  - c. Vent: 2 Inch.
2. Urinal, Waterless: P-3
  - a. Waste: 2 Inch.
  - b. Vent: 1-1/2 Inch.
3. Lavatory:
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 1-1/2 Inch.
  - d. Vent: 1-1/4 Inch.
4. Sink:
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 1-1/2 Inch.
  - d. Vent: 1-1/4 Inch.
5. Service Sink: P-6
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 2 Inch.
  - d. Vent: 1-1/2 Inch.
6. Service Sink: P-6
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 3 Inch.
  - d. Vent: 1-1/2 Inch.
7. Drinking Fountain: DF
  - a. Cold Water: 1/2 Inch.
  - b. Waste: 1-1/4 Inch.
  - c. Vent: 1-1/4 Inch.
8. Shower: P-5A AND P-5B
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 1-1/2 Inch.
  - d. Vent: 1-1/4 Inch.

**END OF SECTION**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 23 07 13

## DUCT INSULATION

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Insulation jackets.

#### 1.02 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
- C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014 (Reapproved 2019).
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

#### 1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section , with minimum 5 years of experience and approved by manufacturer.

### PART 2 PRODUCTS

#### 2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

#### 2.02 GLASS FIBER, FLEXIBLE

- A. **Manufacturer: Owens Corning, Johns Manville or equivalent**
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 1200 degrees F.
  - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure sensitive tape.

### 2.03 GLASS FIBER, RIGID

- A. Insulation: ASTM C612; rigid, noncombustible blanket.
  - 1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 450 degrees F.
  - 3. Maximum Water Vapor Absorption: 5.0 percent.
  - 4. Maximum Density: 8.0 lb/cu ft.
- B. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure sensitive tape.

### 2.04 JACKETS

- A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated Ducts Conveying Air Below Ambient Temperature:
  - 1. Provide insulation with vapor barrier jackets.
  - 2. Finish with tape and vapor barrier jacket.
  - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  - 4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Insulated Ducts Conveying Air Above Ambient Temperature:
  - 1. Provide with or without standard vapor barrier jacket.
  - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
- F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with outdoor jacket.
- G. Slope exterior ductwork to shed water.
- H. External Duct Insulation Application:
  - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
  - 2. Secure insulation without vapor barrier with staples, tape, or wires.
  - 3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
  - 4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
  - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

END OF SECTION



## CCRI KNIGHT CAMPUS

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## SECTION 23 31 00

## HVAC DUCTS AND CASINGS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Duct cleaning.

#### 1.02 REFERENCE STANDARDS

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

### PART 2 PRODUCTS

#### 2.01 DUCT ASSEMBLIES

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

#### 2.02 DUCTWORK FABRICATION

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

#### 2.03 MANUFACTURED DUCTWORK AND FITTINGS

### PART 3 EXECUTION

#### 3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

#### 3.02 CLEANING

- A. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

END OF SECTION



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

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## SECTION 23 37 00

## AIR OUTLETS AND INLETS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Diffusers:
  - 1. Rectangular ceiling diffusers.
  - 2. Round ceiling diffusers.
- B. Registers/grilles:
  - 1. Ceiling-mounted, exhaust and return register/grilles.
  - 2. Ceiling-mounted, supply register/grilles.
- C. Duct-mounted supply and return registers/louvers.
- D. Wall and ceiling gypsum board access panels with return air grilles.

#### 1.02 REFERENCE STANDARDS

- A. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

### PART 2 PRODUCTS

#### 2.01 ROUND CEILING DIFFUSERS

- A. Type: Round, adjustable pattern, stamped or spun, multi-core diffuser to discharge air in 360 degree pattern, with sectorizing baffles where indicated. Diffuser collar shall project not more than 1 inch above ceiling. In plaster ceilings, provide plaster ring and ceiling plaque.
- B. Fabrication: Steel with baked enamel finish.
- C. Color: As selected by Architect from manufacturer's standard range.

#### 2.02 RECTANGULAR CEILING DIFFUSERS

- A. Accessories: Provide radial opposed blade, butterfly, combination splitter, and volume control damper; removable core, sectorizing baffle, safety chain, wire guard, equalizing grid, operating rod extension, anti-smudging device, gaskets for surface mounted diffusers, and with damper adjustable from diffuser face.

#### 2.03 DUCT-MOUNTED SUPPLY AND RETURN REGISTERS/LOUVERS

- A. Type: Duct-mounted, rectangular register for round-spiral duct with adjustable pivot-ended blades, end caps, built-in volume damper, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.
- B. Material: 22 gage, 0.0299 inch.
  - 1. Provide crossing spiral fitting-body of matching duct diameter.
- C. Color: As indicated on drawings.

#### 2.04 CEILING SUPPLY REGISTERS/GRILLES

- A. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

**2.05 CEILING EXHAUST AND RETURN REGISTERS/GRILLES**

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.
- B. Color: To be selected by Architect from manufacturer's standard range.
- C. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- D. Install diffusers to ductwork with air tight connection.

**END OF SECTION**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

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## SECTION 26 05 19

## LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

### PART 1 - GENERAL

#### SUMMARY

##### Section Includes:

- Copper building wire.
- Aluminum building wire.
- Metal-clad cable, Type MC.
- Connectors and splices.

##### Related Requirements:

- Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
- Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

#### ACTION SUBMITTALS

Product Data: For each type of product.

#### INFORMATIONAL SUBMITTALS

Field quality-control reports.

#### PRODUCTS

##### COPPER BUILDING WIRE

Description: Flexible, insulated, and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

[Alpha Wire Company.](#)

[American Bare Conductor.](#)

[Okonite Company \(The\).](#)

[Southwire Company.](#)

[WESCO.](#)

**Standards:**

Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

**Conductor Insulation:**

Type THHN and Type THWN-2: Comply with UL 83.

Type XHHW-2: Comply with UL 44.

**METAL-CLAD CABLE, TYPE MC**

Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

[Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

[Alpha Wire Company.](#)

[American Bare Conductor.](#)

[Okonite Company \(The\).](#)

[Southwire Company.](#)

[WESCO.](#)

**Standards:**

Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

Comply with UL 1569.

Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

**Circuits:**

Single circuit.

Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

Ground Conductor: Insulated.

**Conductor Insulation:**

Type THHN/THWN-2: Comply with UL 83.



Type XHHW-2: Comply with UL 44.

Aarmor: Steel, interlocked.

Jacket: PVC applied over armor.

## **CONNECTORS AND SPLICES**

Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[3M Electrical Products.](#)

[ABB \(Electrification Products Division\).](#)

[Appleton - O-Z/Gedney; Emerson Electric Co., Automation Solutions.](#)

[Hubbell Incorporated, Power Systems.](#)

[ILSCO.](#)

Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

Material: Copper.

Type: One or Two hole with standard barrels.

Termination: Compression or Crimp.

## **EXECUTION**

### **CONDUCTOR MATERIAL APPLICATIONS**

Feeders:

Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

Branch Circuits:

Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### **CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS**

Exposed Feeders: Type THHN/THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.

Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

Feeders Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

## **LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.

Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

Branch Circuits Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless steel, wire-mesh, strain relief device at terminations to suit application.

## **INSTALLATION, GENERAL**

Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

## **CONNECTIONS**

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-486B.

Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

Wiring at Outlets: Install conductor at each outlet, with at least 6 inch (150 mm) of slack.

## **IDENTIFICATION**

Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

## **FIRESTOPPING**

Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

## **FIELD QUALITY CONTROL**

### **Tests and Inspections:**

After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements:

**END OF SECTION 260519**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

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## SECTION 26 05 26

## GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

### GENERAL

#### SUMMARY

Section includes grounding and bonding systems and equipment.

#### PRODUCTS

#### SYSTEM DESCRIPTION

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Comply with UL 467 for grounding and bonding materials and equipment.

#### MANUFACTURERS

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Burndy; Hubbell Incorporated, Construction and Energy.](#)

[Harger Lightning & Grounding.](#)

[ILSCO.](#)

[Siemens Industry, Inc., Energy Management Division.](#)

#### CONDUCTORS

Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

Bare Copper Conductors:

Solid Conductors: ASTM B3.

Stranded Conductors: ASTM B8.

Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.

Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

#### CONNECTORS

Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

Bus-Bar Connectors: Compression type, copper, or copper alloy, with two wire terminals.

Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

Cable-to-Cable Connectors: Compression type, copper, or copper alloy.

Conduit Hubs: Mechanical type, terminal with threaded hub.

Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

## **EXECUTION**

### **APPLICATIONS**

Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

Grounding Conductors: Green-colored insulation.

Conductor Terminations and Connections:

Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.

Connections to Structural Steel: Welded connectors.

### **EQUIPMENT GROUNDING**

Install insulated equipment grounding conductors with all feeders and branch circuits.

Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

### **INSTALLATION**

Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.

Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.

Make connections with clean, bare metal at points of contact.

Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.

Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

## **FIELD QUALITY CONTROL**

Perform tests and inspections.

Tests and Inspections:

After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.

Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

Grounding system will be considered defective if it does not pass tests and inspections.

Prepare test and inspection reports.

**END OF SECTION 260526**



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

## **SECTION 26 05 29**

# **HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

### **GENERAL**

#### **SUMMARY**

Section Includes:

Steel slotted support systems.

Aluminum slotted support systems.

Conduit and cable support devices.

Support for conductors in vertical conduit.

Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

#### **ACTION SUBMITTALS**

Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.

Hangers. Include product data for components.

Slotted support systems.

Equipment supports.

Delegated-Design Submittal: For hangers and supports for electrical systems.

Include design calculations and details of hangers.

#### **PRODUCTS**

#### **PERFORMANCE REQUIREMENTS**

Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.

Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified."

Component Importance Factor: 1.0.

## **SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS**

Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.

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

[Atkore International \(Allied Tube & Conduit\).](#)

[Atkore International \(Unistrut\).](#)

[Eaton \(B-line\).](#)

Standard: Comply with MFMA-4 factory-fabricated components for field assembly.

Material for Channel, Fittings, and Accessories: Galvanized steel.

Channel Width: Selected for applicable load criteria.

Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.

Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.

Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.

Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.

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

[ABB \(Electrification Products Division\).](#)

[Atkore International \(Unistrut\).](#)

[Cooper Industries, Inc.](#)

Standard: Comply with MFMA-4 factory-fabricated components for field assembly.

Channel Material: 6063-T5 aluminum alloy.



Fittings and Accessories Material: 5052-H32 aluminum alloy.

Channel Width: Selected for applicable load criteria **<Insert dimension>**.

Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.

Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.

Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.

Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).

Toggle Bolts: All-steel springhead type.

Hanger Rods: Threaded steel.

## **EXECUTION**

### **APPLICATION**

Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

NECA 1.

NECA 101

NECA 102.

Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

Secure raceways and cables to these supports with two-bolt conduit clamps.

## **SUPPORT INSTALLATION**

Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

To Wood: Fasten with lag screws or through bolts.

To New Concrete: Bolt to concrete inserts.

To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.

To Existing Concrete: Expansion anchor fasteners.

To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.

To Light Steel: Sheet metal screws.

Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

## **PAINTING**

Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

Touchup: Comply with requirements in Section 099123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

**END OF SECTION 260529**



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

## **SECTION 26 05 33**

## **RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS**

### **GENERAL**

#### **SUMMARY**

Section Includes:

Type EMT-S raceways and elbows.

Type ERMC-S raceways, elbows, couplings, and nipples.

Type FMC-S raceways.

Type LFMC raceways.

Fittings for conduit, tubing, and cable.

Threaded metal joint compound.

Wireways and auxiliary gutters.

Metallic outlet boxes, device boxes, rings, and covers.

Cabinets, cutout boxes, junction boxes, pull boxes, and miscellaneous enclosures.

Cover plates for device boxes.

#### **ACTION SUBMITTALS**

Product Data: For the following:

Wireways and auxiliary gutters.

Surface metal raceways.

Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

### **PRODUCTS**

#### **TYPE EMT-S RACEWAYS AND ELBOWS**

Steel Electrical Metal Tubing (EMT-S) and Elbows:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Atkore International \(Allied Tube & Conduit\).](#)

[Atkore International \(Calconduit\).](#)

[Topaz Lighting & Electric.](#)

[Zekelman Industries \(Western Tube\).](#)

[Zekelman Industries \(Wheatland Tube\).](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL 797 and UL Category Control Number FJMX.

Material: Steel.

Exterior Coating: Zinc.

Interior Coating: Zinc with organic top coating.

Options:

Minimum Trade Size: 3/4 inch (21 mm).

#### **TYPE ERM-C-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES**

Galvanized-Steel Electrical Rigid Metal Conduit (ERM-C-S-G), Elbows, Couplings, and Nipples:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Atkore International \(Allied Tube & Conduit\).](#)

[Atkore International \(Calconduit\).](#)

[Topaz Lighting & Electric.](#)

[Zekelman Industries \(Western Tube\).](#)

[Zekelman Industries \(Wheatland Tube\).](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL 6 and UL Category Control Number DYIX.

Exterior Coating: Zinc.

Interior Coating: Zinc with organic top coating.

Options:

Minimum Trade Size: 3/4 inch (21 mm).

#### **TYPE FMC-S AND TYPE FMC-A RACEWAYS**

Steel Flexible Metal Conduit (FMC-S):

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[ABB \(Electrification Products Division\).](#)

[Electri-Flex Company.](#)

[Topaz Lighting & Electric.](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standard: UL 1 and UL Category Control Number DXUZ.

Material: Steel.

Options:

Minimum Trade Size: 3/4 inch (21 mm).

#### **TYPE LFMC RACEWAYS**

Steel Liquidtight Flexible Metal Conduit (LFMC-S):

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[ABB \(Electrification Products Division\).](#)

[Anamet Electrical, Inc \(Anaconda Sealtite\).](#)

[Electri-Flex Company.](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standard: UL 360 and UL Category Control Number DXHR.

Material: Steel.

Options:

Minimum Trade Size: 3/4 inch (21 mm).

Colors: As indicated on Drawings.

Stainless Steel Liquidtight Flexible Metal Conduit (LFMC-SS):

[Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Electri-Flex Company.](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standard: UL 360 and UL Category Control Number DXHR.

Material: Stainless steel.

Options:

Minimum Trade Size: 3/4 inch (21 mm).

**FITTINGS FOR CONDUIT, TUBING, AND CABLE**

Fittings for Type ERM Raceways:

[Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Southwire Company.](#)

[Topaz Lighting & Electric.](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL 514B and UL Category Control Number DWTT.

Material: Steel.

Coupling Method: Compression coupling or Raintight compression coupling with distinctive color gland nut.

Options:

Conduit Fittings for Hazardous (Classified) Locations: UL 1203.

Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

Fittings for Type EMT Raceways:

[Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[ABB \(Electrification Products Division\).](#)

[Atkore International \(Allied Tube & Conduit\).](#)

[Atkore International \(Calconduit\).](#)

[Southwire Company.](#)

[Topaz Lighting & Electric.](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL 514B and UL Category Control Number FKAV.

Material: Steel.

Coupling Method: Compression coupling or Raintight compression coupling with distinctive color gland nut.

Fittings for Type FMC Raceways:



Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[American Fittings Corp. \(AMFICO\).](#)

[Liquid Tight Connector Co.](#)

[Southwire Company.](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL 514B and UL Category Control Number ILNR.

Fittings for Type LFMC Raceways:

Manufacturers: Subject to compliance with requirements, provide products by the following:

[Liquid Tight Connector Co.](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL 514B and UL Category Control Number DXAS.

## **WIREWAYS AND AUXILIARY GUTTERS**

Metal Wireways and Auxiliary Gutters:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[ABB \(Electrification Products Division\).](#)

[Eaton \(B-line\).](#)

[nVent \(Hoffman\).](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL 870 and UL Category Control Number ZOYX.

Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.

Finish: Manufacturer's standard enamel finish.

Options:

Degree of Protection: Type 1 unless otherwise indicated.

Wireway Covers: Screw-cover type unless otherwise indicated.

## **METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS**

Metallic Outlet Boxes:

Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[ABB \(Electrification Products Division\).](#)

[Eaton \(Crouse-Hinds\).](#)

[Hubbell Premise Wiring; Hubbell Incorporated, Commercial, and Industrial.](#)

[Pass & Seymour; Legrand North America, LLC.](#)

[Wiremold; Legrand North America, LLC.](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL 514A and UL Category Control Number QCIT.

Options:

Material: Sheet steel.

Sheet Metal Depth: Minimum 2 inch (50 mm).

Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb (23 kg).

**Metallic Conduit Bodies:**

Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.

**Applicable Standards:**

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

**General Characteristics:**

Reference Standards: UL 514A and UL Category Control Number QCIT.

**Metallic Device Boxes:**

Description: Box with provisions for mounting wiring device directly to box.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[ABB \(Electrification Products Division\).](#)

[Eaton \(Crouse-Hinds\).](#)

[Hubbell Premise Wiring; Hubbell Incorporated, Commercial, and Industrial.](#)

**Applicable Standards:**

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

**General Characteristics:**

Reference Standards: UL 514A and UL Category Control Number QCIT.

**Options:**

Material: Sheet steel.

Sheet Metal Depth: minimum 2 inch (50 mm).

Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb (23 kg).

**Metallic Extension Rings:**

Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Eaton \(B-line\).](#)

[Pass & Seymour; Legrand North America, LLC.](#)

[Topaz Lighting & Electric.](#)

[Wiring Device-Kellems; Hubbell Incorporated, Commercial, and Industrial.](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL 514A and UL Category Control Number QCIT.

## **CABINETS, CUTOOT BOXES, JUNCTION BOXES, PULL BOXES, AND MISCELLANEOUS ENCLOSURES**

Indoor Sheet Metal Cabinets:

Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Eaton \(B-line\).](#)

[nVent \(Hoffman\).](#)

[Schneider Electric USA \(Square D\).](#)

[Siemens Industry, Inc. \(Building Technologies Division\).](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL Category Control Number CYIV.

Non-Environmental Characteristics: UL 50.

Environmental Characteristics: UL 50E.

Indoor Sheet Metal Cutout Boxes:

Description: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Eaton \(B-line\).](#)

[Eaton \(Crouse-Hinds\).](#)

[nVent \(Hoffman\).](#)

[Schneider Electric USA \(Square D\).](#)

[Siemens Industry, Inc. \(Building Technologies Division\).](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL Category Control Number CYIV.

Non-Environmental Characteristics: UL 50.

Environmental Characteristics: UL 50E.

Indoor Sheet Metal Junction and Pull Boxes:

Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Eaton \(B-line\).](#)

[Hubbell Industrial Controls; Hubbell Incorporated, Commercial and Industrial.](#)

[nVent \(Hoffman\).](#)

[Schneider Electric USA \(Square D\).](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL Category Control Number BGUZ.

Non-Environmental Characteristics: UL 50.

Environmental Characteristics: UL 50E.

Indoor Cast-Metal Junction and Pull Boxes:

Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[Appleton - EGS; Emerson Electric Co., Automation Solutions.](#)

[Appleton - O-Z/Gedney; Emerson Electric Co., Automation Solutions.](#)

[Eaton \(Crouse-Hinds\).](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL Category Control Number BGUZ.

Non-Environmental Characteristics: UL 50.

Environmental Characteristics: UL 50E.

Indoor Sheet Metal Miscellaneous Enclosures:

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

[ABB \(Electrification Products Division\).](#)

[Eaton \(B-line\).](#)

[nVent \(Hoffman\).](#)

[Schneider Electric USA \(Square D\).](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards:

UL 1773 and UL Category Control Number XCKT.

Non-Environmental Characteristics: UL 50.

Environmental Characteristics: UL 50E.

## **COVER PLATES FOR DEVICES BOXES**

Metallic Cover Plates for Device Boxes:

[Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

[Eaton \(Crouse-Hinds\).](#)

[Eaton \(Wiring Devices - Arrow Hart\).](#)

[Pass & Seymour; Legrand North America, LLC.](#)

[Wiremold; Legrand North America, LLC.](#)

Applicable Standards:

Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

General Characteristics:

Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.

Wallplate-Securing Screws: Metal with head color to match wallplate finish.

Options:

Damp and Wet Locations: Listed, labeled, and marked for location and use.  
Provide gaskets and accessories necessary for compliance with listing.

Wallplate Material: 0.032 inch (0.8 mm) thick Type 302/304 non-magnetic stainless steel with brushed finish or Steel with white baked enamel, suitable for field painting or as indicated on architectural Drawings.

## **EXECUTION**

### **SELECTION OF RACEWAYS**

### **RACEWAY AND BOXES FOR ELECTRICAL**

Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult Architect for resolution of conflicting requirements.

**Outdoors:**

Exposed Conduit: ERM C.

Concealed Conduit, Aboveground: ERM C or EMT.

Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.

**Indoors:**

Hazardous Classified Locations: ERM C.

Exposed and Subject to Physical Damage: ERM C. Raceway locations include the following:

Loading docks.

Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.

Mechanical rooms.

Gymnasiums.

Exposed, Not Subject to Physical Damage: ERM C.

Concealed in Ceilings and Interior Walls and Partitions: ERM C or EMT.

Damp or Wet Locations: ERM C.

Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC or FMC.

Stub-ups to Above Recessed Ceilings: Provide EMT or ERM C for raceways.

Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.

ERM C: Provide threaded type fittings unless otherwise indicated.

**SELECTION OF BOXES AND ENCLOSURES**

Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.

**Degree of Protection:**

**Indoors:**

Type 1 unless otherwise indicated.



Damp or Dusty Locations: Type 12.

Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.

Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.

Locations Exposed to Airborne Dust, Lint, Fibers, or Flyings: Type 4.

Locations Exposed to Hosedown: Type 4.

Locations Exposed to Corrosive Agents: Type 4X.

Exposed Boxes Installed Less Than 6.5 ft. (2 m) Above Floor:

Provide cast-metal boxes.

Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

## **INSTALLATION OF RACEWAYS**

Installation Standards:

Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult Architect for resolution of conflicting requirements.

Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.

Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.

Comply with NECA NEIS 101 for installation of steel raceways.

Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.

Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4 inch (35 mm) trade size and insulated throat metal bushings on 1-1/2 inch (41 mm) trade size and larger conduits terminated with locknuts.

Raceway Terminations at Locations Subject to Moisture or Vibration:

Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

General Requirements for Installation of Raceways:

Complete raceway installation before starting conductor installation.

Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft. (0.6 m) above finished floor.

Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inch (300 mm) of changes in direction.

Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.

Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.

Support conduit within 12 inch (300 mm) of enclosures to which attached.

Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of raceways at the following points:

Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.

Where an underground service raceway enters a building or structure.

Conduit extending from interior to exterior of building.

Conduit extending into pressurized duct and equipment.

Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.

Where otherwise required by NFPA 70.

Keep raceways at least 6 inch (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.

Cut conduit perpendicular to the length. For conduits 2 inch (53 mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.

Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb (90 kg) tensile strength. Leave at least 12 inch (300 mm) of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

Requirements for Installation of Specific Raceway Types:

Types EMT-A, ERMCA, and FMC-A:

Do not install aluminum raceways or fittings.

**Types ERM:**

Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions:

Apply listed compound that maintains electrical conductivity to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.

**Type ERM-S-PVC:**

Follow manufacturer's installation instructions for clamping, cutting, threading, bending, and assembly.

Provide PVC-coated sealing locknut for exposed male threads transitioning into female NPT threads that do not have sealing sleeves, including transitions from PVC couplings/female adapters to Type ERM-S-PVC elbows in direct-burial applications. PVC-coated sealing locknuts must not be used in place of conduit hub. PVC-coated sealing locknut must cover exposed threads on Type ERM-S-PVC raceway.

Coat field-cut threads on PVC-coated raceway with manufacturer-approved corrosion-preventing conductive compound prior to assembly.

**Types FMC, LFMC:**

Comply with NEMA RV 3. Provide a maximum of 36 inch (915 mm) of flexible conduit for recessed and semi recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.

**Types PVC and EPEC:**

Do not install Type PVC or Type EPEC conduit unless directed on drawings.

Comply with manufacturer's written instructions for solvent welding and fittings.

**Stub-ups to Above Recessed Ceilings:**

Provide EMT or ERM for raceways.

Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.

**Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.**

ERM-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.

EMT: Provide compression, steel fittings. Comply with NEMA FB 2.10.

Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.

**Expansion-Joint Fittings:**

Install in runs of aboveground ERM and EMT conduit that are located where environmental temperature change may exceed 100 deg F (55 deg C) and that have straight-run length that exceeds 100 ft. (30 m).

Install type and quantity of fittings that accommodate temperature change listed for the following locations:

Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.

Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.

Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.

Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.

Install expansion fittings at locations where conduits cross building or structure expansion joints.

Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.

**Raceways Penetrating Rooms or Walls with Acoustical Requirements:**

Seal raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.

**INSTALLATION OF BOXES AND ENCLOSURES**

Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.

Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.

Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.

Locate boxes so that cover or plate will not span different building finishes.

Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.

Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.

Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.

Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.

Boxes and Enclosures in Areas or Walls with Acoustical Requirements:

Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.

Provide gaskets for wallplates and covers.

## **FIRESTOPPING**

Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

## **PROTECTION**

Protect coatings, finishes, and cabinets from damage and deterioration.

Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

## **CLEANING**

Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

## **END OF SECTION 260533**



## **CCRI KNIGHT CAMPUS**

### **Bathroom Renovations**

**Warwick, Rhode Island 02886**

**AA# 19158**

## **SECTION 26 05 53**

## **IDENTIFICATION FOR ELECTRICAL SYSTEMS**

### **GENERAL**

#### **SUMMARY**

Section Includes:

Labels.

Bands and tubes.

Tapes and stencils.

Signs.

Cable ties.

Miscellaneous identification products.

#### **ACTION SUBMITTALS**

Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

Delegated-Design Submittal: For arc-flash hazard study.

### **PRODUCTS**

#### **PERFORMANCE REQUIREMENTS**

Comply with 29 CFR 1910.144 and 29 CFR 1910.145.

Comply with ANSI Z535.4 for safety signs and labels.

Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.

Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## **COLOR AND LEGEND REQUIREMENTS**

Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.

Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.

Colors for 208/120-V Circuits:

Phase A: Black.

Phase B: Red.

Phase C: Blue.

Colors for 480/277-V Circuits:

Phase A: Brown.

Phase B: Orange.

Phase C: Yellow.

Color for Neutral: White or gray.

Color for Equipment Grounds: Green.

Warning Label Colors:

Identify system voltage with black letters on an orange background.

Warning labels and signs shall include, but are not limited to, the following legends:

Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."

Equipment Identification Labels:

Black letters on a white field.

## **LABELS**

Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, vinyl flexible label with acrylic pressure-sensitive adhesive.

Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.

Marker for Labels:

Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.

Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.

Minimum Nominal Size:

1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.

3-1/2 by 5 inches (76 by 127 mm) for equipment.

As required by authorities having jurisdiction.

## **TAPES AND STENCILS**

Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.

Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.

## **SIGNS**

Baked-Enamel Signs:

Preprinted aluminum signs punched or drilled for fasteners, with colors, legend, and size required for application.

1/4-inch (6.4-mm) grommets in corners for mounting.

Nominal Size: 7 by 10 inches (180 by 250 mm).

Laminated Acrylic or Melamine Plastic Signs:

Engraved legend.

Thickness:

For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.

For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.

Self-adhesive.

Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## **CABLE TIES**

General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

Minimum Width: 3/16 inch (5 mm).



Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).

Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).

Color: Black, except where used for color-coding.

UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

Minimum Width: 3/16 inch (5 mm).

Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).

Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).

Color: Black.

## **MISCELLANEOUS IDENTIFICATION PRODUCTS**

Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

## **EXECUTION**

### **PREPARATION**

Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

### **INSTALLATION**

Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

Install identifying devices before installing acoustical ceilings and similar concealment.

Verify identity of each item before installing identification products.

Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

Apply identification devices to surfaces that require finish after completing finish work.

Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.

Secure tight to surface of conductor, cable, or raceway.

Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:

"EMERGENCY POWER."

"POWER."

Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.

Self-Adhesive Labels:

On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.

Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.

Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.

Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.

Baked-Enamel Signs:

Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

Laminated Acrylic or Melamine Plastic Signs:

Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.

Cable Ties: General purpose, for attaching tags, except as listed below:

Outdoors: UV-stabilized nylon.

## **IDENTIFICATION SCHEDULE**

Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:

"EMERGENCY POWER."

"POWER."

Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive vinyl tape to identify the phase.

Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.

Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.

Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.

Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.

Apply to exterior of door, cover, or other access.

For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

Power-transfer switches.

Controls with external control power connections.

Arc Flash Warning Labeling: Self-adhesive labels.

Equipment Identification Labels:

Indoor Equipment: Self-adhesive label, Baked-enamel signs or Laminated acrylic or melamine plastic sign.

Outdoor Equipment: Laminated acrylic or melamine sign.

Equipment to Be Labeled:

Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.

Enclosures and electrical cabinets.

Access doors and panels for concealed electrical items.

Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.

Emergency system boxes and enclosures.

Enclosed switches.

Enclosed circuit breakers.

Enclosed controllers.

Contactors.

**END OF SECTION 260553**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 26 09 23

## LIGHTING CONTROL SYSTEMS

### GENERAL

#### 1.01 SUMMARY

A. Section Includes:

1. Low-voltage lighting control system.
2. Low voltage wall stations
3. Power interfaces
4. Wired sensors

B. Related Requirements:

1. Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
2. Section 26 05 33: Raceways and Boxes for Electrical Systems.
3. Section 26 24 16: Panelboards.
4. Section 26 09 23: Lighting Control Devices.
5. Section 26 51 19: LED Interior Lighting

#### 1.02 SUMMARY

- A. The lighting controls system specified in this section shall provide time-based, sensor-based (both occupancy and daylight), and manual lighting control.
- B. The system shall be capable of turning lighting loads on/off as well as dimming lights. Specific dimmers will be capable of “dimming lights to off”.
- C. All system devices shall be networked together, enable digital communication between devices, and shall be individually addressed.
- D. The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity, even if network connectivity to the greater system is lost.
- E. The system architecture shall facilitate remote operation via a computer station.
- F. The system shall not require any centrally hardwired switching equipment.
- G. The system shall be capable of wireless, wired, or hybrid wireless/wired architectures.

#### 1.03 SUBMITTALS

- A. Submit a complete one-line diagram of the proposed system configuration for Architect/Engineer's review. The riser diagram shall identify but not be limited to wiring, equipment, components, interconnection with other systems, and location and type of raceways.
- B. Manufacturer's Data: Submit catalog cuts and description of each system component.
- C. Provide wiring diagrams and installation details for lighting control equipment.
- D. Shop Drawings: Submit a complete set of detailed Shop Drawings for the entire lighting control system; the shop drawings shall include but not be limited to relay panels with designations and dimensions, day light sensors locations based on manufacturer's recommendations, and system components with manufacturer's part numbers.
- E. Installation Instructions: Submit manufacturer's written installation instructions, wiring diagrams. Instructions shall include recommendations for handling of equipment and parts, and protection and storage requirements.
- F. Riser Diagrams – Typical per room type (detailed drawings showing device interconnectivity of devices).
- G. Example Contractor Startup/Commissioning Worksheet – must be completed prior to factory startup.
- H. Hardware and Software Operation Manuals.

#### **1.04 QUALITY ASSURANCE**

- A. Components shall be listed and labeled by Underwriter's Laboratories (UL), or another Nationally Recognized Testing Laboratory (NRTL).
- B. Lighting Control Systems shall comply with the state of California Building and Electrical Codes, and Title 24 energy requirements in effect at time of submittal for building permit.
- C. Conduct a coordination meeting with the lighting control contractor, electrical contractor, EOR, Manufacturer Representative, and the OAR to validate the location of lighting control system components, including daylight sensors. Sensors shall be located based on manufacturer's recommendations.

#### **1.05 WARRANTY**

- A. Manufacturer shall provide a five year material warranty.
- B. Installer shall provide a two year installation warranty.
- C. Technical support contact.

#### **1.06 SYSTEM REQUIREMENTS**

- A. System shall have an architecture that is based upon three main concepts: 1) intelligent lighting control devices 2) standalone lighting control zones 3) network backbone for remote or time based operation.
- B. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.

- C. Intelligent lighting control devices shall communicate digitally, require  $<7$  mA of current to function (Graphic wall stations excluded), and possess RJ-45 style connectors.
- D. Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher level network backbone.
- E. Devices within a lighting control zone shall be connected with CAT-5e low voltage cabling in any order.
- F. Lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.
- G. Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.
- H. Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, controls enabled luminaires, or from the network backbone. Standalone “bus power supplies” shall not be required in all cases.
- I. All switching and dimming for a specific lighting zone shall take place within the devices located in the zone itself (i.e. not in remotely located devices such as panels) to facilitate system robustness and minimize wiring requirements. Specific applications that require centralized or remote switching shall be capable of being accommodated.
- J. System shall have one or more primary wall mounted network control “gateway” devices that are capable of accessing and controlling connected system devices and linking into an Ethernet LAN.
- K. System shall use “bridge” devices that route communication and distribute power for up to 8 directly connected lighting zones together for purposes of decreasing system wiring requirements.
- L. System shall have a web-based software management program that enables remote system control, status monitoring, and creation of lighting control schedules and profiles.
- M. Individual lighting zones shall be capable of being segmented into several “local” channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.
- N. Devices located in different lighting zones shall be able to communicate occupancy, photocell (non-dimming), and switch information via either the wired or Wi-Fi backbone.
- O. Control software shall enable logging of system performance data and presenting this information in a web-based format and downloadable to .CSV files.
- P. System shall provide the option of having pre-terminated plenum rated CAT-5e cabling supplied with hardware.
- Q. System software shall provide real time status of each relay, each zone and each group.
- R. Lighting control system shall be able to be monitored and take commands from a remote Personal Computer (PC); should the remote PC go off-line system programming uploaded to the lighting control system shall continue to operate as intended. Systems requiring an online PC or server for normal operation are not acceptable
- S. Devices shall be able to be pre-addressed at the factory. Systems requiring field addressing only are not acceptable.

- T. Programs, schedules, time of day, etcetera, shall be held in non-volatile memory at power failure. At restoration of power, lighting control system shall implement programs required by current time and date.
- U. System shall be capable of flashing lighting OFF/ON for any relay or lighting zone prior to the lights being turned OFF. The warning interval time between the flash and the final lights off signal shall be definable for each zone. Occupant shall be able to override any scheduled OFF sweep using local lighting zone override switches within the zone or occupied space. Occupant override time shall be pre-programmed not to exceed two hours, or current California Title 24 requirements.

## **PART 2 - PRODUCTS**

### **2.01 LIGHTING CONTROL**

- A. Lighting Control System shall be nLight by Acuity Controls or equal.
  - 1. Shall be preprogrammed and preassembled with control equipment and relays as indicated on the lighting plans.
  - 2. Each device shall be rated for 120 or 277 VAC.
  - 3. Shall be preassembled, preprogrammed, and include relays capable of switching 20 amps lighting loads for 120 or 277 VAC.
  - 4. Power packs, low voltage switches, interior light sensors, exterior light sensors, and associated control electronics shall be furnished by nLight by Acuity Controls , or equal.

### **2.02 CONTROL MODULE (GATEWAY)**

- A. Control module shall be a device that facilitates communication and time-based control of downstream network devices and linking into an Ethernet network.
- B. Devices shall have a user interface that is capable of wall mounting and powered by low voltage.
- C. Control device shall have three RJ-45 ports for connection other backbone device bridges or directly to the lighting control devices, up to 128 per port.
- D. Devices shall automatically detect all devices downstream of it, have a standard and astronomical internal time clock, one RJ-45 10/100 BaseT Ethernet connection, and USB port.
- E. Each control gateway device shall be capable of linking 1500 devices to the management software, with reduced memory version capable of support up to 400 devices.

### **2.03 COMMUNICATION BRIDGES**

- A. Device shall surface mount on a standard 4"x4" square junction box with 8 RJ-45 ports.
- B. Device shall be capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to Control Gateway.
- C. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply or delivered via CAT-5 cabled connection.
- D. Device shall be capable of redistributing power from its local supply and connect lighting controls zones with excess power to lighting control zones with insufficient local power. This architecture also enables loss of power to a particular area to be less impactful on network lighting system.

### **2.04 NETWORKED SYSTEM POWER (RELAYS) PACKS**



- A. Power Packs shall incorporate one Class 1 Relay, 0-10 VDC dimming output, and contribute low voltage power to the rest of the system. Secondary Packs shall incorporate the relay and 0-10 VDC or line voltage dimming output but shall not be required to contribute system power. Power Supplies shall provide system power only but are not required to switch line voltage circuit. Auxiliary Relay Packs shall switch low voltage circuits only.
- B. Power Packs shall accept 120 or 277, be plenum rated, and provide Class 2 power to the system.
- C. All devices shall have two RJ-45 ports.
- D. Every Power Pack parameter shall be available and configurable remotely from the software and locally via the device push-button.
- E. Power Pack shall be securely mounted to junction box location through a threaded ¾” chase nipple or be capable of being secured within a luminaire driver channel. Plastic clips into junction box shall not be acceptable. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads.
- F. Power Packs (Secondary) shall be available that provide up to 16 Amp switching of all lighting load types.
- G. Power Packs shall be available to provide up to 5 amps switching of all lighting load types as well as 0-10VC dimming of LED drivers.
- H. Specific Power/Secondary Packs shall be available that are UL 924 listed for switching of Emergency circuits.
- I. Relays shall be nLight by Acuity Controls, or equal.

## **2.05 LOW VOLTAGE SWITCHES**

- A. Low voltage switches shall be wired per the lighting control manufactures requirements. Digital switches shall be part of the lighting control system network. Analog switches shall be wired to lighting control panel designated by manufacturer. Use nLight by Acuity Controls, or equal.
- B. Keyed switches shall be analog or digital and connect to programmable inputs in the nearest lighting control system or be digital and connect to the lighting control system network.
- C. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
- D. All devices shall have two RJ-45 ports.
- E. All devices shall provide toggle switch control and raise/lower dimming control.
- F. Devices shall be white in color.

## **2.06 OCCUPANCY SENSORS**

- A. Occupancy Sensors:
  - 1. Ceiling-Mounted Dual Technology Sensors:
    - a. Sensors shall be dual technology infrared-ultrasonic capable of detecting presence in floor area to be controlled, by detecting Doppler shifts in transmitted ultrasound and infrared technology.
    - b. Detection shall be maintained when a person moves only within a maximum distance of 12 inches, in either a horizontal or vertical manner, at approximate

speed of 12 inches per second. Lights shall not go off when a person is reading or writing while seated at a desk.

- c. Each sensor shall be furnished with a convenient shunt provision, which will enable a person to by-pass sensor in event of failure.
- d. Sensitivity shall not change more than ten percent in temperature range of 0 degrees F. to 120 degrees F., and in humidity range of ten percent to 80 percent. Sensitivity adjustment shall be provided for each technology.
- e. Time delay range shall be adjustable from 15 seconds to 15 minutes.
- f. Sensors shall be available with one or two occupancy “poles”, each of which provides a programmable time delay.
- g. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
- h. All sensors shall have two RJ-45 ports or capable of utilizing a splitter.
- i. All sensors shall have the ability to detect when it is not receiving valid communication (via CAT-5) and blink its LED in a pattern to visually indicated a potential wiring issue.
- j. Every sensor parameter shall be available and configurable remotely from the software and locally via the device push button.
- k. Sensors shall be able to function together with other sensors in order to provide expanded coverage areas by simply daisy-chain wiring together the units with CAT-5 wiring.
- l. Manufacturers: nLight by Acuity Controls, or equal.

### **PART 3 - EXECUTION**

#### **3.01 GENERAL**

- A. Lighting control system shall not be used for any other purpose other than its intended use and application.
- B. Provide required interconnections with other systems such as emergency power sources, fire alarm systems, and building management system as required or indicated on drawings.
- C. Installation shall meet or exceed standard practice of workmanship and quality.
- D. Drawings generally indicate work to be provided, but do not indicate bends, transitions, or special fittings required to clear beams, girders, or other work already in place. Investigate conditions where conduits are to be installed, and furnished and install required fittings.

#### **3.02 INSTALLATION AND SET-UP**

- A. Verify that conduit for line voltage wires enters panel in line voltage areas and conduit for low-voltage control wires enters panel on low-voltage areas. Refer to manufacturer's drawings for location of line and low-voltage areas.
- B. Digital switches and wire shall be according to lighting control manufactures requirements.
- C. Maintain the required bending radius of conductors inside cabinets.

- D. To facilities start up, all devices daisy-chained together via CAT-5 shall automatically be grouped together into a functional lighting control zone.
- E. All lighting control zones shall be capable to function according to default settings once adequate power is applied and before any system software is installed.
- F. Once software is installed, system shall be able to auto-discover all system devices without requiring and commissioning.
- G. All system devices shall be capable of being given user defined names.
- H. All devices within the network shall be able to have their own firmware upgraded remotely and without being physically uninstalled for purpose of upgrading functionality at a later date.
- I. All sensor devices shall have the ability to detect improper communication wiring and blink it's LED in a specific cadence as to alert installation/startup personnel.
- J. Follow manufacturers' instructions for installation.
- K. Contractor shall have a meeting with the manufacturer to review installation prior to rough in.
- L. Programming shall be done by a manufacturer's representative.
- M. Photocells shall be calibrated after furniture has been installed.

### **3.03 OPERATING/SERVICE MANUALS**

- A. Service and Operation Manuals:
  - 1. Submit operation and service manuals. Complete manuals shall be bound in flexible binders and data shall be typewritten or drafted.
  - 2. Provide a printed copy of the systems configuration as programmed, including system labeling codes, and passwords.
  - 3. Provide an electronic copy on compact disk of the system configuration program.
  - 4. Manuals shall include instructions necessary for proper operation and servicing of system and shall include complete wiring circuit diagrams of system, wiring destination schedules for circuits and replacement part numbers. Manuals shall include as-built cable Project site plot plans and floor plans indicating cables, both underground and in each building with conduit, and as-built coding used on cables. Programming forms of systems shall be submitted with complete information.
  - 5. Record Drawings: Provide a copy on vellum of Project site and building drawings, indicating location of equipment, conduit and cable runs, and other pertinent information.

### **3.04 PROTECTION**

- A. Protect the Work of this section until Substantial Completion.

### **3.05 TESTING**

- A. A. Set-up, commissioning and testing of the lighting control system, and Owner instruction shall include:
  - 1. Confirmation of system programming.

2. Confirmation of operation of individual relays, switches, occupancy sensors and daylight sensors.
3. Operation of system's features under normal and emergency operations.
4. Before energizing check and demonstrate in the presence of the Project Inspector that cables and wire connections are free from short circuits, ground faults, and that there is continuity, and necessary insulation.
5. Confirm system operations and functionality.
6. Check system interface response to other systems such as fire alarm and emergency power system conditions.
7. Provide training to cover installation, maintenance, troubleshooting, programming, and repair and operation of the lighting control system.

**3.06 INSTRUCTION PERIODS**

- A. Before Substantial Completion, arrange and provide an eight hour Owner instruction period for designated personnel.

**3.07 SPARE PARTS**

- A. Provide a minimum of five percent spare parts of each type of relay, sensors, switches, and peripheral devices.

**3.08 CLEANUP**

- A. Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

**END OF SECTION 26 09 23.1**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 26 09 23

## LIGHTING CONTROL DEVICES

### GENERAL

#### SUMMARY

Section Includes:

Indoor occupancy and vacancy sensors.

Switchbox-mounted occupancy sensors.

Conductors and cables.

Related Requirements:

Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

#### ACTION SUBMITTALS

Product Data: For each type of product.

Shop Drawings:

Show installation details for the following:

Occupancy sensors.

Vacancy sensors.

Interconnection diagrams showing field-installed wiring.

Include diagrams for power, signal, and control wiring.

Field quality-control reports.

Sample Warranty: For manufacturer's warranties.

#### CLOSEOUT SUBMITTALS

Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

## **WARRANTY**

Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.

Failures include, but are not limited to, the following:

Faulty operation of lighting control software.

Faulty operation of lighting control devices.

Warranty Period: Two years from date of Substantial Completion.

## **PRODUCTS**

### **INDOOR OCCUPANCY AND VACANCY SENSORS**

General Requirements for Sensors:

Ceiling-mounted, solid-state indoor occupancy sensors.

Dual technology.

Separate power pack.

Hardwired connection to switch.

Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Power: Line voltage.

Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.

Mounting:

Sensor: Suitable for mounting in any position on a standard outlet box.

Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.

Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.

Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.

Bypass Switch: Override the "on" function in case of sensor failure.

Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

Sensitivity Adjustment: Separate for each sensing technology.

Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).

Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.

Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of **[1000 square feet (110 square meters)] [2000 square feet (220 square meters)] [3000 square feet (330 square meters)]** when mounted 48 inches (1200 mm) above finished floor.

### **SWITCHBOX-MOUNTED OCCUPANCY SENSORS**

General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox.

Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).

Switch Rating: Not less than 800-VA LED load at 120 V, 1200-VA LED load at 277 V, and 800-W incandescent.

Wall-Switch Sensor:

Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of **2100 sq. ft (196 sq. m)**.

Sensing Technology: Dual technology - PIR and ultrasonic.

Capable of controlling load in three-way application.

Voltage: Dual voltage - 120 and 277 V.

Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.

Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.

Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.

Color: White.

Faceplate: Color matched to switch.

### **CONDUCTORS AND CABLES**

Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG.

Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

### **EXECUTION**

#### **EXAMINATION**

Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.

Examine walls and ceilings for suitable conditions where lighting control devices will be installed.

Proceed with installation only after unsatisfactory conditions have been corrected.

#### **INSTALLATION OF SENSORS**

Comply with NECA 1.

Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.

Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

#### **INSTALLATION OF WIRING**

Comply with NECA 1.

Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).

Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's written instructions.

Size conductors in accordance with lighting control device manufacturer's written instructions unless otherwise indicated.

### **LIGHTING CONTROL DEVICES**



Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

## **IDENTIFICATION**

Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems.

Identify controlled circuits in lighting contactors.

Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.

Label time switches and contactors with a unique designation.

## **FIELD QUALITY CONTROL**

Perform the following tests and inspections:

Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.

Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

Lighting control devices will be considered defective if they do not pass tests and inspections.

Prepare test and inspection reports.

## **ADJUSTING**

Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions.

For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

## **END OF SECTION 260923**



## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 26 22 13

## LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

### GENERAL

#### SUMMARY

Section includes distribution, dry-type transformers with a nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

#### ACTION SUBMITTALS

Product Data: For each type of product.

Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and size of transformer.

Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.

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.

Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.

Include diagrams for power, signal, and control wiring.

#### INFORMATIONAL SUBMITTALS

Qualification Data: For testing agency.

Seismic Qualification Data: Certificates, for transformers, accessories, and components, from manufacturer.

Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

Certification: Indicate that equipment meets equipment seismic requirements.

Source quality-control reports.

Field quality-control reports.

#### **CLOSEOUT SUBMITTALS**

Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

#### **DELIVERY, STORAGE, AND HANDLING**

Inspection: On receipt, inspect for and note any shipping damage to packaging and transformer.

If manufacturer packaging is removed for inspection, and transformer will be stored after inspection, re-package transformer using original or new packaging materials that provide protection equivalent to manufacturer's packaging.

Storage: Store in a warm, dry, and temperature-stable location in original shipping packaging.

Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

Handling: Follow manufacturer's instructions for lifting and transporting transformers.

#### **PRODUCTS**

##### **MANUFACTURERS**

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

[ABB \(Electrification Products Division\).](#)

[Eaton.](#)

[Schneider Electric USA \(Square D\).](#)

[Siemens Industry, Inc., Energy Management Division.](#)

Source Limitations: Obtain each transformer type from single source from single manufacturer.

#### **PERFORMANCE REQUIREMENTS**

Seismic Performance: Transformers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

The term "withstand" means "the transformer will remain in place without separation of any parts when subjected to the seismic forces specified and the transformer will be fully operational after the seismic event."

#### **GENERAL TRANSFORMER REQUIREMENTS**

Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.

Comply with NFPA 70.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

Transformers Rated 15 kVA and Larger:

Comply with 10 CFR 431 (DOE 2016) efficiency levels.

Marked as compliant with DOE 2016 efficiency levels by an NRTL.

Shipping Restraints: Paint or otherwise color-code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

#### **DISTRIBUTION TRANSFORMERS**

Comply with NFPA 70, and list and label as complying with UL 1561.

Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.

One leg per phase.

Grounded to enclosure.

Coils: Continuous windings without splices except for taps.

Coil Material: Aluminum or Copper.

Internal Coil Connections: Brazed or pressure type.

Terminal Connections: Welded or Bolted.

Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.

Enclosure: Ventilated.

NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound to seal out moisture and air.

KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.

Wiring Compartment: Sized for conduit entry and wiring installation.

Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.

Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.

Insulation Class, Smaller Than 30 kVA: 180 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.

Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.

Grounding: Provide ground-bar kit or a ground bar installed on the inside of the transformer enclosure.

Wall Brackets when required: Manufacturer's standard brackets.

## **IDENTIFICATION**

Nameplates: Engraved, laminated-acrylic, or melamine plastic signs for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

## **SOURCE QUALITY CONTROL**

Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.

Resistance measurements of all windings at rated voltage connections and at all tap connections.

Ratio tests at rated voltage connections and at all tap connections.

Phase relation and polarity tests at rated voltage connections.

No load losses, and excitation current and rated voltage at rated voltage connections.

Impedance and load losses at rated current and rated frequency at rated voltage connections.

Applied and induced tensile tests.

Regulation and efficiency at rated load and voltage.

Insulation-Resistance Tests:

High-voltage to ground.

Low-voltage to ground.

High-voltage to low-voltage.

Temperature tests.

## **EXECUTION**

## **EXAMINATION**

Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.

Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.

Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.

Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.

Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.

Proceed with installation only after unsatisfactory conditions have been corrected.

## **INSTALLATION**

Install wall-mounted transformers level and plumb with wall brackets fabricated by transformer manufacturer.

Coordinate installation of wall-mounted and structure-hanging supports with actual transformer provided.

Construct concrete bases according to Section 033000 "Cast-in-Place Concrete" and anchor floor-mounted transformers according to manufacturer's written instructions and requirements in Section 260529 "Hangers and Supports for Electrical Systems."

Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.

Secure transformer to concrete base according to manufacturer's written instructions.

Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.

Remove shipping bolts, blocking, and wedges.

## **CONNECTIONS**

Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."

Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

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-486B.

Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

## **FIELD QUALITY CONTROL**

Perform tests and inspections.

Small (Up to 167-kVA Single-Phase or 500-kVA Three-Phase) Dry-Type Transformer Field Tests:

Visual and Mechanical Inspection.

Inspect physical and mechanical condition.

Inspect anchorage, alignment, and grounding.

Verify that resilient mounts are free and that any shipping brackets have been removed.

Verify the unit is clean.

Perform specific inspections and mechanical tests recommended by manufacturer.

Verify that as-left tap connections are as specified.

Verify the presence of surge arresters and that their ratings are as specified.

Electrical Tests:

Measure resistance at each winding, tap, and bolted connection.

Perform insulation-resistance tests winding-to-winding and each winding-to-ground.

Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index: the value of the index shall not be less than 1.0.

Perform turns-ratio tests at all tap positions. Test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio. If test fails, replace the transformer.

Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.

Remove and replace units that do not pass tests or inspections and retest as specified above.

Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

## **ADJUSTING**

Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period.

Adjust transformer taps to provide optimum voltage conditions at secondary terminals.

Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

Output Settings Report: Prepare a written report recording output voltages and tap settings.

**CLEANING**

Vacuum dirt and debris; do not use compressed air to assist in cleaning.

**END OF SECTION 262213**





## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 26 24 16 PANELBOARDS

### GENERAL

#### SUMMARY

Section Includes:

Distribution panelboards.

Lighting and appliance branch-circuit panelboards.

#### DEFINITIONS

ATS: Acceptance testing specification.

GFCI: Ground-fault circuit interrupter.

GFEP: Ground-fault equipment protection.

MCCB: Molded-case circuit breaker.

#### ACTION SUBMITTALS

Product Data: For each type of panelboard.

Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.

Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.

Shop Drawings: For each panelboard and related equipment.

Include dimensioned plans, elevations, sections, and details.

Detail bus configuration, current, and voltage ratings.

Short-circuit current rating of panelboards and overcurrent protective devices.

Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.

Include wiring diagrams for power, signal, and control wiring.

Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graph paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

## **INFORMATIONAL SUBMITTALS**

Qualification Data: For testing agency.

Panelboard Schedules: For installation in panelboards.

## **CLOSEOUT SUBMITTALS**

Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

Manufacturer's written instructions for testing and adjusting overcurrent protective devices.

Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

## **MAINTENANCE MATERIAL SUBMITTALS**

Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Keys: Two spares for each type of panelboard cabinet lock.

## **QUALITY ASSURANCE**

Manufacturer Qualifications: ISO 9001 or ISO 9002 certified.

## **DELIVERY, STORAGE, AND HANDLING**

Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.

Handle and prepare panelboards for installation according to NECA 407.

## **FIELD CONDITIONS**

Environmental Limitations:

Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

Service Conditions: NEMA PB 1, usual service conditions, as follows:

Ambient temperatures within limits specified.

Altitude not exceeding 6600 feet (2000 m).

Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

Notify Owner no fewer than 10 days in advance of proposed interruption of electric service.

Do not proceed with interruption of electric service without Owner's written permission.

Comply with NFPA 70E.

## **WARRANTY**

Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

Panelboard Warranty Period: 18 months from date of Substantial Completion.

## **PRODUCTS**

### **PANELBOARDS COMMON REQUIREMENTS**

Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Comply with NEMA PB 1.

Comply with NFPA 70.

Enclosures: Flush and Surface-mounted, dead-front cabinets.

Rated for environmental conditions at installed location.

Indoor Dry and Clean Locations: NEMA 250, Type 1.

Height: 84 inches (2.13 m) maximum.

Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.

Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.

Finishes:

Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

Back Boxes: Same finish as panels and trim.

Incoming Mains:

Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.

Phase, Neutral, and Ground Buses:

Material: Tin-plated aluminum or Hard-drawn copper, 98 percent conductivity.

Plating shall run entire length of bus.

Bus shall be fully rated the entire length.

Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.

Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.

Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.

Conductor Connectors: Suitable for use with conductor material and sizes.

Material: Tin-plated aluminum or Hard-drawn copper, 98 percent conductivity as required.

Terminations shall allow use of 75 deg C rated conductors without derating.

Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.

Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.

Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.

Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.

NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.

Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.

Percentage of Future Space Capacity: 10 percent.

Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.

Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.

Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

## **PERFORMANCE REQUIREMENTS**

Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

## **POWER PANELBOARDS**

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

[Eaton.](#)

[Schneider Electric USA \(Square D\).](#)

[Siemens Industry, Inc., Energy Management Division.](#)

Panelboards: NEMA PB 1, distribution type.

Mains: Circuit breaker.

Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.

Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

## **LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS**

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

[Eaton.](#)

[Schneider Electric USA \(Square D\).](#)

[Siemens Industry, Inc., Energy Management Division.](#)

Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.

Mains: Circuit breaker.

Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.

Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

## **DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES**

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

[Eaton.](#)

[Schneider Electric USA \(Square D\).](#)

[Siemens Industry, Inc., Energy Management Division.](#)

MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.

Thermal-Magnetic Circuit Breakers:

Inverse time-current element for low-level overloads.

Instantaneous magnetic trip element for short circuits.

Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.

Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.

Electronic Trip Circuit Breakers:

RMS sensing.

Field-replaceable rating plug or electronic trip.

Field-Adjustable Settings:

Instantaneous trip.

Long- and short-time pickup levels.

Long and short time adjustments.

GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).

GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).

MCCB Features and Accessories:

Standard frame sizes, trip ratings, and number of poles.

Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.

Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.

Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.

## **IDENTIFICATION**

Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.

Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.

Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.

Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

## **ACCESSORY COMPONENTS AND FEATURES**

Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

## **EXECUTION**

### **EXAMINATION**

Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

Receive, inspect, handle, and store panelboards according to NECA 407.

Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.

Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.

Proceed with installation only after unsatisfactory conditions have been corrected.

## **INSTALLATION**

## **PANELBOARDS**

Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

Comply with NECA 1.

Equipment Mounting:

Attach panelboard to the vertical finished or structural surface behind the panelboard.

Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.

Mount panelboard cabinet plumb and rigid without distortion of box.

Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.

Mount surface-mounted panelboards to steel slotted supports 5/8 inch (16 mm) in depth. Orient steel slotted supports vertically.

Install overcurrent protective devices and controllers not already factory installed.

Set field-adjustable, circuit-breaker trip ranges.

Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.

Install filler plates in unused spaces.

Stub four 1-inch (25 mm) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (25 mm) empty conduits into raised floor space or below slab not on grade.

Arrange conductors in gutters into groups and bundle and wrap with wire ties.

## **IDENTIFICATION**

Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.

Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

## **FIELD QUALITY CONTROL**

Perform tests and inspections.

Acceptance Testing Preparation:

Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.

Test continuity of each circuit.

Tests and Inspections:

Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Do not perform optional tests. Certify compliance with test parameters.

Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

Panelboards will be considered defective if they do not pass tests and inspections.

**ADJUSTING**

Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

Set field-adjustable circuit-breaker trip ranges as indicated.

**END OF SECTION 262416**





## CCRI KNIGHT CAMPUS

### Bathroom Renovations

Warwick, Rhode Island 02886

AA# 19158

## SECTION 26 51 19

## LED INTERIOR LIGHTING

### GENERAL

#### SUMMARY

Section Includes:

Cylinder.

Downlight.

Recessed, linear.

Surface mount, linear.

Surface mount, nonlinear.

Suspended, linear.

Suspended, nonlinear.

Materials.

Luminaire support.

Related Requirements:

Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.

Section 260923.1 "Lighting Control Systems"

#### DEFINITIONS

CCT: Correlated color temperature.

CRI: Color Rendering Index.

Fixture: See "Luminaire."

IP: International Protection or Ingress Protection Rating.

LED: Light-emitting diode.

Lumen: Measured output of lamp and luminaire, or both.

Luminaire: Complete lighting unit, including lamp, reflector, and housing.

### **ACTION SUBMITTALS**

Product Data: For each type of product.

- Arrange in order of luminaire designation.

- Include data on features, accessories, and finishes.

- Include physical description and dimensions of luminaires.

- Include emergency lighting units, including batteries and chargers.

- Include life, output (lumens, CCT, and CRI), and energy-efficiency data.

- Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.

- Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

Shop Drawings: For nonstandard or custom luminaires.

- Include plans, elevations, sections, and mounting and attachment details.

- Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

- Include diagrams for power, signal, and control wiring.

Samples: For each luminaire and for each color and texture with standard factory-applied finish.

Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.

- Include Samples of luminaires and accessories involving color and finish selection.

Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

### **INFORMATIONAL SUBMITTALS**

Qualification Data: For testing laboratory providing photometric data for luminaires.

Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.

- Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

Product Certificates: For each type of luminaire.

Product Test Reports: For each type of luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.

Sample warranty.

#### **CLOSEOUT SUBMITTALS**

Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.

Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

#### **QUALITY ASSURANCE**

Luminaire Photometric Data Testing Laboratory Qualifications:

Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.

Provide luminaires from a single manufacturer for each luminaire type.

#### **DELIVERY, STORAGE, AND HANDLING**

Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

#### **WARRANTY**

Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.

Warranty Period: Five year(s) from date of Substantial Completion.

#### **PRODUCTS**

#### **PERFORMANCE REQUIREMENTS**

Seismic Performance:

Luminaires shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

Luminaires and lamps shall be labeled vibration and shock resistant.

The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."

Ambient Temperature: **41 to 104 deg F (5 to 40 deg C).**

Relative Humidity: Zero to 95 percent.

Altitude: Sea level to **1000 feet (300 m).**

#### **LUMINAIRE REQUIREMENTS**

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.

Label shall include the following lamp characteristics:

"USE ONLY" and include specific lamp type.

Lamp diameter, shape, size, wattage, and coating.

CCT and CRI.

Recessed luminaires shall comply with NEMA LE 4.

#### **CYLINDER.**

Nominal Operating Voltage: as indicated on drawings.

Lamp:

Minimum 250 lm.

Minimum allowable efficacy of 80 lm/W.

CRI of 80. CCT of 3500 K.

Rated lamp life is a minimum of 35,000 hours to L70.

Dimmable from 100 percent to zero percent of maximum light output.

Internal driver.

User-Replaceable Lamps:

Bulb shape complying with ANSI C78.79.

Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.

Housings:

Extruded-aluminum housing and heat sink.

Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed

to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

With integral mounting provisions.

Standards:

ENERGY STAR certified.

RoHS compliant.

UL Listing: Listed for damp location.

**DOWNLIGHT.**

Nominal Operating Voltage: dual rated 120/277Vac

Lamp:

Minimum 250 lm.

Minimum allowable efficacy of 80 lm/W.

CRI of 80. CCT of 3500 K.

Rated lamp life of 50,000 hours to L70.

Dimmable from 100 percent to zero percent of maximum light output.

Internal driver.

User-Replaceable Lamps:

Bulb shape complying with ANSI C78.79.

Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.

Housings:

Extruded-aluminum housing and heat sink.

Universal mounting bracket.

Integral junction box with conduit fittings.

Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

Standards:

ENERGY STAR certified.

RoHS compliant.

UL Listing: Listed for damp location.

Recessed luminaires shall comply with NEMA LE 4.

**RECESSED, LINEAR.**

Nominal Operating Voltage: dual voltage 120/277 Vac.

Lamp:

Minimum 1,500 lm.

Minimum allowable efficacy of 85 lm/W.

CRI of 80. CCT of 3500 K.

Rated lamp life of 50,000 hours to L70.

Dimmable from 100 percent to zero percent of maximum light output.

Internal driver.

User-Replaceable Lamps:

Bulb shape complying with ANSI C78.79.

Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.

Housings:

Extruded-aluminum housing and heat sink.

With integral mounting provisions.

Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

Standards:

ENERGY STAR certified.

RoHS compliant.

UL Listing: Listed for damp location.

NEMA LE 4.

**SURFACE MOUNT, LINEAR.**

Nominal Operating Voltage: dual 120/277Vac.

Lamp:

Minimum 750 lm.

Minimum allowable efficacy of 80 lm/W.

CRI of 80. CCT of 3500 K.

Rated lamp life of 50,000 hours to L70.

Dimmable from 100 percent to zero percent of maximum light output.

Internal driver.

User-Replaceable Lamps:

Bulb shape complying with ANSI C78.79.

Housings:

Extruded-aluminum housing and heat sink.

With integral mounting provisions.

Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

Standards:

ENERGY STAR certified.

RoHS compliant.

UL Listing: Listed for damp location.

#### **SURFACE MOUNT, NONLINEAR**

Nominal Operating Voltage: dual rated 120/277Vac.

Lamp:

Minimum 750 lm.

Minimum allowable efficacy of 80 lm/W.

CRI of 80. CCT of 3500 K.

Rated lamp life of 50,000 hours to L70.

Dimmable from 100 percent to zero percent of maximum light output.

Internal driver.

User-Replaceable Lamps:

Bulb shape complying with ANSI C78.79.

Housings:

Extruded-aluminum housing and heat sink.

With integral mounting provisions.

Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

Standards:

ENERGY STAR certified.

RoHS compliant.

UL Listing: Listed for damp location.

### **SUSPENDED, LINEAR**

Nominal Operating Voltage: dual rated 120/277Vac.

Lamp:

Minimum 1,500 lm.

Minimum allowable efficacy of 85 lm/W.

CRI of 80. CCT of 3500 K.

Rated lamp life of 50,000 hours to L70.

Dimmable from 100 percent to zero percent of maximum light output.

Internal driver.

User-Replaceable Lamps:

Bulb shape complying with ANSI C78.79.

Housings:

Extruded-aluminum housing and heat sink.

With integral mounting provisions.

Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

Standards:

ENERGY STAR certified.

RoHS compliant.



UL Listing: Listed for damp location.

**SUSPENDED, NONLINEAR**

Nominal Operating Voltage: dual rated 120/277 Vac.

Lamp:

Minimum 1,500 lm.

Minimum allowable efficacy of 85 lm/W.

CRI of 80. CCT of 3500 K.

Rated lamp life of 50,000 hours to L70.

Dimmable from 100 percent to zero percent of maximum light output.

Internal driver.

User-Replaceable Lamps:

Bulb shape complying with ANSI C78.79.

Housings:

Extruded-aluminum housing and heat sink.

Universal mounting bracket.

Integral junction box with conduit fittings.

Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

Standards:

ENERGY STAR certified.

RoHS compliant.

UL Listing: Listed for damp location.

**MATERIALS**

Metal Parts:

Free of burrs and sharp corners and edges.

Sheet metal components shall be steel unless otherwise indicated.

Form and support to prevent warping and sagging.

Steel:

ASTM A36/A36M for carbon structural steel.

ASTM A568/A568M for sheet steel.

Stainless Steel:

Manufacturer's standard grade.

Manufacturer's standard type, ASTM A240/240M.

Galvanized Steel: ASTM A653/A653M.

Aluminum: ASTM B209.

## **METAL FINISHES**

Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

## **LUMINAIRE SUPPORT**

Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.

Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.

Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, **12 gage (2.68 mm)**.

Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.

Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

## **EXECUTION**

### **EXAMINATION**

Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.

Proceed with installation only after unsatisfactory conditions have been corrected.

### **INSTALLATION**

Comply with NECA 1.

Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

Install lamps in each luminaire.

Supports:

Sized and rated for luminaire weight.

Able to maintain luminaire position after cleaning and relamping.

Provide support for luminaire without causing deflection of ceiling or wall.

Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

Flush-Mounted Luminaires:

Secured to outlet box.

Attached to ceiling structural members at four points equally spaced around circumference of luminaire.

Trim ring flush with finished surface.

Wall-Mounted Luminaires:

Attached to structural members in walls or Attached to a minimum 20 gauge backing plate attached to wall structural members.

Do not attach luminaires directly to gypsum board.

Suspended Luminaires:

Ceiling Mount:

Two 5/32-inch- (4-mm-) diameter aircraft cable supports adjustable to **10 feet (3 m)** in length.

Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.

Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.

Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.

Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

Ceiling-Grid-Mounted Luminaires:

Secure to any required outlet box.

Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

**IDENTIFICATION**

Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

**FIELD QUALITY CONTROL**

Perform the following tests and inspections:

Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.

Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

Luminaire will be considered defective if it does not pass operation tests and inspections.

Prepare test and inspection reports.

**END OF SECTION 265119**



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## SECTION 014533

### CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Code-required special inspections.

##### 1.02 REFERENCE STANDARDS

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).
- B. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel 2018.

#### PART 2 PRODUCTS - NOT USED

#### PART 3 EXECUTION

##### 3.01 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION

- A. Reinforcing Steel, Including Prestressing of Tendons and Placement: Verify compliance with approved Contract Documents and ACI 318, Sections 3.5 and 7.1 through 7.7; periodic.
- B. Reinforcing Steel Welding: Verify compliance with AWS D1.4/D1.4M and ACI 318, Section 3.5.2; periodic.
- C. Design Mix: Verify plastic concrete complies with the design mix in approved Contract Documents and with ACI 318, Chapter 4 and 5.2; periodic.
- D. Specified Curing Temperature and Techniques: Verify compliance with approved Contract Documents and ACI 318, Sections 5.11 through 5.13; periodic.
- E. Concrete Strength in Situ: Verify concrete strength complies with approved Contract Documents and ACI 318, Section 6.2, for the following.
- F. Formwork Shape, Location and Dimensions: Verify compliance with approved Contract Documents and ACI 318, Section 6.1.1; periodic.

**END OF SECTION**

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## SECTION 220516

### EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.
- C. Pipe loops, offsets, and swing joints.

##### 1.02 RELATED REQUIREMENTS

- A. Section 221005 - Plumbing Piping.
- B. Section 232113 - Hydronic Piping.

##### 1.03 REFERENCE STANDARDS

- A. EJMA (STDS) - EJMA Standards Tenth Edition.
- B. UL (DIR) - Online Certifications Directory Current Edition.

#### PART 2 PRODUCTS

##### 2.01 REGULATORY REQUIREMENTS

- A. Comply with UL (DIR) requirements.

#### PART 3 EXECUTION

##### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.
- C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
- D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- E. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
- F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.
- G. Substitute grooved piping for vibration isolated equipment instead of flexible connectors. Grooved piping need not be anchored.

#### A. END OF SECTION

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## SECTION 220517

### SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Pipe sleeves.
- B. Manufactured sleeve-seal systems.

##### 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 220523 - General-Duty Valves for Plumbing Piping.
- C. Section 220553 - Identification for Plumbing Piping and Equipment: Piping identification.
- D. Section 220719 - Plumbing Piping Insulation.

##### 1.03 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type) 2016.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

#### PART 2 PRODUCTS

##### 2.01 PIPE SLEEVES

- A. Vertical Piping:
  - 1. Sleeve Length: 1 inch above finished floor.
  - 2. Provide sealant for watertight joint.
  - 3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
  - 4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Below Grade Exterior Walls:
  - 1. Zinc coated or cast iron pipe.
  - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
  - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
  - 2. Connect sleeve with floor plate except in mechanical rooms.
- E. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
  - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
  - 2. Connect sleeve with floor plate except in mechanical rooms.
- F. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Architect.
- G. Clearances:
  - 1. Provide allowance for insulated piping.
  - 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
  - 3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

##### 2.02 MANUFACTURED SLEEVE-SEAL SYSTEMS

- A. Modular/Mechanical Seal:
  - 1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.

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2. Provide watertight seal between pipe and wall/casing opening.
3. Elastomer element size and material in accordance with manufacturer's recommendations.
4. Glass reinforced plastic pressure end plates.

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

#### **3.02 INSTALLATION**

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Inserts:
  1. Provide inserts for placement in concrete formwork.
  2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- E. Structural Considerations:
  1. Do not penetrate building structural members unless indicated.
- F. Provide sleeves when penetrating footings, floors, walls, partitions, and similar. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
  1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
  2. Aboveground Piping:
    - a. Pack solid using mineral fiber complying with ASTM C592.
    - b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
  3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
  4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- G. Manufactured Sleeve-Seal Systems:
  1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
  2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  3. Locate piping in center of sleeve or penetration.
  4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  5. Tighten bolting for a water-tight seal.
  6. Install in accordance with manufacturer's recommendations.
- H. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

#### **3.03 CLEANING**

- A. Upon completion of work, clean all parts of the installation.

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- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.
- C. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

**A. END OF SECTION**

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## SECTION 220523

### GENERAL-DUTY VALVES FOR PLUMBING PIPING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Applications.
- B. General requirements.

##### 1.02 RELATED REQUIREMENTS

#### PART 2 PRODUCTS

##### 2.01 APPLICATIONS

- A. Provide the following valves for the applications if not indicated on drawings:
- B. Sanitary Waste and Hot Water Valves:

##### 2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
- D. Valve-End Connections:
- E. General ASME Compliance:

#### PART 3 EXECUTION

##### 3.01 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

#### A. END OF SECTION

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## SECTION 220529

### HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

#### PART 1 GENERAL

##### 1.01 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

##### 1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping 2014.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2018).
- F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- I. MFMA-4 - Metal Framing Standards Publication 2004.
- J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.
- K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

##### 1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
  - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

##### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

##### 1.05 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

#### PART 2 PRODUCTS

##### 2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:

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1. Comply with MSS SP-58.
  2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
  3. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
  4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of [\_\_\_\_]. Include consideration for vibration, equipment operation, and shock loads where applicable.
  5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Metal Channel (Strut) Framing Systems:
1. Comply with MFMA-4.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch diameter.
    - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
    - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
    - d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.
- D. Thermal Insulated Pipe Supports:
1. General Construction and Requirements:
    - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
    - b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
    - c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch iron pipes.
    - d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by a 360 degree, PVC jacketing.
  2. PVC Jacket:
    - a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
    - b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
    - c. Thickness: 60 mil.
    - d. Connections: Brush on welding adhesive.
  3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.
- E. Pipe Supports:
1. Liquid Temperatures Up To 122 degrees F:
    - a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
    - b. Support From Below: MSS SP-58 Types 35 through 38.
- F. Pipe Stanchions: For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
- G. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
1. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
  2. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- H. Riser Clamps:

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1. Provide copper plated clamps for copper tubing support.
2. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
- I. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.
- J. Strut Clamps: Two-piece pipe clamp.
- K. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.
- L. Pipe Hangers: For a given pipe run, use hangers of the same type and material.
  1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
- M. Nonmetallic Pipe Hangers:
- N. Intermediate Pipe Guides: Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.
  1. Pipe Diameter 6 inches and Smaller: Provide minimum clearance of 0.16 inch.
  2. Pipe Diameter 8 inches: Provide U-bolts with double nuts providing minimum clearance of 0.28 inch.
  3. Pipe Diameter 8 inches: 0.625 inch U-bolt.
  4. Pipe Diameter 10 inches: 0.75 inch U-bolt.
  5. Pipe Diameter 12 to 16 inches: 0.875 inch U-bolt.
  6. Pipe Diameter 18 to 30 inches: 1 inch U-bolt.
- O. Pipe Alignment Guides: Galvanized steel.
  1. Pipe Diameter 8 inches and Smaller: Spider or sleeve type.
  2. Pipe Diameter 10 inches and Larger: Roller type.
  3. Pipe Diameter 18 to 30 inches: 1 inch U-bolt.
- P. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
- Q. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
  1. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
  2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
  3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
  4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
- R. Pipe Shields for Insulated Piping:
  1. General Construction and Requirements:
    - a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
    - b. Shields Material: UV-resistant polypropylene with glass fill.
    - c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
    - d. Minimum Service Temperature: Minus 40 degrees F.
    - e. Maximum Service Temperature: 178 degrees F.
    - f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
- S. Anchors and Fasteners:
  1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  2. Hammer-driven anchors and fasteners are not permitted.
  3. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    - a. Comply with MFMA-4.

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- b. Channel Material: Use galvanized steel.
  - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
- T. Pipe Installation Accessories:
- 1. Overhead Pipe Supports:
  - 2. Plenum Pipe Supports:
  - 3. Telescoping Pipe Supports:
  - 4. Inserts and Clamps:

## 2.02 RETROFIT PIPING COVER SYSTEM

- A. General Requirements:
- 1. Surface Burning Characteristics: Flame spread index/smoke developed index of 20/250, maximum, when tested in accordance with ASTM E84 or UL 723.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- G. Equipment Support and Attachment:
- 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

### A. END OF SECTION

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## SECTION 220533

### HEAT TRACING FOR PLUMBING PIPING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Self-regulating parallel resistance electric heating cable.
- B. Cable outer jacket markings.
- C. Connection kits.

##### 1.02 REFERENCE STANDARDS

- A. IEEE 515.1 - IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications 2012.
- B. ITS (DIR) - Directory of Listed Products current edition.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL (DIR) - Online Certifications Directory Current Edition.

##### 1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

##### 1.04 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

#### PART 2 PRODUCTS

##### 2.01 SELF-REGULATING PARALLEL RESISTANCE ELECTRIC HEATING CABLE

- A. Manufacturers:
  - 1. Chromalox, Inc; HWM (HOT WATER MAINTENANCE @ 10W/FT 208-277V : [www.chromalox.com/#sle](http://www.chromalox.com/#sle).
  - 2. Pentair; MATCH CHROMALOX SPEC: [www.pentairthermal.com/#sle](http://www.pentairthermal.com/#sle).
- B. Provide products listed, classified, and labeled by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction (AHJ).
- C. Factory Rating and Testing: Comply with IEEE 515.1.
- D. Heating Element:
  - 1. Provide pair of parallel No.16 tinned or nickel coated stranded copper bus wires embedded in cross linked conductive polymer core with varying heat output in response to temperature along its length.
  - 2. Terminations: Waterproof, factory assembled, non-heating leads with connector at one end and water-tight seal at opposite end.
  - 3. Capable of crossing over itself without overheating.
- E. Insulated Jacket: Flame retardant polyolefin.
- F. Cable Cover: Provide tinned copper and polyolefin outer jacket with UV inhibitor.
- G. Maximum Power-On Operating Temperature: 150 degrees F.
- H. Maximum Power-Off Exposure Temperature: 185 degrees F.
- I. Electrical Characteristics:
  - 1. 208-277 volts, single phase, 60 Hz.

##### 2.02 CABLE OUTER JACKET MARKINGS

- A. Name of manufacturer, trademark, or other recognized symbol of identification.
- B. Catalog number, reference number, or model.

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C. Month and year of manufacture, date coding, applicable serial number, or equivalent.

D. Agency listing or approval.

**2.03 CONNECTION KITS**

A. Provide power connection, splice/tee, and end seal kits compatible with the heating cable and without requiring cutting of the cable core to expose bus wires.

B. Provide with NEMA 4X rating for prevention of corrosion and water ingress.

**A. END OF SECTION**

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**SECTION 220719  
PLUMBING PIPING INSULATION**

**A. PART 1 GENERAL**

**I. SECTION INCLUDES**

1. Piping insulation.
2. Flexible removable and reusable blanket insulation.
3. Jackets and accessories.

**II. RELATED REQUIREMENTS**

1. Section 078400 - Firestopping.

**III. REFERENCE STANDARDS**

1. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
3. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
4. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
5. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2013).
6. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.
7. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2016.
8. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.
9. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation 2017, with Editorial Revision (2018).
10. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
11. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).
12. ASTM C1695 - Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service 2019.
13. ASTM D1056 - Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber 2014.
14. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
15. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
16. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

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## B. PART 2 PRODUCTS

### I. REGULATORY REQUIREMENTS

1. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

### II. GLASS FIBER

1. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  - a. K Value: ASTM C177, 0.24 at 75 degrees F.
  - b. Maximum Service Temperature: 850 degrees F.
  - c. Maximum Moisture Absorption: 0.2 percent by volume.
2. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
  - a. K Value: ASTM C177, 0.23 at 75 degrees F.
  - b. Maximum Service Temperature: 220 degrees F.
  - c. Maximum Moisture Absorption: 0.2 percent by volume.
3. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
  - a. K Value: ASTM C177, 0.24 at 75 degrees F.
  - b. Maximum Service Temperature: 650 degrees F.
  - c. Maximum Moisture Absorption: 0.2 percent by volume.
4. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
5. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
6. Vapor Barrier Lap Adhesive: Compatible with insulation.
7. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
8. Fibrous Glass Fabric:
  - a. Cloth: Untreated; 9 oz/sq yd weight.
  - b. Blanket: 1.0 lb/cu ft density.
  - c. Weave: 5 by 5.
9. Indoor Vapor Barrier Finish:
  - a. Cloth: Untreated; 9 oz/sq yd weight.
  - b. Vinyl emulsion type acrylic, compatible with insulation, black color.
10. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
11. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

### III. FLEXIBLE REMOVABLE AND REUSABLE BLANKET INSULATION

1. Insulation: ASTM C553 Type V; flexible, noncombustible.
  - a. Comply with ASTM C1695.
  - b. K Value: 0.37 at 100 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
  - c. Minimum Service Temperature: 32 degrees F.
  - d. Maximum Service Temperature: 500 degrees F.
  - e. Maximum Water Vapor Absorption: Less than 5.0 percent by weight.

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- f. Color: Green.
- g. Effective Thickness: 1.25 plus/minus 0.25 inch.

#### IV. CELLULAR GLASS

- 1. Insulation: ASTM C552, Type II, Grade 6.
  - a. K Value: 0.35 at 100 degrees F.
  - b. Service Temperature Range: From 250 degrees F to 800 degrees F.
  - c. Water Vapor Permeability: 0.005 perm inch maximum per inch.
  - d. Water Absorption: 0.5 percent by volume, maximum.

#### V. POLYETHYLENE

- 1. Insulation: Flexible closed-cell polyethylene tubing, slit lengthwise for installation, complying with applicable requirements of ASTM D1056.
  - a. K Value: ASTM C177; 0.25 at 75 degrees F.
  - b. Maximum Service Temperature: 200 degrees F.
  - c. Density: 2 lb/cu ft.
  - d. Maximum Moisture Absorption: 1.0 percent by volume.
  - e. Moisture Vapor Permeability: 0.05 perm inch, when tested in accordance with ASTM E96/E96M.
  - f. Connection: Contact adhesive.

#### VI. FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- 1. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
  - a. Minimum Service Temperature: Minus 40 degrees F.
  - b. Maximum Service Temperature: 220 degrees F.
  - c. Connection: Waterproof vapor barrier adhesive.

#### VII. JACKETS

- 1. PVC Plastic.
  - a. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - i. Minimum Service Temperature: 0 degrees F.
    - ii. Maximum Service Temperature: 150 degrees F.
    - iii. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
    - iv. Thickness: 10 mil.
    - v. Connections: Brush on welding adhesive.
- 2. ABS Plastic:
  - a. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - i. Minimum Service Temperature: Minus 40 degrees F.
    - ii. Maximum Service Temperature: 180 degrees F.
    - iii. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
    - iv. Thickness: 30 mil.
    - v. Connections: Brush on welding adhesive.
- 3. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
  - a. Lagging Adhesive: Compatible with insulation.
- 4. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
  - a. Thickness: 0.016 inch sheet.

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- b. Finish: Smooth.
  - c. Joining: Longitudinal slip joints and 2 inch laps.
  - d. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
  - e. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
5. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel.
- a. Thickness: 0.010 inch.
  - b. Finish: Smooth.
  - c. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

## C. PART 3 EXECUTION

### I. EXAMINATION

1. Verify that piping has been tested before applying insulation materials.
2. Verify that surfaces are clean and dry, with foreign material removed.

### II. INSTALLATION

1. Install in accordance with manufacturer's instructions.
2. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
3. Exposed Piping: Locate insulation and cover seams in least visible locations.
4. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
5. Glass fiber insulated pipes conveying fluids below ambient temperature:
  - a. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  - b. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
6. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
7. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
8. Glass fiber insulated pipes conveying fluids above ambient temperature:
  - a. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  - b. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
9. Inserts and Shields:
  - a. Application: Piping 1-1/2 inches diameter or larger.
  - b. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  - c. Insert Location: Between support shield and piping and under the finish jacket.
  - d. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

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- e. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
10. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.
11. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
12. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
13. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

### III. SCHEDULES

1. Plumbing Systems: SIZES AND THICKNESS PER RISBC FOR R-VALUE ENERGY COMPLIANCE
  - a. Domestic Hot Water Supply:
    - i. Glass Fiber Insulation:
    - ii. Cellular Glass Insulation:
  - b. Domestic Hot Water Recirculation:
    - i. Glass Fiber Insulation:
    - ii. Polyethylene Insulation:
  - c. Tempered Domestic Water Supply:
  - d. Tempered Domestic Water Recirculation:
  - e. Domestic Cold Water:
2. Heating Systems:
  - a. Heating Water Supply and Return:
  - b. Glycol Heating Supply and Return:
  - c. Gravity Steam Condensate:
3. Cooling Systems:
  - a. Chilled Water:
  - b. Condenser Water:
  - c. Glycol Cooling Supply and Return:
  - d. Condensate Drains from Cooling Coils:
  - e. Refrigerant Suction:
  - f. Refrigerant Hot Gas:

**END OF SECTION**

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## SECTION 221005 PLUMBING PIPING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Domestic water.
  - 3. Flanges, unions, and couplings.
  - 4. Pipe hangers and supports.
  - 5. Valves.
  - 6. Flow controls.
  - 7. Check.
  - 8. Water pressure reducing valves.
  - 9. Relief valves.
  - 10. Strainers.

#### 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 083100 - Access Doors and Panels.
- C. Section 099113 - Exterior Painting.
- D. Section 099123 - Interior Painting.
- E. Section 220516 - Expansion Fittings and Loops for Plumbing Piping.
- F. Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- G. Section 330110.58 - Disinfection of Water Utility Piping Systems.

#### 1.03 REFERENCE STANDARDS

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems 2015.
- B. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250 2016.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.
- E. ASME B31.9 - Building Services Piping 2017.
- F. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers 2019.
- G. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications 2019.
- H. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems 2009.
- I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.
- J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2020.
- K. ASTM B32 - Standard Specification for Solder Metal 2008 (Reapproved 2014).
- L. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.
- M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.
- N. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.

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- O. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.
- P. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.
- Q. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2015.
- R. AWWA C550 - Protective Interior Coatings for Valves and Hydrants 2017.
- S. AWWA C606 - Grooved and Shouldered Joints 2015.
- T. AWWA C651 - Disinfecting Water Mains 2014.
- U. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications 2017 (Revised 2018).
- V. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2012 (Revised 2018).
- W. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements 2015.
- X. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements 2016.
- Y. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.
- Z. NSF 61 - Drinking Water System Components - Health Effects 2019.
- AA. NSF 372 - Drinking Water System Components - Lead Content 2016.

#### 1.04 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- D. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

#### 2.02 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
  - 1. Fittings: Cast iron.
  - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

#### 2.03 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: CISPI 301, hubless.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

#### 2.04 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

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**2.05 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING**

**2.06 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.
- B. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized, using one of the following joint types:
  - 1. Threaded Joints: ASME B16.4 cast iron fittings.
  - 2. Grooved Joints: AWWA C606 grooved pipe, cast iron fittings, and mechanical couplings.

**2.07 PIPE HANGERS AND SUPPORTS**

- A. Provide hangers and supports that comply with MSS SP-58.
  - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
  - 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
  - 1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  - 2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  - 3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  - 4. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
  - 5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  - 6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
  - 1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  - 2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  - 3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
  - 4. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
  - 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  - 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
  - 7. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
  - 8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  - 9. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
  - 10. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
  - 11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
  - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
  - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
  - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
  - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
  - 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

**2.08 PIPING SPECIALTIES**

- A. Flow Controls:
  - 1. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

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2. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

## 2.09 WATER PRESSURE REDUCING VALVES

- A. Up to 2 Inches:
  1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
- B. Over 2 Inches:
  1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.

## 2.10 RELIEF VALVES

- A. Pressure:
  1. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
- B. Temperature and Pressure:
  1. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME BPVC-IV certified and labelled.

## 2.11 STRAINERS

- A. Size 2 Inches and Under:
  1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
  2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- B. Size 1-1/2 inch to 4 inches:
  1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.
- C. Size 5 inch and Larger:
  1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

### 3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### 3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 220516.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Establish elevations of buried piping outside the building to ensure not less than code min of cover.

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- J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; refer to Arch spec.
- K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- L. Provide support for utility meters in accordance with requirements of utility companies.
- M. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
- N. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- O. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- P. Sleeve pipes passing through partitions, walls, and floors.
- Q. Inserts:
  - 1. Provide inserts for placement in concrete formwork.
  - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- R. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Support horizontal piping as indicated.
  - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches of each horizontal elbow.
  - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - 8. Provide copper plated hangers and supports for copper piping.
  - 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
    - a. Painting of interior plumbing systems and components is specified in Section 099123.
    - b. Painting of exterior plumbing systems and components is specified in Section 099113.
  - 10. Provide hangers adjacent to motor-driven equipment with vibration isolation; refer to Section 220548.
  - 11. Support cast iron drainage piping at every joint.
- S. Manufactured Sleeve-Seal Systems:
  - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
  - 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  - 3. Locate piping in center of sleeve or penetration.
  - 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  - 5. Tighten bolting for a watertight seal.
  - 6. Install in accordance with manufacturer's recommendations.
- T. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

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### 3.04 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install globe valves for throttling, bypass, or manual flow control services.
- F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- G. Provide spring-loaded check valves on discharge of water pumps.
- H. Provide flow controls in water recirculating systems where indicated.

### 3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

### 3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Section 330110.58.
- B. Prior to starting work, verify system is complete, flushed, and clean.
- C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

### 3.07 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
  - 1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
  - 2. Provide 18 gage, 0.0478-inch galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

### 3.08 SCHEDULES

- A. Pipe Hanger Spacing:
  - 1. Metal Piping:
    - a. Pipe Size: 1/2 inches to 1-1/4 inches:
      - 1) Maximum Hanger Spacing: 6.5 ft.
      - 2) Hanger Rod Diameter: 3/8 inches.
    - b. Pipe Size: 1-1/2 inches to 2 inches:
      - 1) Maximum Hanger Spacing: 10 ft.

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- 2) Hanger Rod Diameter: 3/8 inch.
- c. Pipe Size: 2-1/2 inches to 3 inches:
  - 1) Maximum Hanger Spacing: 10 ft.
  - 2) Hanger Rod Diameter: 1/2 inch.
- d. Pipe Size: 4 inches to 6 inches:
  - 1) Maximum Hanger Spacing: 10 ft.
  - 2) Hanger Rod Diameter: 5/8 inch.
- e. Pipe Size: 8 inches to 12 inches:
  - 1) Maximum hanger spacing: 14 ft.
  - 2) Hanger Rod Diameter: 7/8 inch.
- f. Pipe Size: 14 inches and Over:
  - 1) Maximum Hanger Spacing: 20 ft.
  - 2) Hanger Rod Diameter: 1 inch.
- 2. Plastic Piping:
  - a. All Sizes:
    - 1) Maximum Hanger Spacing: 6 ft.
    - 2) Hanger Rod Diameter: 3/8 inch.

**A. END OF SECTION**

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## SECTION 221006 PLUMBING PIPING SPECIALTIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Drains.
- B. Cleanouts.
- C. Hose bibbs.
- D. Refrigerator valve and recessed box.
- E. Backflow preventers.
- F. Water hammer arrestors.
- G. Sanitary waste interceptors.
- H. Mixing valves.
- I. Catch basins and manholes.
- J. Exterior penetration accessories.
- K. Fire-rated enclosures.

#### 1.02 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.6.3 - Floor and Trench Drains 2019.
- C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers 2017.
- D. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers 2011.
- E. NSF 61 - Drinking Water System Components - Health Effects 2019.
- F. NSF 372 - Drinking Water System Components - Lead Content 2016.
- G. PDI-WH 201 - Water Hammer Arresters 2017.

### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

#### 2.02 DRAINS

- A. Floor Drains:
- B. Floor Drain (FD-1):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.
- C. Floor Drain (FD-2):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable round nickel bronze strainer with removable perforated sediment bucket.
- D. Floor Drain (FD-3):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer with polished bronze funnel or anti-splash rim.
- E. Floor Drain (FD-4):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze extra heavy duty strainer.

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- F. Floor Drain (FD-5):
1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze extra heavy duty strainer with hinged grate and sediment bucket.
- G. Floor Drain (FD-6):
1. Lacquered cast iron or stainless steel, two piece body with drainage flange, heavy duty grate 6 inches wide, 12 inches long, dome strainer, end plates with gaskets.

## 2.03 CLEANOUTS

- A. Cleanouts at Exterior Surfaced Areas (CO-1):
1. Round cast nickel bronze access frame and non-skid cover.
- B. Cleanouts at Exterior Unsurfaced Areas (CO-2):
1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.
- C. Cleanouts at Interior Finished Floor Areas (CO-3):
1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.
- D. Cleanouts at Interior Finished Wall Areas (CO-4):
1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.
- E. Cleanouts at Interior Unfinished Accessible Areas (CO-5): Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

## 2.04 HOSE BIBBS

- A. Interior Hose Bibbs:
1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with handwheel, integral vacuum breaker in compliance with ASSE 1011.
- B. Interior Mixing Type Hose Bibbs:
1. Bronze or brass, wall mounted, double service faucet with hose thread spout, integral stops, chrome plated where exposed with handwheels, and vacuum breaker in compliance with ASSE 1011.

## 2.05 BACKFLOW PREVENTERS

- A. Reduced Pressure Backflow Preventers:
1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

## 2.06 WATER HAMMER ARRESTORS

- A. Water Hammer Arrestors:
1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

## 2.07 SANITARY WASTE INTERCEPTORS

## 2.08 MIXING VALVES

- A. Thermostatic Mixing Valves:
1. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
  2. Accessories:
    - a. Check valve on inlets.
    - b. Volume control shut-off valve on outlet.

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- c. Stem thermometer on outlet.
- d. Strainer stop checks on inlets.
- 3. Cabinet: 16 gage, 0.0598 inch prime coated steel, for recessed mounting with keyed lock.

## 2.09 RELIEF VALVES

- A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

## 2.10 AIR VENTS

- A. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
- B. Float Type:
  - 1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
  - 2. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.
- C. Washer Type:
  - 1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

## 2.11 FLOOR DRAIN TRAP SEALS

- A. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

## 2.12 DOMESTIC WATER DISTRIBUTION MANIFOLDS

- A. Description: Domestic water distribution system with integrated quarter-turn shutoff valves for each plumbing fixture.

## 2.13 EXTERIOR PENETRATION ACCESSORIES

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- B. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for piping, cables, and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- C. Plumbing Ventilation Thru Roof Accessories - Retrofit:
  - 1. Plumbing Pipe Extension Kit: Extends roof plumbing pipes above minimum clearance from roof surface per local codes and Authority Having Jurisdiction (AHJ).
  - 2. Retrofit Cap: Spun aluminum cap for use with aluminum or PVC plumbing stack.
  - 3. Vandal Resistant Cap: Spun aluminum cap for use with aluminum or PVC plumbing stack. Cap designed to be secured with pop-rivets to prevent removal.

## 2.14 FIRE-RATED ENCLOSURES

- A. Provide as required to preserve fire resistance rating of building elements.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

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- F. Pipe relief from backflow preventer to nearest drain.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks, washing machine outlets, or where required by Code.
- H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

**A. END OF SECTION**

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## SECTION 224000 PLUMBING FIXTURES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Water closets.
- B. Waterless urinals.
- C. Lavatories.
- D. All-in-one lavatory system.
- E. Sinks.
- F. Service sinks.
- G. Mop sinks.
- H. Under-lavatory pipe supply covers.
- I. Showers.
- J. Eye and face wash fountains.
- K. Emergency showers.

#### 1.02 RELATED REQUIREMENTS

- A. Section 221005 - Plumbing Piping.
- B. Section 221006 - Plumbing Piping Specialties.
- C. Section 223000 - Plumbing Equipment.
- D. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

#### 1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2017).
- C. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping 2015.
- D. FM (AG) - FM Approval Guide current edition.
- E. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment 2014.
- F. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use 1997 (Reaffirmed 2017).
- G. ASME A112.18.1 - Plumbing Supply Fittings 2018, with Errata.
- H. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures 2018.
- I. ASME A112.19.2 - Ceramic Plumbing Fixtures 2018.
- J. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks 2017.
- K. ASME A112.19.14 - Six Liter Water Closets Equipped with Dual Flushing Device 2013 (Reaffirmed 2018).
- L. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers 2005.
- M. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices 2015.
- N. NSF 61 - Drinking Water System Components - Health Effects 2019.
- O. NSF 372 - Drinking Water System Components - Lead Content 2016.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

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- B. Waterless Urinals: Submit recommended frequency of maintenance and parts replacement, methods of cleaning, sources of replacement supplies and parts.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Faucet Washers: One set of each type and size.
  - 3. Extra Lavatory Supply Fittings: One set of each type and size.
  - 4. Extra Shower Heads: One of each type and size.
  - 5. Extra Toilet Seats: One of each type and size.
  - 6. Flush Valve Service Kits: One for each type and size.
  - 7. Extra Waterless Urinal Trap Seals/Supplies: Provide one year's worth of replacement trap seal parts or supplies, based on normal, expected use of facility of this type.
  - 8. Extra Waterless Urinal Trap Seals/Supplies: One year's worth, based on normal, expected use of facility of this type.

## PART 2 PRODUCTS

### 2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

### 2.02 FLUSH VALVE WATER CLOSETS (P-1)

- A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
  - 1. Bowl: ASME A112.19.2; 16.5 inches high with elongated rim.
  - 2. Flush Valve: Exposed (top spud).
  - 3. Flush Operation: Sensor operated.
  - 4. Handle Height: 44 inches or less.
  - 5. Supply Size: 1-1/2 inches.
  - 6. Outlet Size: 2 inches.
  - 7. Manufacturers: (SUGGESTIONS ARE LISTED BELOW. SUBMIT TO ENGINEER OF RECORD FOR APPROVAL)
    - a. Advanced Modern Technologies Corporation: [www.amtcorporation.com/#sle](http://www.amtcorporation.com/#sle).
    - b. American Standard, Inc; AFWALL FLOWISE ADA RETROFIT TOILET W/SENSOR - OPERATED FLUSHOMETER: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - c. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
    - d. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
    - e. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
    - f. SLOAN MODEL # ROYAL 111-1.28 FLUSHOMETER.
    - g. TOTO TOILET MODEL CT 708U #01
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
  - 1. Sensor-Operated Type: Solenoid or motor-driven operator, low voltage hard-wired, infrared sensor with mechanical over-ride or over-ride push button.
  - 2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
  - 3. Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT TO EOR FOR APPROVAL
    - a. Advanced Modern Technologies Corporation; AEF-800 Series, Automatic Flush Valve: [www.amtcorporation.com/#sle](http://www.amtcorporation.com/#sle).
    - b. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - c. Delany Products: [www.delanyproducts.com/#sle](http://www.delanyproducts.com/#sle).

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- d. Sloan Valve Company: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
- e. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- f. SLOAN MODEL EBV-500-A SIDE MOUNTED SINGLE FLUSH TOILET/URINAL FLUSH VALVE RETROFIT KIT.

C. Seats:

1. Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT TO EOR FOR APPROVAL
  - a. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  - b. Bemis Manufacturing Company: [www.bemismfg.com/#sle](http://www.bemismfg.com/#sle).
  - c. Church Seat Company: [www.churchseats.com/#sle](http://www.churchseats.com/#sle).
  - d. DXV by American Standard, Inc: [www.dxv.com/#sle](http://www.dxv.com/#sle).
  - e. Olsonite: [www.olsonite.com/#sle](http://www.olsonite.com/#sle).
  - f. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
2. Solid black plastic, open front, extended back, self-sustaining hinge, brass bolts, with cover.

D. Water Closet Carriers:

1. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

**2.03 WATERLESS URINALS (P-3)**

- A. Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT FOR APPROVAL TO EOR.
  1. American Standard, Inc; FLOWISE FLUSH FREE WATERLESS URINAL MODEL 6150.100: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  2. Falcon Waterfree Technologies: [www.falconwaterfree.com/#sle](http://www.falconwaterfree.com/#sle).
  3. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  4. Sloan Valve: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
  5. Waterless Co: [www.waterless.com/#sle](http://www.waterless.com/#sle).
  6. Zero Flush: [www.zeroflush.com/#sle](http://www.zeroflush.com/#sle).
  7. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. Urinal UR- [ ]: Wall-hung, vitreous china, complying with ASME A112.19.2; one piece bowl and shields, with integral trap, back outlet, carrier, and all necessary fittings.
  1. Trap Assembly: Siphon trap type not requiring additional water for drainage of urine; liquid trap seal that is lower specific gravity than water or urine and is biodegradable; completely enclosed cartridge intended to be replaced periodically or refillable liquid trap seal; tamperproof but removable for cleaning and replacement.
  2. Projection From Wall: Approximately 14 inches.
  3. Width: Approximately 19 inches.
  4. Color: White.

**2.04 LAVATORIES (P-2A, P-2B, P-2C)**

- A. Lavatory Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
  1. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  2. DXV by American Standard, Inc: [www.dxv.com/#sle](http://www.dxv.com/#sle).
  3. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
  4. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  5. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  6. SLOAN GRADIENT SERIES- P-2A (ELGR-8100, ELGR-8200, ELGR-8300).
- B. Supply Faucet Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
  1. Advanced Modern Technologies Corporation; AEF-300 Series, Wall Mounted: [www.amtcorporation.com/#sle](http://www.amtcorporation.com/#sle).
  2. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  3. DXV by American Standard, Inc: [www.dxv.com/#sle](http://www.dxv.com/#sle).

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4. Grohe America, Inc: [www.grohe.com/us/#sle](http://www.grohe.com/us/#sle).
  5. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  6. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  7. TOTO FAUCET SPOUT ASSEMBLY 21-16-94C, CONTROLLER 21-16-58B, MIXING VALVE 21-20-03A AND THERMOSTAT 21-16-96D.
- C. Sensor Operated Faucet: Cast brass, chrome plated, wall mounted with sensor located on neck of spout.
1. Spout Style: Standard.
  2. Mixing Valve: None, single line for tempered water.
  3. Water Supply: 3/8 inch compression connections.
  4. Aerator: Vandal resistant, 0.5 GPM, laminar flow device.
  5. Finish: Polished chrome.
  6. Sensor Operated Faucet Manufacturers:
    - a. Advanced Modern Technologies Corporation; AEF-300 Series, Deck Mounted: [www.amtcorporation.com/#sle](http://www.amtcorporation.com/#sle).
    - b. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - c. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
    - d. Grohe America, Inc: [www.grohe.com/us/#sle](http://www.grohe.com/us/#sle).
    - e. The Chicago Faucet Company: [www.chicagofaucets.com/#sle](http://www.chicagofaucets.com/#sle).
    - f. Moen Incorporated: [www.moen.com/#sle](http://www.moen.com/#sle).
    - g. Powers Controls: [www.powerscontrols.com/#sle](http://www.powerscontrols.com/#sle).
    - h. Sloan Valve Company: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
    - i. Toto USA: [www.totousa.com/#sle](http://www.totousa.com/#sle).
    - j. Watts: [www.watts.com/#sle](http://www.watts.com/#sle).
    - k. Zurn Industries, Inc; AquaSense Z6913: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- D. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.
- E. Provide lavatory with combination stop and strainer.

## 2.05 SHOWERS (P-4)

- A. Shower Manufacturers:
1. SHOWER TRIM KIT- MOEN COMMERCIAL MODEL M-DURA COMMERCIAL SINGLE HANDLE POSI-TEMP HANDHELD SHOWER SYSTEM T9346GBM
  2. SHOWER BASE P-5A, KOHLER MODEL K-9055 60"X 36" ENAMELED CAST IRON SHOWER BASE W/ SAFEGUARD SLIP RESISTANT SURFACE ON BATH FLOOR, SINGLE THRESHOLD FOR ALCOVE INSTALLATION WITH CENTER DRAIN
  3. SHOWER BASE P-5B, KOHLER MODEL K-9396 36" X 36" ACRYLIC SHOWER BASE, SINGLE THRESHOLD FOR ALCOVE INSTALLATION, CENTER DRAIN W/ COVERED DRAIN (REMOVABLE COVER)
- B. Shower Valve:
1. Comply with ASME A112.18.1.
  2. Provide two handle in wall diverter valve body with integral thermostatic mixing valve to supply 1.5 gpm.
- C. Wall Mounted Shower Valve:
1. Comply with ASME A112.18.1.
  2. Provide two handle in wall diverter valve body with integral thermostatic mixing valve to supply 1.5 gpm.
  3. Shower Valve Manufacturers:
- D. Shower Head:
1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 2.5 gpm flow control.
- E. Low-Flow Shower Head:

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1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 1.5 gpm flow control.
- F. Hand-Held Shower Head:
  1. ASME A112.18.1, adjustable spray hand-held shower head with swivel fitting, with ASSE 1014 backflow preventer.
  2. Provide pushbutton flow control.
  3. Include 60 inch minimum flexible polished stainless steel hose and in-line vacuum breaker
  4. Provide wall bracket to mount hand spray, allowing use of the unit as either a hand-held spray or a fixed shower head.
- G. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

## 2.06 MOP SINKS (P-6)

- A. Mop Sink Manufacturers: SUGGESTIONS LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
  1. Acorn Engineering Company: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  2. Just Manufacturing Company: [www.justmfg.com/#sle](http://www.justmfg.com/#sle).
  3. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  4. FIAT PRODUCTS-ACRANE PLUMBING COMPANY MOLDED STONE MOP BASIN MSB 2424/ SERVICE SINK FAUCET 830-AA.
- B. Material: Stainless steel.
- C. Type: Rectilinear.
- D. Tiling Flange Construction: Galvanized steel.
- E. Grid Strainer: Stainless steel; integral; removable.
- F. Accessories:
  1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
  2. Hose clamp hanger.
  3. Mop hanger.
- G. Terrazzo Mop Sink Manufacturers: SUGGESTIONS LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
  1. Acorn Engineering Company; [\_\_\_\_]: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  2. Just Manufacturing Company; [\_\_\_\_]: [www.justmfg.com/#sle](http://www.justmfg.com/#sle).
  3. Zurn Industries, Inc; [\_\_\_\_]: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- H. Material: Precast terrazzo composed of marble chips cast in Portland cement.
- I. Type: Rectilinear, standard height.
- J. Tiling Flange Construction: Galvanized steel.
- K. Grid strainer: Stainless steel; integral; removable.
- L. Dimensions: As indicated on drawings.
- M. Accessories:
  1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
  2. Hose clamp hanger.
  3. Mop hanger.

## 2.07 SERVICE SINKS

- A. Bowl: ASME A112.19.1; 22 by 18 by 12 inch deep, porcelain enamelled (inside only) cast iron roll-rim sink, with 12 inch high back, concealed hanger, chrome plated strainer, stainless steel rim guard, cast iron P-trap with adjustable floor flange.
- B. Bowl: 36 by 24 by 10 inch high white molded stone, floor mounted, with one inch wide shoulders, vinyl bumper guard, stainless steel strainer.

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- C. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.
- D. Accessories:
  - 1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
  - 2. Hose clamp hanger.
  - 3. Mop hanger.

## 2.08 EMERGENCY EYE AND FACE WASH

- A. Emergency Wash Manufacturers: SUGGESTIONS LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
  - 1. Haws Corporation; [\_\_\_\_]: [www.hawsco.com/#sle](http://www.hawsco.com/#sle).
  - 2. Therm-Omega-Tech, Inc; [\_\_\_\_]: [www.thermomegatech.com/#sle](http://www.thermomegatech.com/#sle).
- B. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

## 2.09 EMERGENCY SHOWERS

- A. Emergency Shower: ANSI Z358.1; wall-mounted, self- cleaning, non-clogging 8 inch diameter stainless steel deluge shower head with elbow, one inch full flow valve with pull chain and 8 inch diameter ring, one inch interconnecting fittings.
- B. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

### 3.02 PREPARATION

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

### 3.03 INSTALLATION

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

### 3.04 ADJUSTING

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

### 3.05 PROTECTION

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

### 3.06 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.

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1. Water Closet:
  - a. Standard: 15 inches to top of bowl rim.
  - b. Accessible: 18 inches to top of seat.
2. Water Closet Flush Valves:
  - a. Standard: 11 inches min. above bowl rim.
  - b. Recessed: 10 inches min. above bowl rim.
3. Urinal:
  - a. Standard: 22 inches to top of bowl rim.
  - b. Accessible: 17 inches to top of bowl rim.
4. Lavatory:
  - a. Standard: 31 inches to top of basin rim.
  - b. Accessible: 34 inches to top of basin rim.
5. Drinking Fountain:
  - a. Child: 30 inches to top of basin rim.
  - b. Standard Adult: 40 inches to top of basin rim.
  - c. Accessible: 36 inches to top of spout.
6. Shower Heads:
  - a. Adult Male: 69.5 inches to bottom of head.
  - b. Adult Female: 64.5 inches to bottom of head.
  - c. Child: 58.5 inches to bottom of head.
7. Emergency Eye and Face Wash:
  - a. Standard: 38 inches to receptor rim.
8. Emergency Shower:
  - a. Standard: 84 inches to bottom of head.

B. Fixture Rough-In

1. Water Closet (Flush Valve Type): P-1
  - a. Cold Water: 1 Inch.
  - b. Waste: 4 Inch.
  - c. Vent: 2 Inch.
2. Urinal, Waterless: P-3
  - a. Waste: 2 Inch.
  - b. Vent: 1-1/2 Inch.
3. Lavatory:
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 1-1/2 Inch.
  - d. Vent: 1-1/4 Inch.
4. Sink:
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 1-1/2 Inch.
  - d. Vent: 1-1/4 Inch.
5. Service Sink: P-6
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 2 Inch.
  - d. Vent: 1-1/2 Inch.
6. Service Sink: P-6
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 3 Inch.
  - d. Vent: 1-1/2 Inch.
7. Drinking Fountain: DF

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- a. Cold Water: 1/2 Inch.
- b. Waste: 1-1/4 Inch.
- c. Vent: 1-1/4 Inch.
8. Shower: P-5A AND P-5B
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 1-1/2 Inch.
  - d. Vent: 1-1/4 Inch.

**END OF SECTION**

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## SECTION 230713 DUCT INSULATION

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Insulation jackets.

#### 1.02 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
- C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014 (Reapproved 2019).
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

#### 1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of experience and approved by manufacturer.

### PART 2 PRODUCTS

#### 2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

#### 2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 1200 degrees F.
  - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure sensitive tape.

#### 2.03 GLASS FIBER, RIGID

- A. Insulation: ASTM C612; rigid, noncombustible blanket.
  - 1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 450 degrees F.
  - 3. Maximum Water Vapor Absorption: 5.0 percent.
  - 4. Maximum Density: 8.0 lb/cu ft.
- B. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

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3. Secure with pressure sensitive tape.

## 2.04 JACKETS

- A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.
- B. Verify that surfaces are clean, foreign material removed, and dry.

### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with NAIMA National Insulation Standards.
- C. Insulated Ducts Conveying Air Below Ambient Temperature:
  1. Provide insulation with vapor barrier jackets.
  2. Finish with tape and vapor barrier jacket.
  3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
  4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- D. Insulated Ducts Conveying Air Above Ambient Temperature:
  1. Provide with or without standard vapor barrier jacket.
  2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
- F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with outdoor jacket finished as specified in Section [\_\_\_\_\_].
- G. Slope exterior ductwork to shed water.
- H. External Duct Insulation Application:
  1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
  2. Secure insulation without vapor barrier with staples, tape, or wires.
  3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.
  4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
  5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

## A. END OF SECTION

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## SECTION 233700 AIR OUTLETS AND INLETS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Diffusers:
  - 1. Rectangular ceiling diffusers.
  - 2. Round ceiling diffusers.
- B. Registers/grilles:
  - 1. Ceiling-mounted, exhaust and return register/grilles.
  - 2. Ceiling-mounted, supply register/grilles.
- C. Duct-mounted supply and return registers/louvers.
- D. Wall and ceiling gypsum board access panels with return air grilles.

#### 1.02 REFERENCE STANDARDS

- A. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

### PART 2 PRODUCTS

#### 2.01 ROUND CEILING DIFFUSERS

- A. Type: Round, adjustable pattern, stamped or spun, multi-core diffuser to discharge air in 360 degree pattern, with sectorizing baffles where indicated. Diffuser collar shall project not more than 1 inch above ceiling. In plaster ceilings, provide plaster ring and ceiling plaque.
- B. Fabrication: Steel with baked enamel finish.
- C. Color: As selected by Architect from manufacturer's standard range.

#### 2.02 RECTANGULAR CEILING DIFFUSERS

- A. Accessories: Provide radial opposed blade, butterfly, combination splitter, and volume control damper; removable core, sectorizing baffle, safety chain, wire guard, equalizing grid, operating rod extension, anti-smudging device, gaskets for surface mounted diffusers, and with damper adjustable from diffuser face.

#### 2.03 DUCT-MOUNTED SUPPLY AND RETURN REGISTERS/LOUVERS

- A. Type: Duct-mounted, rectangular register for round-spiral duct with adjustable pivot-ended blades, end caps, built-in volume damper, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.
- B. Material: 22 gage, 0.0299 inch.
  - 1. Provide crossing spiral fitting-body of matching duct diameter.
- C. Color: As indicated on drawings.

#### 2.04 CEILING SUPPLY REGISTERS/GRILLES

- A. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

#### 2.05 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.
- B. Color: To be selected by Architect from manufacturer's standard range.
- C. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

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## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- D. Install diffusers to ductwork with air tight connection.

#### **A. END OF SECTION**

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**SECTION 233100  
HVAC DUCTS AND CASINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Duct cleaning.

**1.02 REFERENCE STANDARDS**

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

**PART 2 PRODUCTS**

**2.01 DUCT ASSEMBLIES**

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

**2.02 DUCTWORK FABRICATION**

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

**2.03 MANUFACTURED DUCTWORK AND FITTINGS**

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

**3.02 CLEANING**

- A. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

**A. END OF SECTION**

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## SECTION 260519

### LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

#### PART 1 - GENERAL

##### 2.01 SUMMARY

Section Includes:

1. Copper building wire.
2. Aluminum building wire.
3. Metal-clad cable, Type MC.
4. Connectors and splices.

Related Requirements:

5. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
6. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

##### 2.02 ACTION SUBMITTALS

Product Data: For each type of product.

##### 2.03 INFORMATIONAL SUBMITTALS

Field quality-control reports.

#### PRODUCTS

##### 2.04 COPPER BUILDING WIRE

Description: Flexible, insulated, and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. [Alpha Wire Company.](#)
2. [American Bare Conductor.](#)
3. [Okonite Company \(The\).](#)
4. [Southwire Company.](#)
5. [WESCO.](#)

Standards:

6. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
7. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

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Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

Conductor Insulation:

8. Type THHN and Type THWN-2: Comply with UL 83.
9. Type XHHW-2: Comply with UL 44.

## 2.05 METAL-CLAD CABLE, TYPE MC

Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. [Alpha Wire Company.](#)
2. [American Bare Conductor.](#)
3. [Okonite Company \(The\).](#)
4. [Southwire Company.](#)
5. [WESCO.](#)

Standards:

6. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
7. Comply with UL 1569.
8. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

Circuits:

9. Single circuit.

Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

Ground Conductor: Insulated.

Conductor Insulation:

10. Type THHN/THWN-2: Comply with UL 83.
11. Type XHHW-2: Comply with UL 44.
12. Armor: Steel, interlocked.

Jacket: PVC applied over armor.

## 2.06 CONNECTORS AND SPLICES

Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

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Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. [3M Electrical Products.](#)
2. [ABB \(Electrification Products Division\).](#)
3. [Appleton - O-Z/Gedney; Emerson Electric Co., Automation Solutions.](#)
4. [Hubbell Incorporated, Power Systems.](#)
5. [ILSCO.](#)

Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

6. Material: Copper.
7. Type: One or Two hole with standard barrels.
8. Termination: Compression or Crimp.

## EXECUTION

### 2.07 CONDUCTOR MATERIAL APPLICATIONS

Feeders:

1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

Branch Circuits:

2. Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### 2.08 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

Exposed Feeders: Type THHN/THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.

Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

Feeders Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.

Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

Branch Circuits Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

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Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless steel, wire-mesh, strain relief device at terminations to suit application.

## 2.09 INSTALLATION, GENERAL

Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

## 2.010 CONNECTIONS

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-486B.

Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

Wiring at Outlets: Install conductor at each outlet, with at least 6 inch (150 mm) of slack.

## 2.011 IDENTIFICATION

Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

## 2.012 FIRESTOPPING

Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

## 2.013 FIELD QUALITY CONTROL

Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements:

Elevator.

2. Perform each of the following visual and electrical tests:

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Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.

Test bolted connections for high resistance using one of the following:

- 1) A low-resistance ohmmeter.
- 2) Calibrated torque wrench.
- 3) Thermographic survey.

Inspect compression-applied connectors for correct cable match and indentation.

Inspect for correct identification.

Inspect cable jacket and condition.

Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration.

Continuity test on each conductor and cable.

Uniform resistance of parallel conductors.

Cables will be considered defective if they do not pass tests and inspections.

Prepare test and inspection reports to record the following:

3. Procedures used.
4. Results that comply with requirements.
5. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

**END OF SECTION 260519**

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## SECTION 260526

### GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 2 - GENERAL

##### 2.01 SUMMARY

Section includes grounding and bonding systems and equipment.

##### PRODUCTS

##### 2.02 SYSTEM DESCRIPTION

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Comply with UL 467 for grounding and bonding materials and equipment.

##### 2.03 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. [Burndy: Hubbell Incorporated, Construction and Energy.](#)
2. [Harger Lightning & Grounding.](#)
3. [ILSCO.](#)
4. [Siemens Industry, Inc., Energy Management Division.](#)

##### 2.04 CONDUCTORS

Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
4. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

##### 2.05 CONNECTORS

Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

Bus-Bar Connectors: Compression type, copper, or copper alloy, with two wire terminals.

Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

Cable-to-Cable Connectors: Compression type, copper, or copper alloy.

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Conduit Hubs: Mechanical type, terminal with threaded hub.

Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

## EXECUTION

### 2.06 APPLICATIONS

Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

Grounding Conductors: Green-colored insulation.

Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Connections to Structural Steel: Welded connectors.

### 2.07 EQUIPMENT GROUNDING

Install insulated equipment grounding conductors with all feeders and branch circuits.

Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

### 2.08 INSTALLATION

Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

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Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

3. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
4. Make connections with clean, bare metal at points of contact.
5. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
6. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
7. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

## 2.09 FIELD QUALITY CONTROL

Perform tests and inspections.

Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

Grounding system will be considered defective if it does not pass tests and inspections.

Prepare test and inspection reports.

## PART 2 - END OF SECTION 260526

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## SECTION 260529

### HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

#### PART 2 - GENERAL

##### 2.01 SUMMARY

Section Includes:

1. Steel slotted support systems.
2. Aluminum slotted support systems.
3. Conduit and cable support devices.
4. Support for conductors in vertical conduit.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

##### 2.02 ACTION SUBMITTALS

Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.

Hangers. Include product data for components.

Slotted support systems.

Equipment supports.

Delegated-Design Submittal: For hangers and supports for electrical systems.

Include design calculations and details of hangers.

#### PRODUCTS

##### 2.03 PERFORMANCE REQUIREMENTS

Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.

Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified."
2. Component Importance Factor: 1.0.

##### 2.04 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.

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

Atkore International (Allied Tube & Conduit).

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[Atkore International \(Unistrut\).](#)

Eaton (B-line).

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: Galvanized steel.
4. Channel Width: Selected for applicable load criteria.
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.

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

ABB (Electrification Products Division).

Atkore International (Unistrut).

Cooper Industries, Inc.

10. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
11. Channel Material: 6063-T5 aluminum alloy.
12. Fittings and Accessories Material: 5052-H32 aluminum alloy.
13. Channel Width: Selected for applicable load criteria **<Insert dimension>**.

Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

14. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
15. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.

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16. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
17. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).
18. Toggle Bolts: All-steel springhead type.
19. Hanger Rods: Threaded steel.

## EXECUTION

### 2.05 APPLICATION

Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA 101
3. NECA 102.

Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

4. Secure raceways and cables to these supports with two-bolt conduit clamps.

### 2.06 SUPPORT INSTALLATION

Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.

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7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

## 2.07 PAINTING

Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

Touchup: Comply with requirements in Section 099123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

## PART 2 - END OF SECTION 260529

## PART 2 -

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## SECTION 260533

### RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

#### PART 2 - GENERAL

##### 2.01 SUMMARY

A. Section Includes:

1. Type EMT-S raceways and elbows.
2. Type ERMC-S raceways, elbows, couplings, and nipples.
3. Type FMC-S raceways.
4. Type LFMC raceways.
5. Fittings for conduit, tubing, and cable.
6. Threaded metal joint compound.
7. Wireways and auxiliary gutters.
8. Metallic outlet boxes, device boxes, rings, and covers.
9. Cabinets, cutout boxes, junction boxes, pull boxes, and miscellaneous enclosures.
10. Cover plates for device boxes.

##### 2.02 ACTION SUBMITTALS

A. Product Data: For the following:

1. Wireways and auxiliary gutters.
2. Surface metal raceways.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

#### PART 2 - PRODUCTS

##### 2.01 TYPE EMT-S RACEWAYS AND ELBOWS

A. Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Atkore International (Allied Tube & Conduit).
  - b. Atkore International (Calconduit).
  - c. Topaz Lighting & Electric.
  - d. Zekelman Industries (Western Tube).
  - e. Zekelman Industries (Wheatland Tube).
2. Applicable Standards:

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- a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- b. General Characteristics:
  - 1) Reference Standards: UL 797 and UL Category Control Number FJMX.
  - 2) Material: Steel.
  - 3) Exterior Coating: Zinc.
  - 4) Interior Coating: Zinc with organic top coating.
- c. Options:
  - 1) Minimum Trade Size: 3/4 inch (21 mm).

## 2.02 TYPE ERM-C-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

- A. Galvanized-Steel Electrical Rigid Metal Conduit (ERM-C-S-G), Elbows, Couplings, and Nipples:
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Atkore International (Allied Tube & Conduit).
    - b. Atkore International (Calconduit).
    - c. Topaz Lighting & Electric.
    - d. Zekelman Industries (Western Tube).
    - e. Zekelman Industries (Wheatland Tube).
  2. Applicable Standards:
    - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    - b. General Characteristics:
      - 1) Reference Standards: UL 6 and UL Category Control Number DYIX.
      - 2) Exterior Coating: Zinc.
      - 3) Interior Coating: Zinc with organic top coating.
    - c. Options:
      - 1) Minimum Trade Size: 3/4 inch (21 mm).

## 2.03 TYPE FMC-S AND TYPE FMC-A RACEWAYS

- A. Steel Flexible Metal Conduit (FMC-S):
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. ABB (Electrification Products Division).
    - b. Electri-Flex Company.

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- c. [Topaz Lighting & Electric.](#)
2. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standard: UL 1 and UL Category Control Number DXUZ.
    - 2) Material: Steel.
  - c. Options:
    - 1) Minimum Trade Size: 3/4 inch (21 mm).

## 2.04 TYPE LFMC RACEWAYS

### A. Steel Liquidtight Flexible Metal Conduit (LFMC-S):

1. [Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [ABB \(Electrification Products Division\).](#)
  - b. [Anamet Electrical, Inc \(Anaconda Sealtite\).](#)
  - c. [Electri-Flex Company.](#)
2. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standard: UL 360 and UL Category Control Number DXHR.
    - 2) Material: Steel.
  - c. Options:
    - 1) Minimum Trade Size: 3/4 inch (21 mm).
    - 2) Colors: As indicated on Drawings.

### B. Stainless Steel Liquidtight Flexible Metal Conduit (LFMC-SS):

1. [Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [Electri-Flex Company.](#)
2. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standard: UL 360 and UL Category Control Number DXHR.

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2) Material: Stainless steel.

c. Options:

1) Minimum Trade Size: 3/4 inch (21 mm).

## 2.05 FITTINGS FOR CONDUIT, TUBING, AND CABLE

### A. Fittings for Type ERM Raceways:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Southwire Company.
  - b. Topaz Lighting & Electric.
2. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL 514B and UL Category Control Number DWTT.
    - 2) Material: Steel.
    - 3) Coupling Method: Compression coupling or Raintight compression coupling with distinctive color gland nut.
  - c. Options:
    - 1) Conduit Fittings for Hazardous (Classified) Locations: UL 1203.
    - 2) Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

### B. Fittings for Type EMT Raceways:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. ABB (Electrification Products Division).
  - b. Atkore International (Allied Tube & Conduit).
  - c. Atkore International (Calconduit).
  - d. Southwire Company.
  - e. Topaz Lighting & Electric.
2. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL 514B and UL Category Control Number FKAV.

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- 2) Material: Steel.
  - 3) Coupling Method: Compression coupling or Raintight compression coupling with distinctive color gland nut.
- C. Fittings for Type FMC Raceways:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. American Fittings Corp. (AMFICO).
    - b. Liquid Tight Connector Co.
    - c. Southwire Company.
  2. Applicable Standards:
    - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    - b. General Characteristics:
      - 1) Reference Standards: UL 514B and UL Category Control Number ILNR.
- D. Fittings for Type LFMC Raceways:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Liquid Tight Connector Co.
  2. Applicable Standards:
    - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    - b. General Characteristics:
      - 1) Reference Standards: UL 514B and UL Category Control Number DXAS.

## 2.06 WIREWAYS AND AUXILIARY GUTTERS

- A. Metal Wireways and Auxiliary Gutters:
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. ABB (Electrification Products Division).
    - b. Eaton (B-line).
    - c. nVent (Hoffman).
  2. Applicable Standards:
    - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    - b. General Characteristics:
      - 1) Reference Standards: UL 870 and UL Category Control Number ZOYX.

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- 2) Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- 3) Finish: Manufacturer's standard enamel finish.
- c. Options:
  - 1) Degree of Protection: Type 1 unless otherwise indicated.
  - 2) Wireway Covers: Screw-cover type unless otherwise indicated.

## 2.07 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

### A. Metallic Outlet Boxes:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [ABB \(Electrification Products Division\).](#)
  - b. [Eaton \(Crouse-Hinds\).](#)
  - c. [Hubbell Premise Wiring: Hubbell Incorporated, Commercial, and Industrial.](#)
  - d. [Pass & Seymour; Legrand North America, LLC.](#)
  - e. [Wiremold; Legrand North America, LLC.](#)
3. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL 514A and UL Category Control Number QCIT.
  - c. Options:
    - 1) Material: Sheet steel.
    - 2) Sheet Metal Depth: Minimum 2 inch (50 mm).
    - 3) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb (23 kg).

### B. Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
2. Applicable Standards:

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- a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL 514A and UL Category Control Number QCIT.
- C. Metallic Device Boxes:
1. Description: Box with provisions for mounting wiring device directly to box.
  2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. ABB (Electrification Products Division).
    - b. Eaton (Crouse-Hinds).
    - c. Hubbell Premise Wiring; Hubbell Incorporated, Commercial, and Industrial.
  3. Applicable Standards:
    - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    - b. General Characteristics:
      - 1) Reference Standards: UL 514A and UL Category Control Number QCIT.
    - c. Options:
      - 1) Material: Sheet steel.
      - 2) Sheet Metal Depth: minimum 2 inch (50 mm).
      - 3) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb (23 kg).
- D. Metallic Extension Rings:
1. Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.
  2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Eaton (B-line).
    - b. Pass & Seymour; Legrand North America, LLC.
    - c. Topaz Lighting & Electric.
    - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial, and Industrial.
  3. Applicable Standards:
    - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    - b. General Characteristics:
      - 1) Reference Standards: UL 514A and UL Category Control Number QCIT.

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**2.08 CABINETS, CUTOOT BOXES, JUNCTION BOXES, PULL BOXES, AND MISCELLANEOUS ENCLOSURES**

**A. Indoor Sheet Metal Cabinets:**

1. Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Eaton (B-line).
  - b. nVent (Hoffman).
  - c. Schneider Electric USA (Square D).
  - d. Siemens Industry, Inc. (Building Technologies Division).
3. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL Category Control Number CYIV.
      - a) Non-Environmental Characteristics: UL 50.
      - b) Environmental Characteristics: UL 50E.

**B. Indoor Sheet Metal Cutout Boxes:**

1. Description: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Eaton (B-line).
  - b. Eaton (Crouse-Hinds).
  - c. nVent (Hoffman).
  - d. Schneider Electric USA (Square D).
  - e. Siemens Industry, Inc. (Building Technologies Division).
3. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL Category Control Number CYIV.
      - a) Non-Environmental Characteristics: UL 50.
      - b) Environmental Characteristics: UL 50E.

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C. Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Eaton (B-line).
  - b. Hubbell Industrial Controls; Hubbell Incorporated, Commercial and Industrial.
  - c. nVent (Hoffman).
  - d. Schneider Electric USA (Square D).
3. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL Category Control Number BGUZ.
      - a) Non-Environmental Characteristics: UL 50.
      - b) Environmental Characteristics: UL 50E.

D. Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Appleton - EGS; Emerson Electric Co., Automation Solutions.
  - b. Appleton - O-Z/Gedney; Emerson Electric Co., Automation Solutions.
  - c. Eaton (Crouse-Hinds).
3. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL Category Control Number BGUZ.
      - a) Non-Environmental Characteristics: UL 50.
      - b) Environmental Characteristics: UL 50E.

E. Indoor Sheet Metal Miscellaneous Enclosures:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. ABB (Electrification Products Division).

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- b. [Eaton \(B-line\).](#)
    - c. [nVent \(Hoffman\).](#)
    - d. [Schneider Electric USA \(Square D\).](#)
  2. Applicable Standards:
    - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    - b. General Characteristics:
      - 1) Reference Standards:
        - a) UL 1773 and UL Category Control Number XCKT.
        - b) Non-Environmental Characteristics: UL 50.
        - c) Environmental Characteristics: UL 50E.

## 2.09 COVER PLATES FOR DEVICES BOXES

- A. Metallic Cover Plates for Device Boxes:
  1. [Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
    - a. [Eaton \(Crouse-Hinds\).](#)
    - b. [Eaton \(Wiring Devices - Arrow Hart\).](#)
    - c. [Pass & Seymour; Legrand North America, LLC.](#)
    - d. [Wiremold; Legrand North America, LLC.](#)
  2. Applicable Standards:
    - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    - b. General Characteristics:
      - 1) Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
      - 2) Wallplate-Securing Screws: Metal with head color to match wallplate finish.
    - c. Options:
      - 1) Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
      - 2) Wallplate Material: 0.032 inch (0.8 mm) thick Type 302/304 non-magnetic stainless steel with brushed finish or Steel with white baked enamel, suitable for field painting or as indicated on architectural Drawings.

## PART 2 - EXECUTION

### 2.01 SELECTION OF RACEWAYS

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- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult Architect for resolution of conflicting requirements.
- B. Outdoors:
  - 1. Exposed Conduit: ERMCM.
  - 2. Concealed Conduit, Aboveground: ERMCM or EMT.
  - 3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- C. Indoors:
  - 1. Hazardous Classified Locations: ERMCM.
  - 2. Exposed and Subject to Physical Damage: ERMCM. Raceway locations include the following:
    - a. Loading docks.
    - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    - c. Mechanical rooms.
    - d. Gymnasiums.
  - 3. Exposed, Not Subject to Physical Damage: ERMCM.
  - 4. Concealed in Ceilings and Interior Walls and Partitions: ERMCM or EMT.
  - 5. Damp or Wet Locations: ERMCM.
  - 6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC or FMC.
- D. Stub-ups to Above Recessed Ceilings: Provide EMT or ERMCM for raceways.
- E. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
  - 1. ERMCM: Provide threaded type fittings unless otherwise indicated.

## 2.02 SELECTION OF BOXES AND ENCLOSURES

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.
- B. Degree of Protection:
  - 1. Indoors:
    - a. Type 1 unless otherwise indicated.
    - b. Damp or Dusty Locations: Type 12.
    - c. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
    - d. Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
    - e. Locations Exposed to Airborne Dust, Lint, Fibers, or Flyings: Type 4.

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- f. Locations Exposed to Hosedown: Type 4.
  - g. Locations Exposed to Corrosive Agents: Type 4X.
- C. Exposed Boxes Installed Less Than 6.5 ft. (2 m) Above Floor:
- 1. Provide cast-metal boxes.
  - 2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

## 2.03 INSTALLATION OF RACEWAYS

### A. Installation Standards:

- 1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult Architect for resolution of conflicting requirements.
- 2. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- 3. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- 4. Comply with NECA NEIS 101 for installation of steel raceways.
- 5. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
- 6. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4 inch (35 mm) trade size and insulated throat metal bushings on 1-1/2 inch (41 mm) trade size and larger conduits terminated with locknuts.
- 7. Raceway Terminations at Locations Subject to Moisture or Vibration:
  - a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

### B. General Requirements for Installation of Raceways:

- 1. Complete raceway installation before starting conductor installation.
- 2. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft. (0.6 m) above finished floor.
- 3. Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inch (300 mm) of changes in direction.
- 4. Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
- 5. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- 6. Support conduit within 12 inch (300 mm) of enclosures to which attached.

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7. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of raceways at the following points:
    - a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
    - b. Where an underground service raceway enters a building or structure.
    - c. Conduit extending from interior to exterior of building.
    - d. Conduit extending into pressurized duct and equipment.
    - e. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
    - f. Where otherwise required by NFPA 70.
  8. Keep raceways at least 6 inch (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
  9. Cut conduit perpendicular to the length. For conduits 2 inch (53 mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
  10. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb (90 kg) tensile strength. Leave at least 12 inch (300 mm) of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- C. Requirements for Installation of Specific Raceway Types:
1. Types EMT-A, ERM-C-A, and FMC-A:
    - a. Do not install aluminum raceways or fittings.
  2. Types ERM-C:
    - a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
  3. Type ERM-C-S-PVC:
    - a. Follow manufacturer's installation instructions for clamping, cutting, threading, bending, and assembly.
    - b. Provide PVC-coated sealing locknut for exposed male threads transitioning into female NPT threads that do not have sealing sleeves, including transitions from PVC couplings/female adapters to Type ERM-C-S-PVC elbows in direct-burial applications. PVC-coated sealing locknuts must not be used in place of conduit hub. PVC-coated sealing locknut must cover exposed threads on Type ERM-C-S-PVC raceway.
    - c. Coat field-cut threads on PVC-coated raceway with manufacturer-approved corrosion-preventing conductive compound prior to assembly.
  4. Types FMC, LFM-C:

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- a. Comply with NEMA RV 3. Provide a maximum of 36 inch (915 mm) of flexible conduit for recessed and semi recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
5. Types PVC and EPEC:
  - a. Do not install Type PVC or Type EPEC conduit unless directed on drawings.
  - b. Comply with manufacturer's written instructions for solvent welding and fittings.
- D. Stub-ups to Above Recessed Ceilings:
  1. Provide EMT or ERMC for raceways.
  2. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- E. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.
  1. ERMC-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  2. EMT: Provide compression, steel fittings. Comply with NEMA FB 2.10.
  3. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.
- F. Expansion-Joint Fittings:
  1. Install in runs of aboveground ERMC and EMT conduit that are located where environmental temperature change may exceed 100 deg F (55 deg C) and that have straight-run length that exceeds 100 ft. (30 m).
  2. Install type and quantity of fittings that accommodate temperature change listed for the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
  3. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
  4. Install expansion fittings at locations where conduits cross building or structure expansion joints.
  5. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- G. Raceways Penetrating Rooms or Walls with Acoustical Requirements:

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1. Seal raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.

#### **2.04 INSTALLATION OF BOXES AND ENCLOSURES**

- A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
- B. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- C. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
- D. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- E. Locate boxes so that cover or plate will not span different building finishes.
- F. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
- G. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
- H. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
- I. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
- J. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:
  1. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
  2. Provide gaskets for wallplates and covers.

#### **2.05 FIRESTOPPING**

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

#### **2.06 PROTECTION**

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

#### **2.07 CLEANING**

- A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

#### **END OF SECTION 260533**

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## SECTION 260553

### IDENTIFICATION FOR ELECTRICAL SYSTEMS

#### PART 2 - GENERAL

##### 2.01 SUMMARY

- A. Section Includes:
  - 1. Labels.
  - 2. Bands and tubes.
  - 3. Tapes and stencils.
  - 4. Signs.
  - 5. Cable ties.
  - 6. Miscellaneous identification products.

##### 2.02 ACTION SUBMITTALS

- A. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.
- B. Delegated-Design Submittal: For arc-flash hazard study.

#### PART 2 - PRODUCTS

##### 2.01 PERFORMANCE REQUIREMENTS

- A. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- B. Comply with ANSI Z535.4 for safety signs and labels.
- C. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.
- D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

##### 2.02 COLOR AND LEGEND REQUIREMENTS

- A. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
  - 1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
  - 2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.

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- c. Phase C: Blue.
3. Colors for 480/277-V Circuits:
  - a. Phase A: Brown.
  - b. Phase B: Orange.
  - c. Phase C: Yellow.
4. Color for Neutral: White or gray.
5. Color for Equipment Grounds: Green.
- B. Warning Label Colors:
  1. Identify system voltage with black letters on an orange background.
- C. Warning labels and signs shall include, but are not limited to, the following legends:
  1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
- D. Equipment Identification Labels:
  1. Black letters on a white field.

## 2.03 LABELS

- A. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
  1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
  2. Marker for Labels:
    - a. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- B. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
  1. Minimum Nominal Size:
    - a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
    - b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
    - c. As required by authorities having jurisdiction.

## 2.04 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.

## 2.05 SIGNS

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- A. Baked-Enamel Signs:
1. Preprinted aluminum signs punched or drilled for fasteners, with colors, legend, and size required for application.
  2. 1/4-inch (6.4-mm) grommets in corners for mounting.
  3. Nominal Size: 7 by 10 inches (180 by 250 mm).
- B. Laminated Acrylic or Melamine Plastic Signs:
1. Engraved legend.
  2. Thickness:
    - a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
    - b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
    - c. Self-adhesive.
    - d. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## 2.06 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
1. Minimum Width: 3/16 inch (5 mm).
  2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
  3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  4. Color: Black, except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.
1. Minimum Width: 3/16 inch (5 mm).
  2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
  3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
  4. Color: Black.

## 2.07 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

## PART 2 - EXECUTION

### 2.01 PREPARATION

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- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

## 2.02 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
1. Secure tight to surface of conductor, cable, or raceway.
- H. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
1. "EMERGENCY POWER."
  2. "POWER."
- I. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
- J. Self-Adhesive Labels:
1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
  2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
- K. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- L. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- M. Baked-Enamel Signs:

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1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.
- N. Laminated Acrylic or Melamine Plastic Signs:
1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
  2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.
- O. Cable Ties: General purpose, for attaching tags, except as listed below:
1. Outdoors: UV-stabilized nylon.

## 2.03 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
1. "EMERGENCY POWER."
  2. "POWER."
- D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive vinyl tape to identify the phase.
1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.
- F. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.
- G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
1. Apply to exterior of door, cover, or other access.
  2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:

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- a. Power-transfer switches.
- b. Controls with external control power connections.
- H. Arc Flash Warning Labeling: Self-adhesive labels.
- I. Equipment Identification Labels:
  - 1. Indoor Equipment: Self-adhesive label, Baked-enamel signs or Laminated acrylic or melamine plastic sign.
  - 2. Outdoor Equipment: Laminated acrylic or melamine sign.
  - 3. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Access doors and panels for concealed electrical items.
    - d. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    - e. Emergency system boxes and enclosures.
    - f. Enclosed switches.
    - g. Enclosed circuit breakers.
    - h. Enclosed controllers.
    - i. Contactors.

**END OF SECTION 260553**

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## SECTION 260923

### LIGHTING CONTROL DEVICES

#### PART 2 - GENERAL

##### 2.01 SUMMARY

A. Section Includes:

1. Indoor occupancy and vacancy sensors.
2. Switchbox-mounted occupancy sensors.
3. Conductors and cables.

B. Related Requirements:

1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

##### 2.02 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings:

1. Show installation details for the following:
  - a. Occupancy sensors.
  - b. Vacancy sensors.
2. Interconnection diagrams showing field-installed wiring.
3. Include diagrams for power, signal, and control wiring.

C. Field quality-control reports.

D. Sample Warranty: For manufacturer's warranties.

##### 2.03 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

##### 2.04 WARRANTY

A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
  - a. Faulty operation of lighting control software.
  - b. Faulty operation of lighting control devices.
2. Warranty Period: Two years from date of Substantial Completion.

#### PART 2 - PRODUCTS

##### 2.01 INDOOR OCCUPANCY AND VACANCY SENSORS

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A. General Requirements for Sensors:

1. Ceiling-mounted, solid-state indoor occupancy sensors.
2. Dual technology.
3. Separate power pack.
4. Hardwired connection to switch.
5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
6. Power: Line voltage.
7. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
8. Mounting:
  - a. Sensor: Suitable for mounting in any position on a standard outlet box.
  - b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
  - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
9. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
10. Bypass Switch: Override the "on" function in case of sensor failure.

B. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of **[1000 square feet (110 square meters)] [2000 square feet (220 square meters)] [3000 square feet (330 square meters)]** when mounted 48 inches (1200 mm) above finished floor.

## 2.02 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
  3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
  4. Switch Rating: Not less than 800-VA LED load at 120 V, 1200-VA LED load at 277 V, and 800-W incandescent.
- B. Wall-Switch Sensor:
1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of **2100 sq. ft (196 sq. m)**.
  2. Sensing Technology: Dual technology - PIR and ultrasonic.
  3. Capable of controlling load in three-way application.
  4. Voltage: Dual voltage - 120 and 277 V.
  5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
  6. Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
  7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
  8. Color: White.
  9. Faceplate: Color matched to switch.

## **2.03 CONDUCTORS AND CABLES**

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

## **PART 2 - EXECUTION**

### **2.01 EXAMINATION**

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### **2.02 INSTALLATION OF SENSORS**

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- A. Comply with NECA 1.
- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- C. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

#### 2.03 INSTALLATION OF WIRING

- A. Comply with NECA 1.
- B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's written instructions.
- D. Size conductors in accordance with lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

#### 2.04 IDENTIFICATION

- A. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems."
  - 1. Identify controlled circuits in lighting contactors.
  - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

#### 2.05 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

#### 2.06 ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions.
  - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

#### END OF SECTION 260923

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## SECTION 26 09 23.1

### LIGHTING CONTROL SYSTEMS

#### PART 2 - GENERAL

##### 1.1 SUMMARY

###### 1.1.1 Section Includes:

- 1.1.1.1 Low-voltage lighting control system.
- 1.1.1.2 Low voltage wall stations
- 1.1.1.3 Power interfaces
- 1.1.1.4 Wired sensors

###### 1.1.2 Related Requirements:

- 1.1.2.1 Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.
- 1.1.2.2 Section 26 05 33: Raceways and Boxes for Electrical Systems.
- 1.1.2.3 Section 26 24 16: Panelboards.
- 1.1.2.4 Section 26 09 23: Lighting Control Devices.
- 1.1.2.5 Section 26 51 19: LED Interior Lighting

##### 1.2 SUMMARY

- 1.2.1 The lighting controls system specified in this section shall provide time-based, sensor-based (both occupancy and daylight), and manual lighting control.
- 1.2.2 The system shall be capable of turning lighting loads on/off as well as dimming lights. Specific dimmers will be capable of “dimming lights to off”.
- 1.2.3 All system devices shall be networked together, enable digital communication between devices, and shall be individually addressed.
- 1.2.4 The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity, even if network connectivity to the greater system is lost.
- 1.2.5 The system architecture shall facilitate remote operation via a computer station.
- 1.2.6 The system shall not require any centrally hardwired switching equipment.
- 1.2.7 The system shall be capable of wireless, wired, or hybrid wireless/wired architectures.

##### 1.3 SUBMITTALS

- 1.3.1 Submit a complete one-line diagram of the proposed system configuration for Architect/Engineer’s review. The riser diagram shall identify but not be limited to wiring, equipment, components, interconnection with other systems, and location and type of raceways.
- 1.3.2 Manufacturer's Data: Submit catalog cuts and description of each system component.
- 1.3.3 Provide wiring diagrams and installation details for lighting control equipment.

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- 1.3.4 Shop Drawings: Submit a complete set of detailed Shop Drawings for the entire lighting control system; the shop drawings shall include but not be limited to relay panels with designations and dimensions, day light sensors locations based on manufacturer's recommendations, and system components with manufacturer's part numbers.
- 1.3.5 Installation Instructions: Submit manufacturer's written installation instructions, wiring diagrams. Instructions shall include recommendations for handling of equipment and parts, and protection and storage requirements.
- 1.3.6 Riser Diagrams – Typical per room type (detailed drawings showing device interconnectivity of devices).
- 1.3.7 Example Contractor Startup/Commissioning Worksheet – must be completed prior to factory startup.
- 1.3.8 Hardware and Software Operation Manuals.

#### **1.4 QUALITY ASSURANCE**

- 1.4.1 Components shall be listed and labeled by Underwriter's Laboratories (UL), or another Nationally Recognized Testing Laboratory (NRTL).
- 1.4.2 Lighting Control Systems shall comply with the state of California Building and Electrical Codes, and Title 24 energy requirements in effect at time of submittal for building permit.
- 1.4.3 Conduct a coordination meeting with the lighting control contractor, electrical contractor, EOR, Manufacturer Representative, and the OAR to validate the location of lighting control system components, including daylight sensors. Sensors shall be located based on manufacturer's recommendations.

#### **1.5 WARRANTY**

- 1.5.1 Manufacturer shall provide a five year material warranty.
- 1.5.2 Installer shall provide a two year installation warranty.
- 1.5.3 Technical support contact.

#### **1.6 SYSTEM REQUIREMENTS**

- 1.6.1 System shall have an architecture that is based upon three main concepts: 1) intelligent lighting control devices 2) standalone lighting control zones 3) network backbone for remote or time based operation.
- 1.6.2 Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.
- 1.6.3 Intelligent lighting control devices shall communicate digitally, require <7 mA of current to function (Graphic wall stations excluded), and possess RJ-45 style connectors.
- 1.6.4 Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher level network backbone.

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- 1.6.5 Devices within a lighting control zone shall be connected with CAT-5e low voltage cabling in any order.
- 1.6.6 Lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.
- 1.6.7 Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.
- 1.6.8 Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, controls enabled luminaires, or from the network backbone. Standalone “bus power supplies” shall not be required in all cases.
- 1.6.9 All switching and dimming for a specific lighting zone shall take place within the devices located in the zone itself (i.e. not in remotely located devices such as panels) to facilitate system robustness and minimize wiring requirements. Specific applications that require centralized or remote switching shall be capable of being accommodated.
- 1.6.10 System shall have one or more primary wall mounted network control “gateway” devices that are capable of accessing and controlling connected system devices and linking into an Ethernet LAN.
- 1.6.11 System shall use “bridge” devices that route communication and distribute power for up to 8 directly connected lighting zones together for purposes of decreasing system wiring requirements.
- 1.6.12 System shall have a web-based software management program that enables remote system control, status monitoring, and creation of lighting control schedules and profiles.
- 1.6.13 Individual lighting zones shall be capable of being segmented into several “local” channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.
- 1.6.14 Devices located in different lighting zones shall be able to communicate occupancy, photocell (non-dimming), and switch information via either the wired or Wi-Fi backbone.
- 1.6.15 Control software shall enable logging of system performance data and presenting this information in a web-based format and downloadable to .CSV files.
- 1.6.16 System shall provide the option of having pre-terminated plenum rated CAT-5e cabling supplied with hardware.
- 1.6.17 System software shall provide real time status of each relay, each zone and each group.
- 1.6.18 Lighting control system shall be able to be monitored and take commands from a remote Personal Computer (PC); should the remote PC go off-line system programming uploaded to the lighting control system shall continue to operate as intended. Systems requiring an online PC or server for normal operation are not acceptable
- 1.6.19 Devices shall be able to be pre-addressed at the factory. Systems requiring field addressing only are not acceptable.
- 1.6.20 Programs, schedules, time of day, etcetera, shall be held in non-volatile memory at power failure. At restoration of power, lighting control system shall implement programs required by current time and date.

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- 1.6.21 System shall be capable of flashing lighting OFF/ON for any relay or lighting zone prior to the lights being turned OFF. The warning interval time between the flash and the final lights off signal shall be definable for each zone. Occupant shall be able to override any scheduled OFF sweep using local lighting zone override switches within the zone or occupied space. Occupant override time shall be pre-programmed not to exceed two hours, or current California Title 24 requirements.

## **PART 2 - PRODUCTS**

### **2.1 LIGHTING CONTROL**

- 2.1.1 Lighting Control System shall be nLight by Acuity Controls or equal.
- 2.1.1.1 Shall be preprogrammed and preassembled with control equipment and relays as indicated on the lighting plans.
- 2.1.1.2 Each device shall be rated for 120 or 277 VAC.
- 2.1.1.3 Shall be preassembled, preprogrammed, and include relays capable of switching 20 amps lighting loads for 120 or 277 VAC.
- 2.1.1.4 Power packs, low voltage switches, interior light sensors, exterior light sensors, and associated control electronics shall be furnished by nLight by Acuity Controls , or equal.

### **2.2 CONTROL MODULE (GATEWAY)**

- 2.2.1 Control module shall be a device that facilitates communication and time-based control of downstream network devices and linking into an Ethernet network.
- 2.2.2 Devices shall have a user interface that is capable of wall mounting and powered by low voltage.
- 2.2.3 Control device shall have three RJ-45 ports for connection other backbone device bridges or directly to the lighting control devices, up to 128 per port.
- 2.2.4 Devices shall automatically detect all devices downstream of it, have a standard and astronomical internal time clock, one RJ-45 10/100 BaseT Ethernet connection, and USB port.
- 2.2.5 Each control gateway device shall be capable of linking 1500 devices to the management software, with reduced memory version capable of support up to 400 devices.

### **2.3 COMMUNICATION BRIDGES**

- 2.3.1 Device shall surface mount on a standard 4"x4" square junction box with 8 RJ-45 ports.
- 2.3.2 Device shall be capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to Control Gateway.
- 2.3.3 Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply or delivered via CAT-5 cabled connection.
- 2.3.4 Device shall be capable of redistributing power from its local supply and connect lighting controls zones with excess power to lighting control zones with insufficient local power. This architecture also enables loss of power to a particular area to be less impactful on network lighting system.

### **2.4 NETWORKED SYSTEM POWER (RELAYS) PACKS**

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- 2.4.1 Power Packs shall incorporate one Class 1 Relay, 0-10 VDC dimming output, and contribute low voltage power to the rest of the system. Secondary Packs shall incorporate the relay and 0-10 VDC or line voltage dimming output but shall not be required to contribute system power. Power Supplies shall provide system power only but are not required to switch line voltage circuit. Auxiliary Relay Packs shall switch low voltage circuits only.
- 2.4.2 Power Packs shall accept 120 or 277, be plenum rated, and provide Class 2 power to the system.
- 2.4.3 All devices shall have two RJ-45 ports.
- 2.4.4 Every Power Pack parameter shall be available and configurable remotely from the software and locally via the device push-button.
- 2.4.5 Power Pack shall be securely mounted to junction box location through a threaded 3/4" chase nipple or be capable of being secured within a luminaire driver channel. Plastic clips into junction box shall not be acceptable. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads.
- 2.4.6 Power Packs (Secondary) shall be available that provide up to 16 Amp switching of all lighting load types.
- 2.4.7 Power Packs shall be available to provide up to 5 amps switching of all lighting load types as well as 0-10VC dimming of LED drivers.
- 2.4.8 Specific Power/Secondary Packs shall be available that are UL 924 listed for switching of Emergency circuits.
- 2.4.9 Relays shall be nLight by Acuity Controls, or equal.

## 2.5 LOW VOLTAGE SWITCHES

- 2.5.1 Low voltage switches shall be wired per the lighting control manufactures requirements. Digital switches shall be part of the lighting control system network. Analog switches shall be wired to lighting control panel designated by manufacturer. Use nLight by Acuity Controls, or equal.
- 2.5.2 Keyed switches shall be analog or digital and connect to programmable inputs in the nearest lighting control system or be digital and connect to the lighting control system network.
- 2.5.3 Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
- 2.5.4 All devices shall have two RJ-45 ports.
- 2.5.5 All devices shall provide toggle switch control and raise/lower dimming control.
- 2.5.6 Devices shall be white in color.

## 2.6 OCCUPANCY SENSORS

- 2.6.1 Occupancy Sensors:
  - 2.6.1.1 Ceiling-Mounted Dual Technology Sensors:
    - 2.6.1.1.1 Sensors shall be dual technology infrared-ultrasonic capable of detecting presence in floor area to be controlled, by detecting Doppler shifts in transmitted ultrasound and infrared technology.

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- 2.6.1.1.2 Detection shall be maintained when a person moves only within a maximum distance of 12 inches, in either a horizontal or vertical manner, at approximate speed of 12 inches per second. Lights shall not go off when a person is reading or writing while seated at a desk.
- 2.6.1.1.3 Each sensor shall be furnished with a convenient shunt provision, which will enable a person to by-pass sensor in event of failure.
- 2.6.1.1.4 Sensitivity shall not change more than ten percent in temperature range of 0 degrees F. to 120 degrees F., and in humidity range of ten percent to 80 percent. Sensitivity adjustment shall be provided for each technology.
- 2.6.1.1.5 Time delay range shall be adjustable from 15 seconds to 15 minutes.
- 2.6.1.1.6 Sensors shall be available with one or two occupancy “poles”, each of which provides a programmable time delay.
- 2.6.1.1.7 Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
- 2.6.1.1.8 All sensors shall have two RJ-45 ports or capable of utilizing a splitter.
- 2.6.1.1.9 All sensors shall have the ability to detect when it is not receiving valid communication (via CAT-5) and blink its LED in a pattern to visually indicated a potential wiring issue.
- 2.6.1.1.10 Every sensor parameter shall be available and configurable remotely from the software and locally via the device push button.
- 2.6.1.1.11 Sensors shall be able to function together with other sensors in order to provide expanded coverage areas by simply daisy-chain wiring together the units with CAT-5 wiring.
- 2.6.1.1.12 Manufacturers: nLight by Acuity Controls, or equal.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- 3.1.1 Lighting control system shall not be used for any other purpose other than its intended use and application.
- 3.1.2 Provide required interconnections with other systems such as emergency power sources, fire alarm systems, and building management system as required or indicated on drawings.
- 3.1.3 Installation shall meet or exceed standard practice of workmanship and quality.
- 3.1.4 Drawings generally indicate work to be provided, but do not indicate bends, transitions, or special fittings required to clear beams, girders, or other work already in place. Investigate conditions where conduits are to be installed, and furnished and install required fittings.

#### **3.2 INSTALLATION AND SET-UP**

- 3.2.1 Verify that conduit for line voltage wires enters panel in line voltage areas and conduit for low-voltage control wires enters panel on low-voltage areas. Refer to manufacturer's drawings for location of line and low-voltage areas.
- 3.2.2 Digital switches and wire shall be according to lighting control manufactures requirements.

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- 3.2.3 Maintain the required bending radius of conductors inside cabinets.
- 3.2.4 To facilities start up, all devices daisy-chained together via CAT-5 shall automatically be grouped together into a functional lighting control zone.
- 3.2.5 All lighting control zones shall be capable to function according to default settings once adequate power is applied and before any system software is installed.
- 3.2.6 Once software is installed, system shall be able to auto-discover all system devices without requiring and commissioning.
- 3.2.7 All system devices shall be capable of being given user defined names.
- 3.2.8 All devices within the network shall be able to have their own firmware upgraded remotely and without being physically uninstalled for purpose of upgrading functionality at a later date.
- 3.2.9 All sensor devices shall have the ability to detect improper communication wiring and blink it's LED in a specific cadence as to alert installation/startup personnel.
- 3.2.10 Follow manufacturers' instructions for installation.
- 3.2.11 Contractor shall have a meeting with the manufacturer to review installation prior to rough in.
- 3.2.12 Programming shall be done by a manufacturer's representative.
- 3.2.13 Photocells shall be calibrated after furniture has been installed.

### 3.3 OPERATING/SERVICE MANUALS

- 3.3.1 Service and Operation Manuals:
  - 3.3.1.1 Submit operation and service manuals. Complete manuals shall be bound in flexible binders and data shall be typewritten or drafted.
  - 3.3.1.2 Provide a printed copy of the systems configuration as programmed, including system labeling codes, and passwords.
  - 3.3.1.3 Provide an electronic copy on compact disk of the system configuration program.
  - 3.3.1.4 Manuals shall include instructions necessary for proper operation and servicing of system and shall include complete wiring circuit diagrams of system, wiring destination schedules for circuits and replacement part numbers. Manuals shall include as-built cable Project site plot plans and floor plans indicating cables, both underground and in each building with conduit, and as-built coding used on cables. Programming forms of systems shall be submitted with complete information.
  - 3.3.1.5 Record Drawings: Provide a copy on vellum of Project site and building drawings, indicating location of equipment, conduit and cable runs, and other pertinent information.

### 3.4 PROTECTION

- 3.4.1 Protect the Work of this section until Substantial Completion.

### 3.5 TESTING

- 3.5.1 A. Set-up, commissioning and testing of the lighting control system, and Owner instruction shall include:
  - 3.5.1.1 Confirmation of system programming.

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- 3.5.1.2 Confirmation of operation of individual relays, switches, occupancy sensors and daylight sensors.
- 3.5.1.3 Operation of system's features under normal and emergency operations.
- 3.5.1.4 Before energizing check and demonstrate in the presence of the Project Inspector that cables and wire connections are free from short circuits, ground faults, and that there is continuity, and necessary insulation.
- 3.5.1.5 Confirm system operations and functionality.
- 3.5.1.6 Check system interface response to other systems such as fire alarm and emergency power system conditions.
- 3.5.1.7 Provide training to cover installation, maintenance, troubleshooting, programming, and repair and operation of the lighting control system.

### **3.6 INSTRUCTION PERIODS**

- 3.6.1 Before Substantial Completion, arrange and provide an eight hour Owner instruction period for designated personnel.

### **3.7 SPARE PARTS**

- 3.7.1 Provide a minimum of five percent spare parts of each type of relay, sensors, switches, and peripheral devices.

### **3.8 CLEANUP**

- 3.8.1 Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

**END OF SECTION 26 09 23.1**

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## SECTION 262213

### LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

#### PART 2 - GENERAL

##### 2.01 SUMMARY

- A. Section includes distribution, dry-type transformers with a nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

##### 2.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and size of transformer.
  - 2. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.
- B. Shop Drawings:
  - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  - 2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
  - 3. Include diagrams for power, signal, and control wiring.

##### 2.03 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Seismic Qualification Data: Certificates, for transformers, accessories, and components, from manufacturer.
  - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
  - 4. Certification: Indicate that equipment meets equipment seismic requirements.
- C. Source quality-control reports.
- D. Field quality-control reports.

##### 2.04 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

##### 2.05 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: On receipt, inspect for and note any shipping damage to packaging and transformer.

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1. If manufacturer packaging is removed for inspection, and transformer will be stored after inspection, re-package transformer using original or new packaging materials that provide protection equivalent to manufacturer's packaging.
- B. Storage: Store in a warm, dry, and temperature-stable location in original shipping packaging.
- C. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.
- D. Handling: Follow manufacturer's instructions for lifting and transporting transformers.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. ABB (Electrification Products Division).
  2. Eaton.
  3. Schneider Electric USA (Square D).
  4. Siemens Industry, Inc., Energy Management Division.
- B. Source Limitations: Obtain each transformer type from single source from single manufacturer.

### 2.02 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Transformers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  1. The term "withstand" means "the transformer will remain in place without separation of any parts when subjected to the seismic forces specified and the transformer will be fully operational after the seismic event."

### 2.03 GENERAL TRANSFORMER REQUIREMENTS

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. Comply with NFPA 70.
  1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Transformers Rated 15 kVA and Larger:
  1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.
  2. Marked as compliant with DOE 2016 efficiency levels by an NRTL.
- D. Shipping Restraints: Paint or otherwise color-code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

### 2.04 DISTRIBUTION TRANSFORMERS

- A. Comply with NFPA 70, and list and label as complying with UL 1561.

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- B. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.
1. One leg per phase.
  2. Grounded to enclosure.
- C. Coils: Continuous windings without splices except for taps.
1. Coil Material: Aluminum or Copper.
  2. Internal Coil Connections: Brazed or pressure type.
  3. Terminal Connections: Welded or Bolted.
- D. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.
- E. Enclosure: Ventilated.
1. NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound to seal out moisture and air.
  2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.
  3. Wiring Compartment: Sized for conduit entry and wiring installation.
- F. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
- G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.
- H. Insulation Class, Smaller Than 30 kVA: 180 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.
- I. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.
- J. Grounding: Provide ground-bar kit or a ground bar installed on the inside of the transformer enclosure.
- K. Wall Brackets when required: Manufacturer's standard brackets.

## **2.05 IDENTIFICATION**

- A. Nameplates: Engraved, laminated-acrylic, or melamine plastic signs for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

## **2.06 SOURCE QUALITY CONTROL**

- A. Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.
1. Resistance measurements of all windings at rated voltage connections and at all tap connections.
  2. Ratio tests at rated voltage connections and at all tap connections.
  3. Phase relation and polarity tests at rated voltage connections.
  4. No load losses, and excitation current and rated voltage at rated voltage connections.

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5. Impedance and load losses at rated current and rated frequency at rated voltage connections.
6. Applied and induced tensile tests.
7. Regulation and efficiency at rated load and voltage.
8. Insulation-Resistance Tests:
  - a. High-voltage to ground.
  - b. Low-voltage to ground.
  - c. High-voltage to low-voltage.
9. Temperature tests.

## **PART 2 - EXECUTION**

### **2.01 EXAMINATION**

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
- C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
- D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
- E. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

### **2.02 INSTALLATION**

- A. Install wall-mounted transformers level and plumb with wall brackets fabricated by transformer manufacturer.
  1. Coordinate installation of wall-mounted and structure-hanging supports with actual transformer provided.
- B. Construct concrete bases according to Section 033000 "Cast-in-Place Concrete" and anchor floor-mounted transformers according to manufacturer's written instructions and requirements in Section 260529 "Hangers and Supports for Electrical Systems."
  1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
- C. Secure transformer to concrete base according to manufacturer's written instructions.
- D. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.
- E. Remove shipping bolts, blocking, and wedges.

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## 2.03 CONNECTIONS

- A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. 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-486B.
- D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

## 2.04 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Small (Up to 167-kVA Single-Phase or 500-kVA Three-Phase) Dry-Type Transformer Field Tests:
  - 1. Visual and Mechanical Inspection.
    - a. Inspect physical and mechanical condition.
    - b. Inspect anchorage, alignment, and grounding.
    - c. Verify that resilient mounts are free and that any shipping brackets have been removed.
    - d. Verify the unit is clean.
    - e. Perform specific inspections and mechanical tests recommended by manufacturer.
    - f. Verify that as-left tap connections are as specified.
    - g. Verify the presence of surge arresters and that their ratings are as specified.
  - 2. Electrical Tests:
    - a. Measure resistance at each winding, tap, and bolted connection.
    - b. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index: the value of the index shall not be less than 1.0.
    - c. Perform turns-ratio tests at all tap positions. Test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio. If test fails, replace the transformer.
    - d. Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.
- C. Remove and replace units that do not pass tests or inspections and retest as specified above.
- D. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

## 2.05 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate

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voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

- B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

## 2.06 CLEANING

- A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

**END OF SECTION 262213**

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## SECTION 262416

### PANELBOARDS

#### PART 2 - GENERAL

##### 2.01 SUMMARY

- A. Section Includes:
  - 1. Distribution panelboards.
  - 2. Lighting and appliance branch-circuit panelboards.

##### 2.02 DEFINITIONS

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. MCCB: Molded-case circuit breaker.

##### 2.03 ACTION SUBMITTALS

- A. Product Data: For each type of panelboard.
  - 1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
  - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details.
  - 2. Detail bus configuration, current, and voltage ratings.
  - 3. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 5. Include wiring diagrams for power, signal, and control wiring.
  - 6. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

##### 2.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Panelboard Schedules: For installation in panelboards.

##### 2.05 CLOSEOUT SUBMITTALS

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- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:
1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
  2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

## **2.06 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Keys: Two spares for each type of panelboard cabinet lock.

## **2.07 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: ISO 9001 or ISO 9002 certified.

## **2.08 DELIVERY, STORAGE, AND HANDLING**

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407.

## **2.09 FIELD CONDITIONS**

- A. Environmental Limitations:
1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
1. Ambient temperatures within limits specified.
  2. Altitude not exceeding 6600 feet (2000 m).
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
1. Notify Owner no fewer than 10 days in advance of proposed interruption of electric service.
  2. Do not proceed with interruption of electric service without Owner's written permission.
  3. Comply with NFPA 70E.

## **2.010 WARRANTY**

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.
1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

## **PART 2 - PRODUCTS**

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## 2.01 PANELBOARDS COMMON REQUIREMENTS

- A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Flush and Surface-mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Height: 84 inches (2.13 m) maximum.
  - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
  - 4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
  - 5. Finishes:
    - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    - b. Back Boxes: Same finish as panels and trim.
- F. Incoming Mains:
  - 1. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.
- G. Phase, Neutral, and Ground Buses:
  - 1. Material: Tin-plated aluminum or Hard-drawn copper, 98 percent conductivity.
    - a. Plating shall run entire length of bus.
    - b. Bus shall be fully rated the entire length.
  - 2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
  - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
  - 4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 1. Material: Tin-plated aluminum or Hard-drawn copper, 98 percent conductivity as required.
  - 2. Terminations shall allow use of 75 deg C rated conductors without derating.

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3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
  4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
  5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
  6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- I. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- J. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
1. Percentage of Future Space Capacity: 10 percent.
- K. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
  2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

## 2.02 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

## 2.03 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
  2. Schneider Electric USA (Square D).
  3. Siemens Industry, Inc., Energy Management Division.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

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## 2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
  2. Schneider Electric USA (Square D).
  3. Siemens Industry, Inc., Energy Management Division.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

## 2.05 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
  2. Schneider Electric USA (Square D).
  3. Siemens Industry, Inc., Energy Management Division.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  3. Electronic Trip Circuit Breakers:
    - a. RMS sensing.
    - b. Field-replaceable rating plug or electronic trip.
    - c. Field-Adjustable Settings:
      - 1) Instantaneous trip.
      - 2) Long- and short-time pickup levels.
      - 3) Long and short time adjustments.
  4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).

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5. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
6. MCCB Features and Accessories:
  - a. Standard frame sizes, trip ratings, and number of poles.
  - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
  - c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
  - d. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.

## 2.06 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
  1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

## 2.07 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

## PART 2 - EXECUTION

### 2.01 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NECA 407.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 2.02 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.

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- C. Equipment Mounting:
1. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- D. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- E. Mount panelboard cabinet plumb and rigid without distortion of box.
- F. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- G. Mount surface-mounted panelboards to steel slotted supports 5/8 inch (16 mm) in depth. Orient steel slotted supports vertically.
- H. Install overcurrent protective devices and controllers not already factory installed.
1. Set field-adjustable, circuit-breaker trip ranges.
  2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- I. Install filler plates in unused spaces.
- J. Stub four 1-inch (25 mm) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (25 mm) empty conduits into raised floor space or below slab not on grade.
- K. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

### 2.03 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

### 2.04 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  2. Test continuity of each circuit.
- C. Tests and Inspections:
1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Do not perform optional tests. Certify compliance with test parameters.

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- 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
  - D. Panelboards will be considered defective if they do not pass tests and inspections.
- 2.05 ADJUSTING**
- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
  - B. Set field-adjustable circuit-breaker trip ranges as indicated.

**END OF SECTION 262416**

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## SECTION 265119

### LED INTERIOR LIGHTING

#### PART 2 - GENERAL

##### 2.01 SUMMARY

- A. Section Includes:
  - 1. Cylinder.
  - 2. Downlight.
  - 3. Recessed, linear.
  - 4. Surface mount, linear.
  - 5. Surface mount, nonlinear.
  - 6. Suspended, linear.
  - 7. Suspended, nonlinear.
  - 8. Materials.
  - 9. Luminaire support.
- B. Related Requirements:
  - 1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
  - 2. Section 260923.1 "Lighting Control Systems"

##### 2.02 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

##### 2.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Arrange in order of luminaire designation.
  - 2. Include data on features, accessories, and finishes.
  - 3. Include physical description and dimensions of luminaires.
  - 4. Include emergency lighting units, including batteries and chargers.

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5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.
  - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Shop Drawings: For nonstandard or custom luminaires.
  1. Include plans, elevations, sections, and mounting and attachment details.
  2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  3. Include diagrams for power, signal, and control wiring.
- C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.
- D. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.
  1. Include Samples of luminaires and accessories involving color and finish selection.
- E. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

#### 2.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing laboratory providing photometric data for luminaires.
- B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Product Certificates: For each type of luminaire.
- D. Product Test Reports: For each type of luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.
- E. Sample warranty.

#### 2.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
  1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

#### 2.06 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications:

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1. Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
  - B. Provide luminaires from a single manufacturer for each luminaire type.
- 2.07 DELIVERY, STORAGE, AND HANDLING**
- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.
- 2.08 WARRANTY**
- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
  - B. Warranty Period: Five year(s) from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.01 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance:
  1. Luminaires shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
  2. Luminaires and lamps shall be labeled vibration and shock resistant.
  3. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."
- B. Ambient Temperature: **41 to 104 deg F (5 to 40 deg C).**
  1. Relative Humidity: Zero to 95 percent.
- C. Altitude: Sea level to **1000 feet (300 m).**

### **2.02 LUMINAIRE REQUIREMENTS**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
  1. Label shall include the following lamp characteristics:
    - a. "USE ONLY" and include specific lamp type.
    - b. Lamp diameter, shape, size, wattage, and coating.
    - c. CCT and CRI.
- C. Recessed luminaires shall comply with NEMA LE 4.

### **2.03 CYLINDER.**

- A. Nominal Operating Voltage: as indicated on drawings.
- B. Lamp:

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1. Minimum 250 lm.
  2. Minimum allowable efficacy of 80 lm/W.
  3. CRI of 80. CCT of 3500 K.
  4. Rated lamp life is a minimum of 35,000 hours to L70.
  5. Dimmable from 100 percent to zero percent of maximum light output.
  6. Internal driver.
  7. User-Replaceable Lamps:
    - a. Bulb shape complying with ANSI C78.79.
  8. Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.
- C. Housings:
1. Extruded-aluminum housing and heat sink.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. With integral mounting provisions.
- F. Standards:
1. ENERGY STAR certified.
  2. RoHS compliant.
  3. UL Listing: Listed for damp location.
- 2.04 **DOWNLIGHT.**
- A. Nominal Operating Voltage: dual rated 120/277Vac
- B. Lamp:
1. Minimum 250 lm.
  2. Minimum allowable efficacy of 80 lm/W.
  3. CRI of 80. CCT of 3500 K.
  4. Rated lamp life of 50,000 hours to L70.
  5. Dimmable from 100 percent to zero percent of maximum light output.
  6. Internal driver.
  7. User-Replaceable Lamps:
    - a. Bulb shape complying with ANSI C78.79.
  8. Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.
- C. Housings:

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1. Extruded-aluminum housing and heat sink.
  2. Universal mounting bracket.
  3. Integral junction box with conduit fittings.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Standards:
1. ENERGY STAR certified.
  2. RoHS compliant.
  3. UL Listing: Listed for damp location.
  4. Recessed luminaires shall comply with NEMA LE 4.

## **2.05 RECESSED, LINEAR.**

- A. Nominal Operating Voltage: dual voltage 120/277 Vac.
- B. Lamp:
1. Minimum 1,500 lm.
  2. Minimum allowable efficacy of 85 lm/W.
  3. CRI of 80. CCT of 3500 K.
  4. Rated lamp life of 50,000 hours to L70.
  5. Dimmable from 100 percent to zero percent of maximum light output.
  6. Internal driver.
  7. User-Replaceable Lamps:
    - a. Bulb shape complying with ANSI C78.79.
  8. Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.
- C. Housings:
1. Extruded-aluminum housing and heat sink.
  2. With integral mounting provisions.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Standards:
1. ENERGY STAR certified.
  2. RoHS compliant.

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3. UL Listing: Listed for damp location.
4. NEMA LE 4.

## 2.06 SURFACE MOUNT, LINEAR.

- A. Nominal Operating Voltage: dual 120/277Vac.
- B. Lamp:
  1. Minimum 750 lm.
  2. Minimum allowable efficacy of 80 lm/W.
  3. CRI of 80. CCT of 3500 K.
  4. Rated lamp life of 50,000 hours to L70.
  5. Dimmable from 100 percent to zero percent of maximum light output.
  6. Internal driver.
  7. User-Replaceable Lamps:
    - a. Bulb shape complying with ANSI C78.79.
- C. Housings:
  1. Extruded-aluminum housing and heat sink.
  2. With integral mounting provisions.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Standards:
  1. ENERGY STAR certified.
  2. RoHS compliant.
  3. UL Listing: Listed for damp location.

## 2.07 SURFACE MOUNT, NONLINEAR

- A. Nominal Operating Voltage: dual rated 120/277Vac.
- B. Lamp:
  1. Minimum 750 lm.
  2. Minimum allowable efficacy of 80 lm/W.
  3. CRI of 80. CCT of 3500 K.
  4. Rated lamp life of 50,000 hours to L70.
  5. Dimmable from 100 percent to zero percent of maximum light output.
  6. Internal driver.

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7. User-Replaceable Lamps:
  - a. Bulb shape complying with ANSI C78.79.
- C. Housings:
  1. Extruded-aluminum housing and heat sink.
  2. With integral mounting provisions.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Standards:
  1. ENERGY STAR certified.
  2. RoHS compliant.
  3. UL Listing: Listed for damp location.

## 2.08 SUSPENDED, LINEAR

- A. Nominal Operating Voltage: dual rated 120/277Vac.
- B. Lamp:
  1. Minimum 1,500 lm.
  2. Minimum allowable efficacy of 85 lm/W.
  3. CRI of 80. CCT of 3500 K.
  4. Rated lamp life of 50,000 hours to L70.
  5. Dimmable from 100 percent to zero percent of maximum light output.
  6. Internal driver.
  7. User-Replaceable Lamps:
    - a. Bulb shape complying with ANSI C78.79.
- C. Housings:
  1. Extruded-aluminum housing and heat sink.
  2. With integral mounting provisions.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Standards:
  1. ENERGY STAR certified.
  2. RoHS compliant.

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3. UL Listing: Listed for damp location.

## 2.09 SUSPENDED, NONLINEAR

- A. Nominal Operating Voltage: dual rated 120/277 Vac.
- B. Lamp:
  1. Minimum 1,500 lm.
  2. Minimum allowable efficacy of 85 lm/W.
  3. CRI of 80. CCT of 3500 K.
  4. Rated lamp life of 50,000 hours to L70.
  5. Dimmable from 100 percent to zero percent of maximum light output.
  6. Internal driver.
  7. User-Replaceable Lamps:
    - a. Bulb shape complying with ANSI C78.79.
- C. Housings:
  1. Extruded-aluminum housing and heat sink.
  2. Universal mounting bracket.
  3. Integral junction box with conduit fittings.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Standards:
  1. ENERGY STAR certified.
  2. RoHS compliant.
  3. UL Listing: Listed for damp location.

## 2.010 MATERIALS

- A. Metal Parts:
  1. Free of burrs and sharp corners and edges.
  2. Sheet metal components shall be steel unless otherwise indicated.
  3. Form and support to prevent warping and sagging.
- B. Steel:
  1. ASTM A36/A36M for carbon structural steel.
  2. ASTM A568/A568M for sheet steel.
- C. Stainless Steel:

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1. Manufacturer's standard grade.
  2. Manufacturer's standard type, ASTM A240/240M.
- D. Galvanized Steel: ASTM A653/A653M.
- E. Aluminum: ASTM B209.

#### **2.011 METAL FINISHES**

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

#### **2.012 LUMINAIRE SUPPORT**

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, **12 gage (2.68 mm)**.
- D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

### **PART 2 - EXECUTION**

#### **2.01 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **2.02 INSTALLATION**

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
1. Sized and rated for luminaire weight.
  2. Able to maintain luminaire position after cleaning and relamping.
  3. Provide support for luminaire without causing deflection of ceiling or wall.
  4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaires:

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1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaires:

1. Attached to structural members in walls or Attached to a minimum 20 gauge backing plate attached to wall structural members.
2. Do not attach luminaires directly to gypsum board.

G. Suspended Luminaires:

1. Ceiling Mount:
  - a. Two 5/32-inch- (4-mm-) diameter aircraft cable supports adjustable to **10 feet (3 m)** in length.
2. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
4. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

**2.03 IDENTIFICATION**

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

**2.04 FIELD QUALITY CONTROL**

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

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C. Prepare test and inspection reports.

**END OF SECTION 265119**

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## **SECTION 014533**

### **CODE-REQUIRED SPECIAL INSPECTIONS AND PROCEDURES**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Code-required special inspections.

##### **1.02 REFERENCE STANDARDS**

- A. ACI 318 - Building Code Requirements for Structural Concrete and Commentary 2014 (Errata 2018).
- B. AWS D1.4/D1.4M - Structural Welding Code - Reinforcing Steel 2018.

#### **PART 2 PRODUCTS - NOT USED**

#### **PART 3 EXECUTION**

##### **3.01 SPECIAL INSPECTIONS FOR CONCRETE CONSTRUCTION**

- A. Reinforcing Steel, Including Prestressing of Tendons and Placement: Verify compliance with approved Contract Documents and ACI 318, Sections 3.5 and 7.1 through 7.7; periodic.
- B. Reinforcing Steel Welding: Verify compliance with AWS D1.4/D1.4M and ACI 318, Section 3.5.2; periodic.
- C. Design Mix: Verify plastic concrete complies with the design mix in approved Contract Documents and with ACI 318, Chapter 4 and 5.2; periodic.
- D. Specified Curing Temperature and Techniques: Verify compliance with approved Contract Documents and ACI 318, Sections 5.11 through 5.13; periodic.
- E. Concrete Strength in Situ: Verify concrete strength complies with approved Contract Documents and ACI 318, Section 6.2, for the following.
- F. Formwork Shape, Location and Dimensions: Verify compliance with approved Contract Documents and ACI 318, Section 6.1.1; periodic.

**END OF SECTION**

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## **SECTION 220516**

### **EXPANSION FITTINGS AND LOOPS FOR PLUMBING PIPING**

#### **PART 1 GENERAL**

##### **1.01 SECTION INCLUDES**

- A. Flexible pipe connectors.
- B. Expansion joints and compensators.
- C. Pipe loops, offsets, and swing joints.

##### **1.02 RELATED REQUIREMENTS**

- A. Section 221005 - Plumbing Piping.
- B. Section 232113 - Hydronic Piping.

##### **1.03 REFERENCE STANDARDS**

- A. EJMA (STDS) - EJMA Standards Tenth Edition.
- B. UL (DIR) - Online Certifications Directory Current Edition.

#### **PART 2 PRODUCTS**

##### **2.01 REGULATORY REQUIREMENTS**

- A. Comply with UL (DIR) requirements.

#### **PART 3 EXECUTION**

##### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install in accordance with EJMA (Expansion Joint Manufacturers Association) Standards.
- C. Install flexible pipe connectors on pipes connected to vibration isolated equipment. Provide line size flexible connectors.
- D. Install flexible connectors at right angles to displacement. Install one end immediately adjacent to isolated equipment and anchor other end. Install in horizontal plane unless indicated otherwise.
- E. Anchor pipe to building structure where indicated. Provide pipe guides so movement is directed along axis of pipe only. Erect piping such that strain and weight is not on cast connections or apparatus.
- F. Provide support and equipment required to control expansion and contraction of piping. Provide loops, pipe offsets, and swing joints, or expansion joints where required.
- G. Substitute grooved piping for vibration isolated equipment instead of flexible connectors. Grooved piping need not be anchored.

#### **A. END OF SECTION**

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## SECTION 220517

### SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Pipe sleeves.
- B. Manufactured sleeve-seal systems.

##### 1.02 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 220523 - General-Duty Valves for Plumbing Piping.
- C. Section 220553 - Identification for Plumbing Piping and Equipment: Piping identification.
- D. Section 220719 - Plumbing Piping Insulation.

##### 1.03 REFERENCE STANDARDS

- A. ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type) 2016.
- B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2013a (Reapproved 2017).

#### PART 2 PRODUCTS

##### 2.01 PIPE SLEEVES

- A. Vertical Piping:
  - 1. Sleeve Length: 1 inch above finished floor.
  - 2. Provide sealant for watertight joint.
  - 3. Blocked Out Floor Openings: Provide 1-1/2 inch angle set in silicon adhesive around opening.
  - 4. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- B. Plastic or Sheet Metal: Pipe passing through interior walls, partitions, and floors, unless steel or brass sleeves are specified below.
- C. Pipe Passing Through Below Grade Exterior Walls:
  - 1. Zinc coated or cast iron pipe.
  - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D. Pipe Passing Through Concrete Beam Flanges, except where Brass Pipe Sleeves are Specified:
  - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
  - 2. Connect sleeve with floor plate except in mechanical rooms.
- E. Pipe Passing Through Mechanical, Laundry, and Animal Room Floors above Basement:
  - 1. Galvanized steel pipe or black iron pipe with asphalt coating.
  - 2. Connect sleeve with floor plate except in mechanical rooms.
- F. Penetrations in concrete beam flanges are permitted but are prohibited through ribs or beams without prior approval from the Architect.
- G. Clearances:
  - 1. Provide allowance for insulated piping.
  - 2. Wall, Floor, Floor, Partitions, and Beam Flanges: 1 inch greater than external; pipe diameter.
  - 3. All Rated Openings: Caulked tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.

##### 2.02 MANUFACTURED SLEEVE-SEAL SYSTEMS

- A. Modular/Mechanical Seal:
  - 1. Synthetic rubber interlocking links continuously fill annular space between pipe and wall/casing opening.

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2. Provide watertight seal between pipe and wall/casing opening.
3. Elastomer element size and material in accordance with manufacturer's recommendations.
4. Glass reinforced plastic pressure end plates.

### **PART 3 EXECUTION**

#### **3.01 PREPARATION**

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.

#### **3.02 INSTALLATION**

- A. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B. Install piping to conserve building space, to not interfere with use of space and other work.
- C. Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D. Inserts:
  1. Provide inserts for placement in concrete formwork.
  2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- E. Structural Considerations:
  1. Do not penetrate building structural members unless indicated.
- F. Provide sleeves when penetrating footings, floors, walls, partitions, and similar. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
  1. Underground Piping: Caulk pipe sleeve watertight with lead and oakum or mechanically expandable chloroprene inserts with bitumen sealed metal components.
  2. Aboveground Piping:
    - a. Pack solid using mineral fiber complying with ASTM C592.
    - b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
  3. All Rated Openings: Caulk tight with fire stopping material complying with ASTM E814 in accordance with Section 078400 to prevent the spread of fire, smoke, and gases.
  4. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- G. Manufactured Sleeve-Seal Systems:
  1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
  2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  3. Locate piping in center of sleeve or penetration.
  4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  5. Tighten bolting for a water-tight seal.
  6. Install in accordance with manufacturer's recommendations.
- H. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

#### **3.03 CLEANING**

- A. Upon completion of work, clean all parts of the installation.

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- B. Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.
- C. See Section 017419 - Construction Waste Management and Disposal, for additional requirements.

**A. END OF SECTION**

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## SECTION 220523

### GENERAL-DUTY VALVES FOR PLUMBING PIPING

#### PART 1 GENERAL

##### 1.01 SECTION INCLUDES

- A. Applications.
- B. General requirements.

##### 1.02 RELATED REQUIREMENTS

#### PART 2 PRODUCTS

##### 2.01 APPLICATIONS

- A. Provide the following valves for the applications if not indicated on drawings:
- B. Sanitary Waste and Hot Water Valves:

##### 2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
- D. Valve-End Connections:
- E. General ASME Compliance:

#### PART 3 EXECUTION

##### 3.01 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

**A. END OF SECTION**

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## SECTION 220529

### HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

#### PART 1 GENERAL

##### 1.01 RELATED REQUIREMENTS

- A. Section 033000 - Cast-in-Place Concrete: Concrete equipment pads.

##### 1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2016a.
- C. ASTM A181/A181M - Standard Specification for Carbon Steel Forgings, for General - Purpose Piping 2014.
- D. ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2014.
- E. ASTM A47/A47M - Standard Specification for Ferritic Malleable Iron Castings 1999, with Editorial Revision (2018).
- F. ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2019.
- G. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- H. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- I. MFMA-4 - Metal Framing Standards Publication 2004.
- J. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.
- K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

##### 1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
  2. Coordinate the work with other trades to provide additional framing and materials required for installation.
  3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
  4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

##### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

##### 1.05 QUALITY ASSURANCE

- A. Comply with applicable building code.
- B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.

#### PART 2 PRODUCTS

##### 2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:

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1. Comply with MSS SP-58.
  2. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
  3. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
  4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of [\_\_\_\_\_]. Include consideration for vibration, equipment operation, and shock loads where applicable.
  5. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Metal Channel (Strut) Framing Systems:
1. Comply with MFMA-4.
- C. Hanger Rods: Threaded zinc-plated steel unless otherwise indicated.
1. Minimum Size, Unless Otherwise Indicated or Required:
    - a. Equipment Supports: 1/2 inch diameter.
    - b. Piping up to 1 inch (27 mm) nominal: 1/4 inch diameter.
    - c. Piping larger than 1 inch (27 mm) nominal: 3/8 inch diameter.
    - d. Trapeze Support for Multiple Pipes: 3/8 inch diameter.
- D. Thermal Insulated Pipe Supports:
1. General Construction and Requirements:
    - a. Insulated pipe supports to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
    - b. Surface Burning Characteristics: Flame spread index/smoke developed index of 5/30, maximum, when tested in accordance with ASTM E84 or UL 723.
    - c. Pipe supports to be provided for nominally sized, 1/2 inch to 30 inch iron pipes.
    - d. Insulation inserts to consist of rigid phenolic foam insulation surrounded by a 360 degree, PVC jacketing.
  2. PVC Jacket:
    - a. Pipe insulation protection shields to be provided with a ball bearing hinge and locking seam.
    - b. Moisture Vapor Transmission: 0.0071 perm inch, when tested in accordance with ASTM E96/E96M.
    - c. Thickness: 60 mil.
    - d. Connections: Brush on welding adhesive.
  3. Pipe insulation protection shields to be provided at the hanger points and guide locations on pipes requiring insulation as indicated on drawings.
- E. Pipe Supports:
1. Liquid Temperatures Up To 122 degrees F:
    - a. Overhead Support: MSS SP-58 Types 1, 3 through 12.
    - b. Support From Below: MSS SP-58 Types 35 through 38.
- F. Pipe Stanchions: For pipe runs, use stanchions of same type and material where vertical adjustment is required for stationary pipe.
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated saddles to isolate steel hangers from dissimilar metal tube or pipe.
- G. Beam Clamps: MSS SP-58 Types 19 through 23, 25 or 27 through 30 based on required load.
1. Material: ASTM A36/A36M carbon steel or ASTM A181/A181M forged steel.
  2. Provide clamps with hardened steel cup-point set screws and lock-nuts for anchoring in place.
- H. Riser Clamps:

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1. Provide copper plated clamps for copper tubing support.
  2. For insulated pipe runs, provide two bolt-type clamps designed for installation under insulation.
- I. Offset Pipe Clamps: Double-leg design two-piece pipe clamp.
- J. Strut Clamps: Two-piece pipe clamp.
- K. Insulation Clamps: Two bolt-type clamps designed for installation under insulation.
- L. Pipe Hangers: For a given pipe run, use hangers of the same type and material.
1. Material: Malleable iron, ASTM A47/A47M; or carbon steel, ASTM A36/A36M.
  2. Provide coated or plated hangers to isolate steel hangers from dissimilar metal tube or pipe.
- M. Nonmetallic Pipe Hangers:
- N. Intermediate Pipe Guides: Use pipe clamps with oversize pipe sleeve that provides clearance around pipe.
1. Pipe Diameter 6 inches and Smaller: Provide minimum clearance of 0.16 inch.
  2. Pipe Diameter 8 inches: Provide U-bolts with double nuts providing minimum clearance of 0.28 inch.
  3. Pipe Diameter 8 inches: 0.625 inch U-bolt.
  4. Pipe Diameter 10 inches: 0.75 inch U-bolt.
  5. Pipe Diameter 12 to 16 inches: 0.875 inch U-bolt.
  6. Pipe Diameter 18 to 30 inches: 1 inch U-bolt.
- O. Pipe Alignment Guides: Galvanized steel.
1. Pipe Diameter 8 inches and Smaller: Spider or sleeve type.
  2. Pipe Diameter 10 inches and Larger: Roller type.
  3. Pipe Diameter 18 to 30 inches: 1 inch U-bolt.
- P. Dielectric Barriers: Provide between metallic supports and metallic piping and associated items of dissimilar type; acceptable dielectric barriers include rubber or plastic sheets or coatings attached securely to pipe or item.
- Q. Nonpenetrating Rooftop Supports for Low-Slope Roofs:
1. Provide steel pedestals with thermoplastic or rubber base that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified.
  2. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
  3. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports.
  4. Mounting Height: Provide minimum clearance of 6 inches under supported component to top of roofing.
- R. Pipe Shields for Insulated Piping:
1. General Construction and Requirements:
    - a. Surface Burning Characteristics: Comply with ASTM E84 or UL 723.
    - b. Shields Material: UV-resistant polypropylene with glass fill.
    - c. Maximum Insulated Pipe Outer Diameter: 12-5/8 inch.
    - d. Minimum Service Temperature: Minus 40 degrees F.
    - e. Maximum Service Temperature: 178 degrees F.
    - f. Pipe shields to be provided at hanger, support, and guide locations on pipe requiring insulation or additional support.
- S. Anchors and Fasteners:
1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
  2. Hammer-driven anchors and fasteners are not permitted.
  3. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
    - a. Comply with MFMA-4.

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- b. Channel Material: Use galvanized steel.
  - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.
- T. Pipe Installation Accessories:
- 1. Overhead Pipe Supports:
  - 2. Plenum Pipe Supports:
  - 3. Telescoping Pipe Supports:
  - 4. Inserts and Clamps:

## 2.02 RETROFIT PIPING COVER SYSTEM

- A. General Requirements:
- 1. Surface Burning Characteristics: Flame spread index/smoke developed index of 20/250, maximum, when tested in accordance with ASTM E84 or UL 723.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- F. Provide thermal insulated pipe supports complete with hangers and accessories. Install thermal insulated pipe supports during the installation of the piping system.
- G. Equipment Support and Attachment:
- 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
  - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
  - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
  - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.
- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

### A. END OF SECTION

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## SECTION 220533 HEAT TRACING FOR PLUMBING PIPING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Self-regulating parallel resistance electric heating cable.
- B. Cable outer jacket markings.
- C. Connection kits.

#### 1.02 REFERENCE STANDARDS

- A. IEEE 515.1 - IEEE Standard for the Testing, Design, Installation, and Maintenance of Electrical Resistance Trace Heating for Commercial Applications 2012.
- B. ITS (DIR) - Directory of Listed Products current edition.
- C. NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. UL (DIR) - Online Certifications Directory Current Edition.

#### 1.03 QUALITY ASSURANCE

- A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.
- B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

#### 1.04 WARRANTY

- A. See Section 017800 - Closeout Submittals, for additional warranty requirements.

### PART 2 PRODUCTS

#### 2.01 SELF-REGULATING PARALLEL RESISTANCE ELECTRIC HEATING CABLE

- A. Manufacturers:
  - 1. Chromalox, Inc; HWM (HOT WATER MAINTENANCE @ 10W/FT 208-277V: [www.chromalox.com/#sle](http://www.chromalox.com/#sle).
  - 2. Pentair; MATCH CHROMALOX SPEC: [www.pentairthermal.com/#sle](http://www.pentairthermal.com/#sle).
- B. Provide products listed, classified, and labeled by UL (DIR), ITS (DIR), or testing firm acceptable to authorities having jurisdiction (AHJ).
- C. Factory Rating and Testing: Comply with IEEE 515.1.
- D. Heating Element:
  - 1. Provide pair of parallel No.16 tinned or nickel coated stranded copper bus wires embedded in cross linked conductive polymer core with varying heat output in response to temperature along its length.
  - 2. Terminations: Waterproof, factory assembled, non-heating leads with connector at one end and water-tight seal at opposite end.
  - 3. Capable of crossing over itself without overheating.
- E. Insulated Jacket: Flame retardant polyolefin.
- F. Cable Cover: Provide tinned copper and polyolefin outer jacket with UV inhibitor.
- G. Maximum Power-On Operating Temperature: 150 degrees F.
- H. Maximum Power-Off Exposure Temperature: 185 degrees F.
- I. Electrical Characteristics:
  - 1. 208-277 volts, single phase, 60 Hz.

#### 2.02 CABLE OUTER JACKET MARKINGS

- A. Name of manufacturer, trademark, or other recognized symbol of identification.
- B. Catalog number, reference number, or model.

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C. Month and year of manufacture, date coding, applicable serial number, or equivalent.

D. Agency listing or approval.

## 2.03 CONNECTION KITS

A. Provide power connection, splice/tee, and end seal kits compatible with the heating cable and without requiring cutting of the cable core to expose bus wires.

B. Provide with NEMA 4X rating for prevention of corrosion and water ingress.

### A. END OF SECTION

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**SECTION 220719  
PLUMBING PIPING INSULATION**

**A. PART 1 GENERAL**

**I. SECTION INCLUDES**

1. Piping insulation.
2. Flexible removable and reusable blanket insulation.
3. Jackets and accessories.

**II. RELATED REQUIREMENTS**

1. Section 078400 - Firestopping.

**III. REFERENCE STANDARDS**

1. ASTM A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar 2015.
2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2014.
3. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric) 2014.
4. ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019.
5. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2013).
6. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.
7. ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2016.
8. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2019.
9. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation 2017, with Editorial Revision (2018).
10. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
11. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2018).
12. ASTM C1695 - Standard Specification for Fabrication of Flexible Removable and Reusable Blanket Insulation for Hot Service 2019.
13. ASTM D1056 - Standard Specification for Flexible Cellular Materials- Sponge or Expanded Rubber 2014.
14. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2021a.
15. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
16. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

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## **B. PART 2 PRODUCTS**

### **I. REGULATORY REQUIREMENTS**

1. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

### **II. GLASS FIBER**

1. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  - a. K Value: ASTM C177, 0.24 at 75 degrees F.
  - b. Maximum Service Temperature: 850 degrees F.
  - c. Maximum Moisture Absorption: 0.2 percent by volume.
2. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible, with wicking material to transport condensed water to the outside of the system for evaporation to the atmosphere.
  - a. K Value: ASTM C177, 0.23 at 75 degrees F.
  - b. Maximum Service Temperature: 220 degrees F.
  - c. Maximum Moisture Absorption: 0.2 percent by volume.
3. Insulation: ASTM C547 and ASTM C795; semi-rigid, noncombustible, end grain adhered to jacket.
  - a. K Value: ASTM C177, 0.24 at 75 degrees F.
  - b. Maximum Service Temperature: 650 degrees F.
  - c. Maximum Moisture Absorption: 0.2 percent by volume.
4. Vapor Barrier Jacket: White Kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
5. Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
6. Vapor Barrier Lap Adhesive: Compatible with insulation.
7. Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
8. Fibrous Glass Fabric:
  - a. Cloth: Untreated; 9 oz/sq yd weight.
  - b. Blanket: 1.0 lb/cu ft density.
  - c. Weave: 5 by 5.
9. Indoor Vapor Barrier Finish:
  - a. Cloth: Untreated; 9 oz/sq yd weight.
  - b. Vinyl emulsion type acrylic, compatible with insulation, black color.
10. Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.
11. Outdoor Breather Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

### **III. FLEXIBLE REMOVABLE AND REUSABLE BLANKET INSULATION**

1. Insulation: ASTM C553 Type V; flexible, noncombustible.
  - a. Comply with ASTM C1695.
  - b. K Value: 0.37 at 100 degrees F, when tested in accordance with ASTM C177 or ASTM C518.
  - c. Minimum Service Temperature: 32 degrees F.
  - d. Maximum Service Temperature: 500 degrees F.
  - e. Maximum Water Vapor Absorption: Less than 5.0 percent by weight.

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- f. Color: Green.
- g. Effective Thickness: 1.25 plus/minus 0.25 inch.

#### IV. CELLULAR GLASS

- 1. Insulation: ASTM C552, Type II, Grade 6.
  - a. K Value: 0.35 at 100 degrees F.
  - b. Service Temperature Range: From 250 degrees F to 800 degrees F.
  - c. Water Vapor Permeability: 0.005 perm inch maximum per inch.
  - d. Water Absorption: 0.5 percent by volume, maximum.

#### V. POLYETHYLENE

- 1. Insulation: Flexible closed-cell polyethylene tubing, slit lengthwise for installation, complying with applicable requirements of ASTM D1056.
  - a. K Value: ASTM C177; 0.25 at 75 degrees F.
  - b. Maximum Service Temperature: 200 degrees F.
  - c. Density: 2 lb/cu ft.
  - d. Maximum Moisture Absorption: 1.0 percent by volume.
  - e. Moisture Vapor Permeability: 0.05 perm inch, when tested in accordance with ASTM E96/E96M.
  - f. Connection: Contact adhesive.

#### VI. FLEXIBLE ELASTOMERIC CELLULAR INSULATION

- 1. Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.
  - a. Minimum Service Temperature: Minus 40 degrees F.
  - b. Maximum Service Temperature: 220 degrees F.
  - c. Connection: Waterproof vapor barrier adhesive.

#### VII. JACKETS

- 1. PVC Plastic.
  - a. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - i. Minimum Service Temperature: 0 degrees F.
    - ii. Maximum Service Temperature: 150 degrees F.
    - iii. Moisture Vapor Permeability: 0.002 perm inch, maximum, when tested in accordance with ASTM E96/E96M.
    - iv. Thickness: 10 mil.
    - v. Connections: Brush on welding adhesive.
- 2. ABS Plastic:
  - a. Jacket: One piece molded type fitting covers and sheet material, off-white color.
    - i. Minimum Service Temperature: Minus 40 degrees F.
    - ii. Maximum Service Temperature: 180 degrees F.
    - iii. Moisture Vapor Permeability: 0.012 perm inch, when tested in accordance with ASTM E96/E96M.
    - iv. Thickness: 30 mil.
    - v. Connections: Brush on welding adhesive.
- 3. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.
  - a. Lagging Adhesive: Compatible with insulation.
- 4. Aluminum Jacket: ASTM B209 (ASTM B209M) formed aluminum sheet.
  - a. Thickness: 0.016 inch sheet.

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- b. Finish: Smooth.
  - c. Joining: Longitudinal slip joints and 2 inch laps.
  - d. Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
  - e. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.
5. Stainless Steel Jacket: ASTM A666, Type 304 stainless steel.
- a. Thickness: 0.010 inch.
  - b. Finish: Smooth.
  - c. Metal Jacket Bands: 3/8 inch wide; 0.010 inch thick stainless steel.

## C. PART 3 EXECUTION

### I. EXAMINATION

- 1. Verify that piping has been tested before applying insulation materials.
- 2. Verify that surfaces are clean and dry, with foreign material removed.

### II. INSTALLATION

- 1. Install in accordance with manufacturer's instructions.
- 2. Install in accordance with North American Insulation Manufacturers Association (NAIMA) National Insulation Standards.
- 3. Exposed Piping: Locate insulation and cover seams in least visible locations.
- 4. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
- 5. Glass fiber insulated pipes conveying fluids below ambient temperature:
  - a. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
  - b. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- 6. For hot piping conveying fluids 140 degrees F or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- 7. For hot piping conveying fluids over 140 degrees F, insulate flanges and unions at equipment.
- 8. Glass fiber insulated pipes conveying fluids above ambient temperature:
  - a. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  - b. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- 9. Inserts and Shields:
  - a. Application: Piping 1-1/2 inches diameter or larger.
  - b. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
  - c. Insert Location: Between support shield and piping and under the finish jacket.
  - d. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.

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- e. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
10. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to Section 078400.
11. Pipe Exposed in Mechanical Equipment Rooms or Finished Spaces (less than 10 feet above finished floor): Finish with canvas jacket sized for finish painting.
12. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with aluminum jacket with seams located on bottom side of horizontal piping.
13. Buried Piping: Provide factory fabricated assembly with inner all-purpose service jacket with self-sealing lap, and asphalt impregnated open mesh glass fabric, with one mil thick aluminum foil sandwiched between three layers of bituminous compound; outer surface faced with a polyester film.

### III. SCHEDULES

1. Plumbing Systems: SIZES AND THICKNESS PER RISBC FOR R-VALUE ENERGY COMPLIANCE
  - a. Domestic Hot Water Supply:
    - i. Glass Fiber Insulation:
    - ii. Cellular Glass Insulation:
  - b. Domestic Hot Water Recirculation:
    - i. Glass Fiber Insulation:
    - ii. Polyethylene Insulation:
  - c. Tempered Domestic Water Supply:
  - d. Tempered Domestic Water Recirculation:
  - e. Domestic Cold Water:
2. Heating Systems:
  - a. Heating Water Supply and Return:
  - b. Glycol Heating Supply and Return:
  - c. Gravity Steam Condensate:
3. Cooling Systems:
  - a. Chilled Water:
  - b. Condenser Water:
  - c. Glycol Cooling Supply and Return:
  - d. Condensate Drains from Cooling Coils:
  - e. Refrigerant Suction:
  - f. Refrigerant Hot Gas:

**END OF SECTION**

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## **SECTION 221005 PLUMBING PIPING**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Pipe, pipe fittings, specialties, and connections for piping systems.
  - 1. Sanitary sewer.
  - 2. Domestic water.
  - 3. Flanges, unions, and couplings.
  - 4. Pipe hangers and supports.
  - 5. Valves.
  - 6. Flow controls.
  - 7. Check.
  - 8. Water pressure reducing valves.
  - 9. Relief valves.
  - 10. Strainers.

#### **1.02 RELATED REQUIREMENTS**

- A. Section 078400 - Firestopping.
- B. Section 083100 - Access Doors and Panels.
- C. Section 099113 - Exterior Painting.
- D. Section 099123 - Interior Painting.
- E. Section 220516 - Expansion Fittings and Loops for Plumbing Piping.
- F. Section 220548 - Vibration and Seismic Controls for Plumbing Piping and Equipment.
- G. Section 330110.58 - Disinfection of Water Utility Piping Systems.

#### **1.03 REFERENCE STANDARDS**

- A. ANSI Z21.22 - American National Standard for Relief Valves and Automatic Gas Shutoff Devices for Hot Water Supply Systems 2015.
- B. ASME B16.4 - Gray Iron Threaded Fittings: Classes 125 and 250 2016.
- C. ASME B16.18 - Cast Copper Alloy Solder Joint Pressure Fittings 2018.
- D. ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2018.
- E. ASME B31.9 - Building Services Piping 2017.
- F. ASME BPVC-IV - Boiler and Pressure Vessel Code, Section IV - Rules for Construction of Heating Boilers 2019.
- G. ASME BPVC-IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators - Welding Brazing and Fusing Qualifications 2019.
- H. ASSE 1003 - Performance Requirements for Water Pressure Reducing Valves for Domestic Water Distribution Systems 2009.
- I. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2018.
- J. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings 2020.
- K. ASTM B32 - Standard Specification for Solder Metal 2008 (Reapproved 2014).
- L. ASTM B88 - Standard Specification for Seamless Copper Water Tube 2020.
- M. ASTM B88M - Standard Specification for Seamless Copper Water Tube (Metric) 2020.
- N. ASTM B813 - Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube 2016.

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- O. ASTM B828 - Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings 2016.
- P. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings 2020a.
- Q. ASTM D2855 - Standard Practice for the Two-Step (Primer & Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets 2015.
- R. AWWA C550 - Protective Interior Coatings for Valves and Hydrants 2017.
- S. AWWA C606 - Grooved and Shouldered Joints 2015.
- T. AWWA C651 - Disinfecting Water Mains 2014.
- U. CISPI 301 - Standard Specification for Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste and Vent Piping Applications 2017 (Revised 2018).
- V. CISPI 310 - Specification for Coupling for Use in Connection with Hubless Cast Iron Soil Pipe and Fittings for Sanitary and Storm Drain, Waste, and Vent Piping Applications 2012 (Revised 2018).
- W. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements 2015.
- X. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements 2016.
- Y. MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018.
- Z. NSF 61 - Drinking Water System Components - Health Effects 2019.
- AA. NSF 372 - Drinking Water System Components - Lead Content 2016.

#### 1.04 QUALITY ASSURANCE

- A. Perform work in accordance with applicable codes.
- B. Valves: Manufacturer's name and pressure rating marked on valve body.
- C. Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- D. Identify pipe with marking including size, ASTM material classification, ASTM specification, potable water certification, water pressure rating.

### PART 2 PRODUCTS

#### 2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

#### 2.02 SANITARY SEWER PIPING, BURIED BEYOND 5 FEET OF BUILDING

- A. Cast Iron Pipe: ASTM A74 extra heavy weight.
  - 1. Fittings: Cast iron.
  - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.

#### 2.03 SANITARY SEWER PIPING, BURIED WITHIN 5 FEET OF BUILDING

- A. Cast Iron Pipe: CISPI 301, hubless.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gasket and stainless steel clamp and shield assemblies.

#### 2.04 SANITARY SEWER PIPING, ABOVE GRADE

- A. Cast Iron Pipe: CISPI 301, hubless, service weight.
  - 1. Fittings: Cast iron.
  - 2. Joints: CISPI 310, neoprene gaskets and stainless steel clamp-and-shield assemblies.

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**2.05 DOMESTIC WATER PIPING, BURIED BEYOND 5 FEET OF BUILDING**

**2.06 DOMESTIC WATER PIPING, ABOVE GRADE**

- A. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).
  - 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
  - 2. Joints: ASTM B32, alloy Sn95 solder.
- B. Steel Pipe: ASTM A53/A53M Schedule 40, galvanized, using one of the following joint types:
  - 1. Threaded Joints: ASME B16.4 cast iron fittings.
  - 2. Grooved Joints: AWWA C606 grooved pipe, cast iron fittings, and mechanical couplings.

**2.07 PIPE HANGERS AND SUPPORTS**

- A. Provide hangers and supports that comply with MSS SP-58.
  - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  - 2. Overhead Supports: Individual steel rod hangers attached to structure or to trapeze hangers.
  - 3. Trapeze Hangers: Welded steel channel frames attached to structure.
  - 4. Vertical Pipe Support: Steel riser clamp.
- B. Plumbing Piping - Drain, Waste, and Vent:
  - 1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  - 2. Hangers for Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  - 3. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  - 4. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
  - 5. Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  - 6. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- C. Plumbing Piping - Water:
  - 1. Hangers for Pipe Sizes 1/2 Inch to 1-1/2 Inches: Malleable iron, adjustable swivel, split ring.
  - 2. Hangers for Cold Pipe Sizes 2 Inches and Over: Carbon steel, adjustable, clevis.
  - 3. Hangers for Hot Pipe Sizes 2 Inches to 4 Inches: Carbon steel, adjustable, clevis.
  - 4. Hangers for Hot Pipe Sizes 6 Inches and Over: Adjustable steel yoke, cast iron pipe roll, double hanger.
  - 5. Wall Support for Pipe Sizes to 3 Inches: Cast iron hook.
  - 6. Wall Support for Pipe Sizes 4 Inches and Over: Welded steel bracket and wrought steel clamp.
  - 7. Wall Support for Hot Pipe Sizes 6 Inches and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron pipe roll.
  - 8. Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
  - 9. Floor Support for Hot Pipe Sizes to 4 Inches: Cast iron adjustable pipe saddle, locknut, nipple, floor flange, and concrete pier or steel support.
  - 10. Floor Support for Hot Pipe Sizes 6 Inches and Over: Adjustable cast iron pipe roll and stand, steel screws, and concrete pier or steel support.
  - 11. Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- D. Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
  - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
  - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
  - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
  - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
  - 5. Concrete Adhesive Type Anchors: Complying with ICC-ES AC308.

**2.08 PIPING SPECIALTIES**

- A. Flow Controls:
  - 1. Construction: Class 125, Brass or bronze body with union on inlet and outlet, temperature and pressure test plug on inlet and outlet, blowdown/backflush drain.

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2. Calibration: Control flow within 5 percent of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure 3.5 psi.

## 2.09 WATER PRESSURE REDUCING VALVES

- A. Up to 2 Inches:
  1. ASSE 1003, bronze body, stainless steel, and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded single union ends.
- B. Over 2 Inches:
  1. ASSE 1003, cast iron body with interior lining complying with AWWA C550, bronze fitted, elastomeric diaphragm and seat disc, flanged.

## 2.10 RELIEF VALVES

- A. Pressure:
  1. ANSI Z21.22, AGA certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
- B. Temperature and Pressure:
  1. ANSI Z21.22, AGA certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 210 degrees F, capacity ASME BPVC-IV certified and labelled.

## 2.11 STRAINERS

- A. Size 2 Inches and Under:
  1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
  2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- B. Size 1-1/2 inch to 4 inches:
  1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.
- C. Size 5 inch and Larger:
  1. Class 125, flanged iron body, basket pattern with 1/8 inch stainless steel perforated screen.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify that excavations are to required grade, dry, and not over-excavated.

### 3.02 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

### 3.03 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D. Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 220516.
- G. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Establish elevations of buried piping outside the building to ensure not less than code min of cover.

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- J. Install vent piping penetrating roofed areas to maintain integrity of roof assembly; refer to Arch spec.
- K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- L. Provide support for utility meters in accordance with requirements of utility companies.
- M. Prepare exposed, unfinished pipe, fittings, supports, and accessories for finish painting.
- N. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.
- O. PVC Pipe: Make solvent-welded joints in accordance with ASTM D2855.
- P. Sleeve pipes passing through partitions, walls, and floors.
- Q. Inserts:
  - 1. Provide inserts for placement in concrete formwork.
  - 2. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - 3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
  - 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
  - 5. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut above slab.
- R. Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Support horizontal piping as indicated.
  - 3. Install hangers to provide minimum 1/2 inch space between finished covering and adjacent work.
  - 4. Place hangers within 12 inches of each horizontal elbow.
  - 5. Use hangers with 1-1/2 inch minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
  - 6. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
  - 7. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
  - 8. Provide copper plated hangers and supports for copper piping.
  - 9. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
    - a. Painting of interior plumbing systems and components is specified in Section 099123.
    - b. Painting of exterior plumbing systems and components is specified in Section 099113.
  - 10. Provide hangers adjacent to motor-driven equipment with vibration isolation; refer to Section 220548.
  - 11. Support cast iron drainage piping at every joint.
- S. Manufactured Sleeve-Seal Systems:
  - 1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior concrete walls at piping entrances into building.
  - 2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  - 3. Locate piping in center of sleeve or penetration.
  - 4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  - 5. Tighten bolting for a watertight seal.
  - 6. Install in accordance with manufacturer's recommendations.
- T. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

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### 3.04 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- D. Install gate valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install globe valves for throttling, bypass, or manual flow control services.
- F. Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- G. Provide spring-loaded check valves on discharge of water pumps.
- H. Provide flow controls in water recirculating systems where indicated.

### 3.05 TOLERANCES

- A. Drainage Piping: Establish invert elevations within 1/2 inch vertically of location indicated and slope to drain at minimum of 1/4 inch per foot slope.
- B. Water Piping: Slope at minimum of 1/32 inch per foot and arrange to drain at low points.

### 3.06 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Section 330110.58.
- B. Prior to starting work, verify system is complete, flushed, and clean.
- C. Ensure acidity (pH) of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- D. Inject disinfectant, free chlorine in liquid, powder, tablet, or gas form throughout system to obtain 50 to 80 mg/L residual.
- E. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- F. Maintain disinfectant in system for 24 hours.
- G. If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- H. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- I. Take samples no sooner than 24 hours after flushing, from 10 percent of outlets and from water entry, and analyze in accordance with AWWA C651.

### 3.07 SERVICE CONNECTIONS

- A. Provide new sanitary sewer services. Before commencing work, check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- B. Provide new water service complete with approved reduced pressure backflow preventer and water meter with by-pass valves, pressure reducing valve, and sand strainer.
  - 1. Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Calk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
  - 2. Provide 18 gage, 0.0478-inch galvanized sheet metal sleeve around service main to 6 inch above floor and 6 feet minimum below grade. Size for minimum of 2 inches of loose batt insulation stuffing.

### 3.08 SCHEDULES

- A. Pipe Hanger Spacing:
  - 1. Metal Piping:
    - a. Pipe Size: 1/2 inches to 1-1/4 inches:
      - 1) Maximum Hanger Spacing: 6.5 ft.
      - 2) Hanger Rod Diameter: 3/8 inches.
    - b. Pipe Size: 1-1/2 inches to 2 inches:
      - 1) Maximum Hanger Spacing: 10 ft.

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- 2) Hanger Rod Diameter: 3/8 inch.
- c. Pipe Size: 2-1/2 inches to 3 inches:
  - 1) Maximum Hanger Spacing: 10 ft.
  - 2) Hanger Rod Diameter: 1/2 inch.
- d. Pipe Size: 4 inches to 6 inches:
  - 1) Maximum Hanger Spacing: 10 ft.
  - 2) Hanger Rod Diameter: 5/8 inch.
- e. Pipe Size: 8 inches to 12 inches:
  - 1) Maximum hanger spacing: 14 ft.
  - 2) Hanger Rod Diameter: 7/8 inch.
- f. Pipe Size: 14 inches and Over:
  - 1) Maximum Hanger Spacing: 20 ft.
  - 2) Hanger Rod Diameter: 1 inch.
- 2. Plastic Piping:
  - a. All Sizes:
    - 1) Maximum Hanger Spacing: 6 ft.
    - 2) Hanger Rod Diameter: 3/8 inch.

**A. END OF SECTION**

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## **SECTION 221006 PLUMBING PIPING SPECIALTIES**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Drains.
- B. Cleanouts.
- C. Hose bibbs.
- D. Refrigerator valve and recessed box.
- E. Backflow preventers.
- F. Water hammer arrestors.
- G. Sanitary waste interceptors.
- H. Mixing valves.
- I. Catch basins and manholes.
- J. Exterior penetration accessories.
- K. Fire-rated enclosures.

#### **1.02 REFERENCE STANDARDS**

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.6.3 - Floor and Trench Drains 2019.
- C. ASSE 1011 - Performance Requirements for Hose Connection Vacuum Breakers 2017.
- D. ASSE 1013 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Principle Fire Protection Backflow Preventers 2011.
- E. NSF 61 - Drinking Water System Components - Health Effects 2019.
- F. NSF 372 - Drinking Water System Components - Lead Content 2016.
- G. PDI-WH 201 - Water Hammer Arresters 2017.

### **PART 2 PRODUCTS**

#### **2.01 GENERAL REQUIREMENTS**

- A. Specialties in Potable Water Supply Systems: Provide products that comply with NSF 61 and NSF 372 for maximum lead content.

#### **2.02 DRAINS**

- A. Floor Drains:
- B. Floor Drain (FD-1):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer.
- C. Floor Drain (FD-2):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable round nickel bronze strainer with removable perforated sediment bucket.
- D. Floor Drain (FD-3):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze strainer with polished bronze funnel or anti-splash rim.
- E. Floor Drain (FD-4):
  - 1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze extra heavy duty strainer.

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**F. Floor Drain (FD-5):**

1. ASME A112.6.3; lacquered cast iron or stainless steel, two piece body with double drainage flange, weep holes, reversible clamping collar, and round, adjustable nickel-bronze extra heavy duty strainer with hinged grate and sediment bucket.

**G. Floor Drain (FD-6):**

1. Lacquered cast iron or stainless steel, two piece body with drainage flange, heavy duty grate 6 inches wide, 12 inches long, dome strainer, end plates with gaskets.

**2.03 CLEANOUTS**

**A. Cleanouts at Exterior Surfaced Areas (CO-1):**

1. Round cast nickel bronze access frame and non-skid cover.

**B. Cleanouts at Exterior Unsurfaced Areas (CO-2):**

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover.

**C. Cleanouts at Interior Finished Floor Areas (CO-3):**

1. Lacquered cast iron body with anchor flange, reversible clamping collar, threaded top assembly, and round gasketed scored cover in service areas and round gasketed depressed cover to accept floor finish in finished floor areas.

**D. Cleanouts at Interior Finished Wall Areas (CO-4):**

1. Line type with lacquered cast iron body and round epoxy coated gasketed cover, and round stainless steel access cover secured with machine screw.

**E. Cleanouts at Interior Unfinished Accessible Areas (CO-5):** Calked or threaded type. Provide bolted stack cleanouts on vertical rainwater leaders.

**2.04 HOSE BIBBS**

**A. Interior Hose Bibbs:**

1. Bronze or brass with integral mounting flange, replaceable hexagonal disc, hose thread spout, chrome plated where exposed with handwheel, integral vacuum breaker in compliance with ASSE 1011.

**B. Interior Mixing Type Hose Bibbs:**

1. Bronze or brass, wall mounted, double service faucet with hose thread spout, integral stops, chrome plated where exposed with handwheels, and vacuum breaker in compliance with ASSE 1011.

**2.05 BACKFLOW PREVENTERS**

**A. Reduced Pressure Backflow Preventers:**

1. ASSE 1013; bronze body with bronze internal parts and stainless steel springs; two independently operating, spring loaded check valves; diaphragm type differential pressure relief valve located between check valves; third check valve that opens under back pressure in case of diaphragm failure; non-threaded vent outlet; assembled with two gate valves, strainer, and four test cocks.

**2.06 WATER HAMMER ARRESTORS**

**A. Water Hammer Arrestors:**

1. Stainless steel construction, bellows type sized in accordance with PDI-WH 201, precharged suitable for operation in temperature range minus 100 to 300 degrees F and maximum 250 psi working pressure.

**2.07 SANITARY WASTE INTERCEPTORS**

**2.08 MIXING VALVES**

**A. Thermostatic Mixing Valves:**

1. Valve: Chrome plated cast brass body, stainless steel or copper alloy bellows, integral temperature adjustment.
2. Accessories:
  - a. Check valve on inlets.
  - b. Volume control shut-off valve on outlet.

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- c. Stem thermometer on outlet.
- d. Strainer stop checks on inlets.
- 3. Cabinet: 16 gage, 0.0598 inch prime coated steel, for recessed mounting with keyed lock.

## 2.09 RELIEF VALVES

- A. Bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labelled.

## 2.10 AIR VENTS

- A. Manual Type: Short vertical sections of 2 inch diameter pipe to form air chamber, with 1/8 inch brass needle valve at top of chamber.
- B. Float Type:
  - 1. Brass or semi-steel body, copper, polypropylene, or solid non-metallic float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve.
  - 2. Cast iron body and cover, float, bronze pilot valve mechanism suitable for system operating temperature and pressure; with isolating valve.
- C. Washer Type:
  - 1. Brass with hygroscopic fiber discs, vent ports, adjustable cap for manual shut-off, and integral spring loaded ball check valve.

## 2.11 FLOOR DRAIN TRAP SEALS

- A. Description: Push-fit EPDM or silicone fitting with a one-way membrane.

## 2.12 DOMESTIC WATER DISTRIBUTION MANIFOLDS

- A. Description: Domestic water distribution system with integrated quarter-turn shutoff valves for each plumbing fixture.

## 2.13 EXTERIOR PENETRATION ACCESSORIES

- A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- B. Sealing Systems for Roof Penetrations: Premanufactured components and accessories as required to preserve integrity of roofing system and maintain roof warranty; suitable for piping, cables, and roofing system to be installed; designed to accommodate existing penetrations where applicable.
- C. Plumbing Ventilation Thru Roof Accessories - Retrofit:
  - 1. Plumbing Pipe Extension Kit: Extends roof plumbing pipes above minimum clearance from roof surface per local codes and Authority Having Jurisdiction (AHJ).
  - 2. Retrofit Cap: Spun aluminum cap for use with aluminum or PVC plumbing stack.
  - 3. Vandal Resistant Cap: Spun aluminum cap for use with aluminum or PVC plumbing stack. Cap designed to be secured with pop-rivets to prevent removal.

## 2.14 FIRE-RATED ENCLOSURES

- A. Provide as required to preserve fire resistance rating of building elements.

## PART 3 EXECUTION

### 3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- C. Encase exterior cleanouts in concrete flush with grade.
- D. Install floor cleanouts at elevation to accommodate finished floor.
- E. Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibbs.

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- F. Pipe relief from backflow preventer to nearest drain.
- G. Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to lavatory sinks, washing machine outlets, or where required by Code.
- H. Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or 3/4 inch minimum, and minimum 18 inches long.

**A. END OF SECTION**

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## SECTION 224000 PLUMBING FIXTURES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Water closets.
- B. Waterless urinals.
- C. Lavatories.
- D. All-in-one lavatory system.
- E. Sinks.
- F. Service sinks.
- G. Mop sinks.
- H. Under-lavatory pipe supply covers.
- I. Showers.
- J. Eye and face wash fountains.
- K. Emergency showers.

#### 1.02 RELATED REQUIREMENTS

- A. Section 221005 - Plumbing Piping.
- B. Section 221006 - Plumbing Piping Specialties.
- C. Section 223000 - Plumbing Equipment.
- D. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

#### 1.03 REFERENCE STANDARDS

- A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design 2010.
- B. ASME A112.18.9 - Protectors/Insulators for Exposed Waste and Supplies on Accessible Fixtures 2011 (Reaffirmed 2017).
- C. ASTM C1822 - Standard Specification for Insulating Covers on Accessible Lavatory Piping 2015.
- D. FM (AG) - FM Approval Guide current edition.
- E. ANSI Z358.1 - American National Standard for Emergency Eyewash and Shower Equipment 2014.
- F. ASME A112.6.1M - Supports for Off-the-Floor Plumbing Fixtures for Public Use 1997 (Reaffirmed 2017).
- G. ASME A112.18.1 - Plumbing Supply Fittings 2018, with Errata.
- H. ASME A112.19.1 - Enamelled Cast Iron and Enamelled Steel Plumbing Fixtures 2018.
- I. ASME A112.19.2 - Ceramic Plumbing Fixtures 2018.
- J. ASME A112.19.5 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks 2017.
- K. ASME A112.19.14 - Six Liter Water Closets Equipped with Dual Flushing Device 2013 (Reaffirmed 2018).
- L. ASSE 1014 - Performance Requirements for Backflow Prevention Devices for Hand-Held Showers 2005.
- M. ASSE 1070 - Performance Requirements for Water Temperature Limiting Devices 2015.
- N. NSF 61 - Drinking Water System Components - Health Effects 2019.
- O. NSF 372 - Drinking Water System Components - Lead Content 2016.

#### 1.04 SUBMITTALS

- A. See Section 013000 - Administrative Requirements, for submittal procedures.

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- B. Waterless Urinals: Submit recommended frequency of maintenance and parts replacement, methods of cleaning, sources of replacement supplies and parts.
- C. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 016000 - Product Requirements, for additional provisions.
  - 2. Extra Faucet Washers: One set of each type and size.
  - 3. Extra Lavatory Supply Fittings: One set of each type and size.
  - 4. Extra Shower Heads: One of each type and size.
  - 5. Extra Toilet Seats: One of each type and size.
  - 6. Flush Valve Service Kits: One for each type and size.
  - 7. Extra Waterless Urinal Trap Seals/Supplies: Provide one year's worth of replacement trap seal parts or supplies, based on normal, expected use of facility of this type.
  - 8. Extra Waterless Urinal Trap Seals/Supplies: One year's worth, based on normal, expected use of facility of this type.

## PART 2 PRODUCTS

### 2.01 GENERAL REQUIREMENTS

- A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Water Efficiency: EPA WaterSense label is required for all water closets, urinals, lavatory faucets, and showerheads.

### 2.02 FLUSH VALVE WATER CLOSETS (P-1)

- A. Water Closets: Vitreous china, ASME A112.19.2, floor mounted, siphon jet flush action, china bolt caps.
  - 1. Bowl: ASME A112.19.2; 16.5 inches high with elongated rim.
  - 2. Flush Valve: Exposed (top spud).
  - 3. Flush Operation: Sensor operated.
  - 4. Handle Height: 44 inches or less.
  - 5. Supply Size: 1-1/2 inches.
  - 6. Outlet Size: 2 inches.
  - 7. Manufacturers: (SUGGESTIONS ARE LISTED BELOW. SUBMIT TO ENGINEER OF RECORD FOR APPROVAL)
    - a. Advanced Modern Technologies Corporation: [www.amtcorporation.com/#sle](http://www.amtcorporation.com/#sle).
    - b. American Standard, Inc; AFWALL FLOWISE ADA RETROFIT TOILET W/SENSOR - OPERATED FLUSHOMETER: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - c. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
    - d. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
    - e. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
    - f. SLOAN MODEL # ROYAL 111-1.28 FLUSHOMETER.
    - g. TOTO TOILET MODEL CT 708U #01
- B. Flush Valves: ASME A112.18.1, diaphragm type, complete with vacuum breaker stops and accessories.
  - 1. Sensor-Operated Type: Solenoid or motor-driven operator, low voltage hard-wired, infrared sensor with mechanical over-ride or over-ride push button.
  - 2. Exposed Type: Chrome plated, escutcheon, integral screwdriver stop.
  - 3. Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT TO EOR FOR APPROVAL
    - a. Advanced Modern Technologies Corporation; AEF-800 Series, Automatic Flush Valve: [www.amtcorporation.com/#sle](http://www.amtcorporation.com/#sle).
    - b. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - c. Delany Products: [www.delanyproducts.com/#sle](http://www.delanyproducts.com/#sle).

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- d. Sloan Valve Company: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
- e. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- f. SLOAN MODEL EBV-500-A SIDE MOUNTED SINGLE FLUSH TOILET/URINAL FLUSH VALVE RETROFIT KIT.

C. Seats:

1. Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT TO EOR FOR APPROVAL
  - a. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  - b. Bemis Manufacturing Company: [www.bemismfg.com/#sle](http://www.bemismfg.com/#sle).
  - c. Church Seat Company: [www.churchseats.com/#sle](http://www.churchseats.com/#sle).
  - d. DXV by American Standard, Inc: [www.dxv.com/#sle](http://www.dxv.com/#sle).
  - e. Olsonite: [www.olsonite.com/#sle](http://www.olsonite.com/#sle).
  - f. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
2. Solid black plastic, open front, extended back, self-sustaining hinge, brass bolts, with cover.

D. Water Closet Carriers:

1. ASME A112.6.1M; adjustable cast iron frame, integral drain hub and vent, adjustable spud, lugs for floor and wall attachment, threaded fixture studs with nuts and washers.

**2.03 WATERLESS URINALS (P-3)**

- A. Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT FOR APPROVAL TO EOR.
1. American Standard, Inc; FLOWISE FLUSH FREE WATERLESS URINAL MODEL 6150.100: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  2. Falcon Waterfree Technologies: [www.falconwaterfree.com/#sle](http://www.falconwaterfree.com/#sle).
  3. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  4. Sloan Valve: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
  5. Waterless Co: [www.waterless.com/#sle](http://www.waterless.com/#sle).
  6. Zero Flush: [www.zeroflush.com/#sle](http://www.zeroflush.com/#sle).
  7. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- B. Urinal UR- [\_\_\_\_]: Wall-hung, vitreous china, complying with ASME A112.19.2; one piece bowl and shields, with integral trap, back outlet, carrier, and all necessary fittings.
1. Trap Assembly: Siphon trap type not requiring additional water for drainage of urine; liquid trap seal that is lower specific gravity than water or urine and is biodegradable; completely enclosed cartridge intended to be replaced periodically or refillable liquid trap seal; tamperproof but removable for cleaning and replacement.
  2. Projection From Wall: Approximately 14 inches.
  3. Width: Approximately 19 inches.
  4. Color: White.

**2.04 LAVATORIES (P-2A, P-2B, P-2C)**

- A. Lavatory Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
1. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  2. DXV by American Standard, Inc: [www.dxv.com/#sle](http://www.dxv.com/#sle).
  3. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
  4. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  5. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  6. SLOAN GRADIENT SERIES- P-2A (ELGR-8100, ELGR-8200, ELGR-8300).
- B. Supply Faucet Manufacturers: SUGGESTIONS ARE LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
1. Advanced Modern Technologies Corporation; AEF-300 Series, Wall Mounted: [www.amtcorporation.com/#sle](http://www.amtcorporation.com/#sle).
  2. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  3. DXV by American Standard, Inc: [www.dxv.com/#sle](http://www.dxv.com/#sle).

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4. Grohe America, Inc: [www.grohe.com/us/#sle](http://www.grohe.com/us/#sle).
  5. Kohler Company: [www.kohler.com/#sle](http://www.kohler.com/#sle).
  6. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  7. TOTO FAUCET SPOUT ASSEMBLY 21-16-94C, CONTROLLER 21-16-58B, MIXING VALVE 21-20-03A AND THERMOSTAT 21-16-96D.
- C. Sensor Operated Faucet: Cast brass, chrome plated, wall mounted with sensor located on neck of spout.
1. Spout Style: Standard.
  2. Mixing Valve: None, single line for tempered water.
  3. Water Supply: 3/8 inch compression connections.
  4. Aerator: Vandal resistant, 0.5 GPM, laminar flow device.
  5. Finish: Polished chrome.
  6. Sensor Operated Faucet Manufacturers:
    - a. Advanced Modern Technologies Corporation; AEF-300 Series, Deck Mounted: [www.amtcorporation.com/#sle](http://www.amtcorporation.com/#sle).
    - b. American Standard, Inc: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
    - c. Gerber Plumbing Fixtures LLC: [www.gerberonline.com/#sle](http://www.gerberonline.com/#sle).
    - d. Grohe America, Inc: [www.grohe.com/us/#sle](http://www.grohe.com/us/#sle).
    - e. The Chicago Faucet Company: [www.chicagofaucets.com/#sle](http://www.chicagofaucets.com/#sle).
    - f. Moen Incorporated: [www.moen.com/#sle](http://www.moen.com/#sle).
    - g. Powers Controls: [www.powerscontrols.com/#sle](http://www.powerscontrols.com/#sle).
    - h. Sloan Valve Company: [www.sloanvalve.com/#sle](http://www.sloanvalve.com/#sle).
    - i. Toto USA: [www.totousa.com/#sle](http://www.totousa.com/#sle).
    - j. Watts: [www.watts.com/#sle](http://www.watts.com/#sle).
    - k. Zurn Industries, Inc; AquaSense Z6913: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- D. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.
- E. Provide lavatory with combination stop and strainer.

## 2.05 SHOWERS (P-4)

- A. Shower Manufacturers:
1. SHOWER TRIM KIT- MOEN COMMERCIAL MODEL M-DURA COMMERCIAL SINGLE HANDLE POSI-TEMP HANDHELD SHOWER SYSTEM T9346GBM
  2. SHOWER BASE P-5A, KOHLER MODEL K-9055 60"X 36" ENAMELED CAST IRON SHOWER BASE W/ SAFEGUARD SLIP RESISTANT SURFACE ON BATH FLOOR, SINGLE THRESHOLD FOR ALCOVE INSTALLATION WITH CENTER DRAIN
  3. SHOWER BASE P-5B, KOHLER MODEL K-9396 36" X 36" ACRYLIC SHOWER BASE, SINGLE THRESHOLD FOR ALCOVE INSTALLATION, CENTER DRAIN W/ COVERED DRAIN (REMOVABLE COVER)
- B. Shower Valve:
1. Comply with ASME A112.18.1.
  2. Provide two handle in wall diverter valve body with integral thermostatic mixing valve to supply 1.5 gpm.
- C. Wall Mounted Shower Valve:
1. Comply with ASME A112.18.1.
  2. Provide two handle in wall diverter valve body with integral thermostatic mixing valve to supply 1.5 gpm.
  3. Shower Valve Manufacturers:
- D. Shower Head:
1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 2.5 gpm flow control.
- E. Low-Flow Shower Head:

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1. ASME A112.18.1; chrome plated vandal-proof institutional head with integral wall bracket, built-in 1.5 gpm flow control.
- F. Hand-Held Shower Head:
  1. ASME A112.18.1, adjustable spray hand-held shower head with swivel fitting, with ASSE 1014 backflow preventer.
  2. Provide pushbutton flow control.
  3. Include 60 inch minimum flexible polished stainless steel hose and in-line vacuum breaker
  4. Provide wall bracket to mount hand spray, allowing use of the unit as either a hand-held spray or a fixed shower head.
- G. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

## 2.06 MOP SINKS (P-6)

- A. Mop Sink Manufacturers: SUGGESTIONS LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
  1. Acorn Engineering Company: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  2. Just Manufacturing Company: [www.justmfg.com/#sle](http://www.justmfg.com/#sle).
  3. Zurn Industries, Inc: [www.zurn.com/#sle](http://www.zurn.com/#sle).
  4. FIAT PRODUCTS-ACRANE PLUMBING COMPANY MOLDED STONE MOP BASIN MSB 2424/ SERVICE SINK FAUCET 830-AA.
- B. Material: Stainless steel.
- C. Type: Rectilinear.
- D. Tiling Flange Construction: Galvanized steel.
- E. Grid Strainer: Stainless steel; integral; removable.
- F. Accessories:
  1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
  2. Hose clamp hanger.
  3. Mop hanger.
- G. Terrazzo Mop Sink Manufacturers: SUGGESTIONS LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.
  1. Acorn Engineering Company; [\_\_\_\_]: [www.americanstandard-us.com/#sle](http://www.americanstandard-us.com/#sle).
  2. Just Manufacturing Company; [\_\_\_\_]: [www.justmfg.com/#sle](http://www.justmfg.com/#sle).
  3. Zurn Industries, Inc; [\_\_\_\_]: [www.zurn.com/#sle](http://www.zurn.com/#sle).
- H. Material: Precast terrazzo composed of marble chips cast in Portland cement.
- I. Type: Rectilinear, standard height.
- J. Tiling Flange Construction: Galvanized steel.
- K. Grid strainer: Stainless steel; integral; removable.
- L. Dimensions: As indicated on drawings.
- M. Accessories:
  1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
  2. Hose clamp hanger.
  3. Mop hanger.

## 2.07 SERVICE SINKS

- A. Bowl: ASME A112.19.1; 22 by 18 by 12 inch deep, porcelain enamelled (inside only) cast iron roll-rim sink, with 12 inch high back, concealed hanger, chrome plated strainer, stainless steel rim guard, cast iron P-trap with adjustable floor flange.
- B. Bowl: 36 by 24 by 10 inch high white molded stone, floor mounted, with one inch wide shoulders, vinyl bumper guard, stainless steel strainer.

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C. Trim: ASME A112.18.1 exposed wall type supply with cross handles, spout wall brace, vacuum breaker, hose end spout, strainers, eccentric adjustable inlets, integral screwdriver stops with covering caps and adjustable threaded wall flanges.

D. Accessories:

1. 5 feet of 1/2 inch diameter plain end reinforced plastic hose.
2. Hose clamp hanger.
3. Mop hanger.

## **2.08 EMERGENCY EYE AND FACE WASH**

A. Emergency Wash Manufacturers: SUGGESTIONS LISTED BELOW. SUBMIT TO EOR FOR APPROVAL.

1. Haws Corporation; [\_\_\_\_]: [www.hawesco.com/#sle](http://www.hawesco.com/#sle).
2. Therm-Omega-Tech, Inc; [\_\_\_\_]: [www.thermomegatech.com/#sle](http://www.thermomegatech.com/#sle).

B. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

## **2.09 EMERGENCY SHOWERS**

A. Emergency Shower: ANSI Z358.1; wall-mounted, self- cleaning, non-clogging 8 inch diameter stainless steel deluge shower head with elbow, one inch full flow valve with pull chain and 8 inch diameter ring, one inch interconnecting fittings.

B. Thermostatic Mixing Valve: Thermostatic mixing valve, ASSE 1070 listed, with combination stop, strainer, and check valves, and flexible stainless steel connectors.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.
- C. Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

### **3.02 PREPARATION**

- A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

### **3.03 INSTALLATION**

- A. Install each fixture with trap, easily removable for servicing and cleaning.
- B. Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- C. Install components level and plumb.
- D. Install and secure fixtures in place with wall supports and bolts.
- E. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

### **3.04 ADJUSTING**

- A. Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

### **3.05 PROTECTION**

- A. Protect installed products from damage due to subsequent construction operations.
- B. Do not permit use of fixtures by construction personnel.
- C. Repair or replace damaged products before Date of Substantial Completion.

### **3.06 SCHEDULES**

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.

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1. Water Closet:
    - a. Standard: 15 inches to top of bowl rim.
    - b. Accessible: 18 inches to top of seat.
  2. Water Closet Flush Valves:
    - a. Standard: 11 inches min. above bowl rim.
    - b. Recessed: 10 inches min. above bowl rim.
  3. Urinal:
    - a. Standard: 22 inches to top of bowl rim.
    - b. Accessible: 17 inches to top of bowl rim.
  4. Lavatory:
    - a. Standard: 31 inches to top of basin rim.
    - b. Accessible: 34 inches to top of basin rim.
  5. Drinking Fountain:
    - a. Child: 30 inches to top of basin rim.
    - b. Standard Adult: 40 inches to top of basin rim.
    - c. Accessible: 36 inches to top of spout.
  6. Shower Heads:
    - a. Adult Male: 69.5 inches to bottom of head.
    - b. Adult Female: 64.5 inches to bottom of head.
    - c. Child: 58.5 inches to bottom of head.
  7. Emergency Eye and Face Wash:
    - a. Standard: 38 inches to receptor rim.
  8. Emergency Shower:
    - a. Standard: 84 inches to bottom of head.
- B. Fixture Rough-In
1. Water Closet (Flush Valve Type): P-1
    - a. Cold Water: 1 Inch.
    - b. Waste: 4 Inch.
    - c. Vent: 2 Inch.
  2. Urinal, Waterless: P-3
    - a. Waste: 2 Inch.
    - b. Vent: 1-1/2 Inch.
  3. Lavatory:
    - a. Hot Water: 1/2 Inch.
    - b. Cold Water: 1/2 Inch.
    - c. Waste: 1-1/2 Inch.
    - d. Vent: 1-1/4 Inch.
  4. Sink:
    - a. Hot Water: 1/2 Inch.
    - b. Cold Water: 1/2 Inch.
    - c. Waste: 1-1/2 Inch.
    - d. Vent: 1-1/4 Inch.
  5. Service Sink: P-6
    - a. Hot Water: 1/2 Inch.
    - b. Cold Water: 1/2 Inch.
    - c. Waste: 2 Inch.
    - d. Vent: 1-1/2 Inch.
  6. Service Sink: P-6
    - a. Hot Water: 1/2 Inch.
    - b. Cold Water: 1/2 Inch.
    - c. Waste: 3 Inch.
    - d. Vent: 1-1/2 Inch.
  7. Drinking Fountain: DF

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- a. Cold Water: 1/2 Inch.
- b. Waste: 1-1/4 Inch.
- c. Vent: 1-1/4 Inch.
- 8. Shower: P-5A AND P-5B
  - a. Hot Water: 1/2 Inch.
  - b. Cold Water: 1/2 Inch.
  - c. Waste: 1-1/2 Inch.
  - d. Vent: 1-1/4 Inch.

**END OF SECTION**

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## SECTION 230713 DUCT INSULATION

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Duct insulation.
- B. Insulation jackets.

#### 1.02 REFERENCE STANDARDS

- A. ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2017.
- B. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
- C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014 (Reapproved 2019).
- D. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2020.
- E. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials 2016.
- F. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

#### 1.03 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B. Applicator Qualifications: Company specializing in performing the type of work specified in this section, with minimum 5 years of experience and approved by manufacturer.

### PART 2 PRODUCTS

#### 2.01 REGULATORY REQUIREMENTS

- A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

#### 2.02 GLASS FIBER, FLEXIBLE

- A. Manufacturer:
- B. Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 1200 degrees F.
  - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure sensitive tape.

#### 2.03 GLASS FIBER, RIGID

- A. Insulation: ASTM C612; rigid, noncombustible blanket.
  - 1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 450 degrees F.
  - 3. Maximum Water Vapor Absorption: 5.0 percent.
  - 4. Maximum Density: 8.0 lb/cu ft.
- B. Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.

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3. Secure with pressure sensitive tape.

#### 2.04 JACKETS

- A. Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire retardant lagging adhesive.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Test ductwork for design pressure prior to applying insulation materials.  
B. Verify that surfaces are clean, foreign material removed, and dry.

#### 3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.  
B. Install in accordance with NAIMA National Insulation Standards.  
C. Insulated Ducts Conveying Air Below Ambient Temperature:  
1. Provide insulation with vapor barrier jackets.  
2. Finish with tape and vapor barrier jacket.  
3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.  
4. Insulate entire system, including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.  
D. Insulated Ducts Conveying Air Above Ambient Temperature:  
1. Provide with or without standard vapor barrier jacket.  
2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.  
E. Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces (below 10 feet above finished floor): Finish with canvas jacket sized for finish painting.  
F. Exterior Applications: Provide insulation with vapor barrier jacket. Cover with outdoor jacket finished as specified in Section [\_\_\_\_].  
G. Slope exterior ductwork to shed water.  
H. External Duct Insulation Application:  
1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.  
2. Secure insulation without vapor barrier with staples, tape, or wires.  
3. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers.  
4. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.  
5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

#### A. END OF SECTION

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## **SECTION 233700 AIR OUTLETS AND INLETS**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Diffusers:
  - 1. Rectangular ceiling diffusers.
  - 2. Round ceiling diffusers.
- B. Registers/grilles:
  - 1. Ceiling-mounted, exhaust and return register/grilles.
  - 2. Ceiling-mounted, supply register/grilles.
- C. Duct-mounted supply and return registers/louvers.
- D. Wall and ceiling gypsum board access panels with return air grilles.

#### **1.02 REFERENCE STANDARDS**

- A. SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

### **PART 2 PRODUCTS**

#### **2.01 ROUND CEILING DIFFUSERS**

- A. Type: Round, adjustable pattern, stamped or spun, multi-core diffuser to discharge air in 360 degree pattern, with sectorizing baffles where indicated. Diffuser collar shall project not more than 1 inch above ceiling. In plaster ceilings, provide plaster ring and ceiling plaque.
- B. Fabrication: Steel with baked enamel finish.
- C. Color: As selected by Architect from manufacturer's standard range.

#### **2.02 RECTANGULAR CEILING DIFFUSERS**

- A. Accessories: Provide radial opposed blade, butterfly, combination splitter, and volume control damper; removable core, sectorizing baffle, safety chain, wire guard, equalizing grid, operating rod extension, anti-smudging device, gaskets for surface mounted diffusers, and with damper adjustable from diffuser face.

#### **2.03 DUCT-MOUNTED SUPPLY AND RETURN REGISTERS/LOUVERS**

- A. Type: Duct-mounted, rectangular register for round-spiral duct with adjustable pivot-ended blades, end caps, built-in volume damper, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.
- B. Material: 22 gage, 0.0299 inch.
  - 1. Provide crossing spiral fitting-body of matching duct diameter.
- C. Color: As indicated on drawings.

#### **2.04 CEILING SUPPLY REGISTERS/GRILLES**

- A. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

#### **2.05 CEILING EXHAUST AND RETURN REGISTERS/GRILLES**

- A. Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with blades set at 45 degrees, vertical face.
- B. Color: To be selected by Architect from manufacturer's standard range.
- C. Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face where not individually connected to exhaust fans.

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## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- D. Install diffusers to ductwork with air tight connection.

#### **A. END OF SECTION**

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## **SECTION 233100 HVAC DUCTS AND CASINGS**

### **PART 1 GENERAL**

#### **1.01 SECTION INCLUDES**

- A. Metal ductwork.
- B. Nonmetal ductwork.
- C. Duct cleaning.

#### **1.02 REFERENCE STANDARDS**

- A. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2018.
- B. SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2005 (Revised 2009).

### **PART 2 PRODUCTS**

#### **2.01 DUCT ASSEMBLIES**

- A. Regulatory Requirements: Construct ductwork to comply with NFPA 90A standards.

#### **2.02 DUCTWORK FABRICATION**

- A. Fabricate and support in accordance with SMACNA (DCS) and as indicated.
- B. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Fabricate continuously welded round and oval duct fittings in accordance with SMACNA (DCS).

#### **2.03 MANUFACTURED DUCTWORK AND FITTINGS**

### **PART 3 EXECUTION**

#### **3.01 INSTALLATION**

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Duct sizes indicated are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- C. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

#### **3.02 CLEANING**

- A. Clean duct systems with high power vacuum machines. Protect equipment that could be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into ductwork for cleaning purposes.

#### **A. END OF SECTION**

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## SECTION 260519

### LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

#### PART 1 - GENERAL

##### 2.01 SUMMARY

Section Includes:

1. Copper building wire.
2. Aluminum building wire.
3. Metal-clad cable, Type MC.
4. Connectors and splices.

Related Requirements:

5. Section 260010 "Supplemental Requirements for Electrical" for additional abbreviations, definitions, submittals, qualifications, testing agencies, and other Project requirements applicable to Work specified in this Section.
6. Section 260011 "Facility Performance Requirements for Electrical" for seismic-load, wind-load, acoustical, and other field conditions applicable to Work specified in this Section.

##### 2.02 ACTION SUBMITTALS

Product Data: For each type of product.

##### 2.03 INFORMATIONAL SUBMITTALS

Field quality-control reports.

#### PRODUCTS

##### 2.04 COPPER BUILDING WIRE

Description: Flexible, insulated, and uninsulated, drawn copper current-carrying conductor with an overall insulation layer or jacket, or both, rated 600 V or less.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. [Alpha Wire Company.](#)
2. [American Bare Conductor.](#)
3. [Okonite Company \(The\).](#)
4. [Southwire Company.](#)
5. [WESCO.](#)

Standards:

6. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
7. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

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Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

Conductor Insulation:

8. Type THHN and Type THWN-2: Comply with UL 83.
9. Type XHHW-2: Comply with UL 44.

## 2.05 METAL-CLAD CABLE, TYPE MC

Description: A factory assembly of one or more current-carrying insulated conductors in an overall metallic sheath.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. [Alpha Wire Company.](#)
2. [American Bare Conductor.](#)
3. [Okonite Company \(The\).](#)
4. [Southwire Company.](#)
5. [WESCO.](#)

Standards:

6. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
7. Comply with UL 1569.
8. Conductor and Cable Marking: Comply with wire and cable marking according to UL's "Wire and Cable Marking and Application Guide."

Circuits:

9. Single circuit.

Conductors: Copper, complying with ASTM B3 for bare annealed copper and with ASTM B8 for stranded conductors.

Ground Conductor: Insulated.

Conductor Insulation:

10. Type THHN/THWN-2: Comply with UL 83.
11. Type XHHW-2: Comply with UL 44.
12. Armor: Steel, interlocked.

Jacket: PVC applied over armor.

## 2.06 CONNECTORS AND SPLICES

Description: Factory-fabricated connectors, splices, and lugs of size, ampacity rating, material, type, and class for application and service indicated; listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.

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Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. [3M Electrical Products.](#)
2. [ABB \(Electrification Products Division\).](#)
3. [Appleton - O-Z/Gedney; Emerson Electric Co., Automation Solutions.](#)
4. [Hubbell Incorporated, Power Systems.](#)
5. [ILSCO.](#)

Jacketed Cable Connectors: For steel and aluminum jacketed cables, zinc die-cast with set screws, designed to connect conductors specified in this Section.

Lugs: One piece, seamless, designed to terminate conductors specified in this Section.

6. Material: Copper.
7. Type: One or Two hole with standard barrels.
8. Termination: Compression or Crimp.

## **EXECUTION**

### **2.07 CONDUCTOR MATERIAL APPLICATIONS**

Feeders:

1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

Branch Circuits:

2. Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

### **2.08 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS**

Exposed Feeders: Type THHN/THWN-2, single conductors in raceway or Type XHHW-2, single conductors in raceway.

Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN/THWN-2, single conductors in raceway.

Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

Feeders Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

Exposed Branch Circuits, Including in Crawlspace: Type THHN/THWN-2, single conductors in raceway.

Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN/THWN-2, single conductors in raceway or Metal-clad cable, Type MC.

Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN/THWN-2, single conductors in raceway.

Branch Circuits Installed below Raised Flooring: Type THHN/THWN-2, single conductors in raceway.

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Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless steel, wire-mesh, strain relief device at terminations to suit application.

## **2.09 INSTALLATION, GENERAL**

Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

Complete raceway installation between conductor and cable termination points according to Section 260533 "Raceways and Boxes for Electrical Systems" prior to pulling conductors and cables.

Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

Complete cable tray systems installation according to Section 260536 "Cable Trays for Electrical Systems" prior to installing conductors and cables.

## **2.010 CONNECTIONS**

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-486B.

Make splices, terminations, and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

Wiring at Outlets: Install conductor at each outlet, with at least 6 inch (150 mm) of slack.

## **2.011 IDENTIFICATION**

Identify and color-code conductors and cables according to Section 260553 "Identification for Electrical Systems."

Identify each spare conductor at each end with identity number and location of other end of conductor, and identify as spare conductor.

## **2.012 FIRESTOPPING**

Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Section 078413 "Penetration Firestopping."

## **2.013 FIELD QUALITY CONTROL**

Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors and conductors feeding the following critical equipment and services for compliance with requirements:

Elevator.

2. Perform each of the following visual and electrical tests:

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Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.

Test bolted connections for high resistance using one of the following:

- 1) A low-resistance ohmmeter.
- 2) Calibrated torque wrench.
- 3) Thermographic survey.

Inspect compression-applied connectors for correct cable match and indentation.

Inspect for correct identification.

Inspect cable jacket and condition.

Insulation-resistance test on each conductor for ground and adjacent conductors. Apply a potential of 500 V(dc) for 300 V rated cable and 1000 V(dc) for 600 V rated cable for a one-minute duration.

Continuity test on each conductor and cable.

Uniform resistance of parallel conductors.

Cables will be considered defective if they do not pass tests and inspections.

Prepare test and inspection reports to record the following:

3. Procedures used.
4. Results that comply with requirements.
5. Results that do not comply with requirements, and corrective action taken to achieve compliance with requirements.

**END OF SECTION 260519**

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## SECTION 260526

### GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

#### PART 2 - GENERAL

##### 2.01 SUMMARY

Section includes grounding and bonding systems and equipment.

##### PRODUCTS

##### 2.02 SYSTEM DESCRIPTION

Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

Comply with UL 467 for grounding and bonding materials and equipment.

##### 2.03 MANUFACTURERS

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

1. [Burdny; Hubbell Incorporated, Construction and Energy.](#)
2. [Harger Lightning & Grounding.](#)
3. [ILSCO.](#)
4. [Siemens Industry, Inc., Energy Management Division.](#)

##### 2.04 CONDUCTORS

Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.

Bare Copper Conductors:

1. Solid Conductors: ASTM B3.
2. Stranded Conductors: ASTM B8.
3. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
4. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.

##### 2.05 CONNECTORS

Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.

Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

Bus-Bar Connectors: Compression type, copper, or copper alloy, with two wire terminals.

Beam Clamps: Mechanical type, terminal, ground wire access from four directions, with dual, tin-plated or silicon bronze bolts.

Cable-to-Cable Connectors: Compression type, copper, or copper alloy.

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Conduit Hubs: Mechanical type, terminal with threaded hub.

Ground Rod Clamps: Mechanical type, copper or copper alloy, terminal with hex head bolt.

U-Bolt Clamps: Mechanical type, copper or copper alloy, terminal listed for direct burial.

## EXECUTION

### 2.06 APPLICATIONS

Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.

Grounding Conductors: Green-colored insulation.

Conductor Terminations and Connections:

1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
2. Connections to Structural Steel: Welded connectors.

### 2.07 EQUIPMENT GROUNDING

Install insulated equipment grounding conductors with all feeders and branch circuits.

Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.

Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.

### 2.08 INSTALLATION

Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.

Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.

1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.

Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install bonding jumper to bond across flexible duct connections to achieve continuity.

Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact are galvanically compatible.

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3. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
4. Make connections with clean, bare metal at points of contact.
5. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
6. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
7. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.

## **2.09 FIELD QUALITY CONTROL**

Perform tests and inspections.

Tests and Inspections:

1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.

Grounding system will be considered defective if it does not pass tests and inspections.

Prepare test and inspection reports.

## **PART 2 - END OF SECTION 260526**

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## SECTION 260529

### HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

#### PART 2 - GENERAL

##### 2.01 SUMMARY

Section Includes:

1. Steel slotted support systems.
2. Aluminum slotted support systems.
3. Conduit and cable support devices.
4. Support for conductors in vertical conduit.
5. Mounting, anchoring, and attachment components, including powder-actuated fasteners, mechanical expansion anchors, concrete inserts, clamps, through bolts, toggle bolts, and hanger rods.

##### 2.02 ACTION SUBMITTALS

Shop Drawings: Signed and sealed by a qualified professional engineer. For fabrication and installation details for electrical hangers and support systems.

Hangers. Include product data for components.

Slotted support systems.

Equipment supports.

Delegated-Design Submittal: For hangers and supports for electrical systems.

Include design calculations and details of hangers.

#### PRODUCTS

##### 2.03 PERFORMANCE REQUIREMENTS

Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design hanger and support system.

Seismic Performance: Hangers and supports shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the supported equipment and systems will remain in place without separation of any parts when subjected to the seismic forces specified."
2. Component Importance Factor: 1.0.

##### 2.04 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

Steel Slotted Support Systems: Preformed steel channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.

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

Atkore International (Allied Tube & Conduit).

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[Atkore International \(Unistrut\).](#)

[Eaton \(B-line\).](#)

2. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
3. Material for Channel, Fittings, and Accessories: Galvanized steel.
4. Channel Width: Selected for applicable load criteria.
5. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
6. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
7. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
8. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

Aluminum Slotted Support Systems: Extruded-aluminum channels and angles with minimum 13/32-inch- (10-mm-) diameter holes at a maximum of 8 inches (200 mm) o.c. in at least one surface.

9. [Manufacturers:](#) Subject to compliance with requirements, provide products by one of the following:

[ABB \(Electrification Products Division\).](#)

[Atkore International \(Unistrut\).](#)

[Cooper Industries, Inc.](#)

10. Standard: Comply with MFMA-4 factory-fabricated components for field assembly.
11. Channel Material: 6063-T5 aluminum alloy.
12. Fittings and Accessories Material: 5052-H32 aluminum alloy.
13. Channel Width: Selected for applicable load criteria **<Insert dimension>**.

Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.

Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for nonarmored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be made of malleable iron.

Structural Steel for Fabricated Supports and Restraints: ASTM A36/A36M steel plates, shapes, and bars; black and galvanized.

Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

14. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
15. Concrete Inserts: Steel or malleable-iron, slotted support system units are similar to MSS Type 18 units and comply with MFMA-4 or MSS SP-58.

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16. Clamps for Attachment to Steel Structural Elements: MSS SP-58 units are suitable for attached structural element.
17. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM F3125/F3125M, Grade A325 (Grade A325M).
18. Toggle Bolts: All-steel springhead type.
19. Hanger Rods: Threaded steel.

## EXECUTION

### 2.05 APPLICATION

Comply with the following standards for application and installation requirements of hangers and supports, except where requirements on Drawings or in this Section are stricter:

1. NECA 1.
2. NECA 101
3. NECA 102.

Comply with requirements in Section 078413 "Penetration Firestopping" for firestopping materials and installation for penetrations through fire-rated walls, ceilings, and assemblies.

Comply with requirements for raceways and boxes specified in Section 260533 "Raceways and Boxes for Electrical Systems."

Maximum Support Spacing and Minimum Hanger Rod Size for Raceways: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch (6 mm) in diameter.

Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.

4. Secure raceways and cables to these supports with two-bolt conduit clamps.

### 2.06 SUPPORT INSTALLATION

Comply with NECA 1 and NECA 101 for installation requirements except as specified in this article.

Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb (90 kg).

Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:

1. To Wood: Fasten with lag screws or through bolts.
2. To New Concrete: Bolt to concrete inserts.
3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
4. To Existing Concrete: Expansion anchor fasteners.
5. To Steel: Beam clamps (MSS SP-58, Type 19, 21, 23, 25, or 27), complying with MSS SP-69.
6. To Light Steel: Sheet metal screws.

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7. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.

Drill holes for expansion anchors in concrete at locations and to depths that avoid the need for reinforcing bars.

## 2.07 PAINTING

Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

Touchup: Comply with requirements in Section 099123 "Interior Painting" for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A780.

## PART 2 - END OF SECTION 260529

## PART 2 -

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## SECTION 260533

### RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

#### PART 2 - GENERAL

##### 2.01 SUMMARY

A. Section Includes:

1. Type EMT-S raceways and elbows.
2. Type ERMC-S raceways, elbows, couplings, and nipples.
3. Type FMC-S raceways.
4. Type LFMC raceways.
5. Fittings for conduit, tubing, and cable.
6. Threaded metal joint compound.
7. Wireways and auxiliary gutters.
8. Metallic outlet boxes, device boxes, rings, and covers.
9. Cabinets, cutout boxes, junction boxes, pull boxes, and miscellaneous enclosures.
10. Cover plates for device boxes.

##### 2.02 ACTION SUBMITTALS

A. Product Data: For the following:

1. Wireways and auxiliary gutters.
2. Surface metal raceways.

B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

#### PART 2 - PRODUCTS

##### 2.01 TYPE EMT-S RACEWAYS AND ELBOWS

A. Steel Electrical Metal Tubing (EMT-S) and Elbows:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Atkore International (Allied Tube & Conduit).
  - b. Atkore International (Calconduit).
  - c. Topaz Lighting & Electric.
  - d. Zekelman Industries (Western Tube).
  - e. Zekelman Industries (Wheatland Tube).
2. Applicable Standards:

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- a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- b. General Characteristics:
  - 1) Reference Standards: UL 797 and UL Category Control Number FJMX.
  - 2) Material: Steel.
  - 3) Exterior Coating: Zinc.
  - 4) Interior Coating: Zinc with organic top coating.
- c. Options:
  - 1) Minimum Trade Size: 3/4 inch (21 mm).

## 2.02 TYPE ERM-C-S RACEWAYS, ELBOWS, COUPLINGS, AND NIPPLES

- A. Galvanized-Steel Electrical Rigid Metal Conduit (ERM-C-S-G), Elbows, Couplings, and Nipples:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. [Atkore International \(Allied Tube & Conduit\).](#)
    - b. [Atkore International \(Calconduit\).](#)
    - c. [Topaz Lighting & Electric.](#)
    - d. [Zekelman Industries \(Western Tube\).](#)
    - e. [Zekelman Industries \(Wheatland Tube\).](#)
  - 2. Applicable Standards:
    - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
    - b. General Characteristics:
      - 1) Reference Standards: UL 6 and UL Category Control Number DYIX.
      - 2) Exterior Coating: Zinc.
      - 3) Interior Coating: Zinc with organic top coating.
    - c. Options:
      - 1) Minimum Trade Size: 3/4 inch (21 mm).

## 2.03 TYPE FMC-S AND TYPE FMC-A RACEWAYS

- A. Steel Flexible Metal Conduit (FMC-S):
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. [ABB \(Electrification Products Division\).](#)
    - b. [Electri-Flex Company.](#)

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- c. [Topaz Lighting & Electric.](#)
- 2. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standard: UL 1 and UL Category Control Number DXUZ.
    - 2) Material: Steel.
  - c. Options:
    - 1) Minimum Trade Size: 3/4 inch (21 mm).

## 2.04 TYPE LFMC RACEWAYS

### A. Steel Liquidtight Flexible Metal Conduit (LFMC-S):

- 1. [Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [ABB \(Electrification Products Division\).](#)
  - b. [Anamet Electrical, Inc \(Anaconda Sealtite\).](#)
  - c. [Electri-Flex Company.](#)
- 2. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standard: UL 360 and UL Category Control Number DXHR.
    - 2) Material: Steel.
  - c. Options:
    - 1) Minimum Trade Size: 3/4 inch (21 mm).
    - 2) Colors: As indicated on Drawings.

### B. Stainless Steel Liquidtight Flexible Metal Conduit (LFMC-SS):

- 1. [Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [Electri-Flex Company.](#)
- 2. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standard: UL 360 and UL Category Control Number DXHR.

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2) Material: Stainless steel.

c. Options:

1) Minimum Trade Size: 3/4 inch (21 mm).

## 2.05 FITTINGS FOR CONDUIT, TUBING, AND CABLE

A. Fittings for Type ERM Raceways:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. Southwire Company.

b. Topaz Lighting & Electric.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number DWTT.

2) Material: Steel.

3) Coupling Method: Compression coupling or Raintight compression coupling with distinctive color gland nut.

c. Options:

1) Conduit Fittings for Hazardous (Classified) Locations: UL 1203.

2) Expansion and Deflection Fittings: UL 651 with flexible external bonding jumper.

B. Fittings for Type EMT Raceways:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

a. ABB (Electrification Products Division).

b. Atkore International (Allied Tube & Conduit).

c. Atkore International (Calconduit).

d. Southwire Company.

e. Topaz Lighting & Electric.

2. Applicable Standards:

a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.

b. General Characteristics:

1) Reference Standards: UL 514B and UL Category Control Number FKAV.

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- 2) Material: Steel.
- 3) Coupling Method: Compression coupling or Raintight compression coupling with distinctive color gland nut.

C. Fittings for Type FMC Raceways:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [American Fittings Corp. \(AMFICO\).](#)
  - b. [Liquid Tight Connector Co.](#)
  - c. [Southwire Company.](#)
2. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL 514B and UL Category Control Number ILNR.

D. Fittings for Type LFMC Raceways:

1. Manufacturers: Subject to compliance with requirements, provide products by the following:
  - a. [Liquid Tight Connector Co.](#)
2. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL 514B and UL Category Control Number DXAS.

## 2.06 WIREWAYS AND AUXILIARY GUTTERS

A. Metal Wireways and Auxiliary Gutters:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [ABB \(Electrification Products Division\).](#)
  - b. [Eaton \(B-line\).](#)
  - c. [nVent \(Hoffman\).](#)
2. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL 870 and UL Category Control Number ZOYX.

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- 2) Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- 3) Finish: Manufacturer's standard enamel finish.
- c. Options:
  - 1) Degree of Protection: Type 1 unless otherwise indicated.
  - 2) Wireway Covers: Screw-cover type unless otherwise indicated.

## 2.07 METALLIC OUTLET BOXES, DEVICE BOXES, RINGS, AND COVERS

### A. Metallic Outlet Boxes:

1. Description: Box having pryout openings, knockouts, threaded entries, or hubs in either the sides of the back, or both, for entrance of conduit, conduit or cable fittings, or cables, with provisions for mounting outlet box cover, but without provisions for mounting wiring device directly to box.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [ABB \(Electrification Products Division\).](#)
  - b. [Eaton \(Crouse-Hinds\).](#)
  - c. [Hubbell Premise Wiring; Hubbell Incorporated, Commercial, and Industrial.](#)
  - d. [Pass & Seymour; Legrand North America, LLC.](#)
  - e. [Wiremold; Legrand North America, LLC.](#)
3. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL 514A and UL Category Control Number QCIT.
  - c. Options:
    - 1) Material: Sheet steel.
    - 2) Sheet Metal Depth: Minimum 2 inch (50 mm).
    - 3) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb (23 kg).

### B. Metallic Conduit Bodies:

1. Description: Means for providing access to interior of conduit or tubing system through one or more removable covers at junction or terminal point. In the United States, conduit bodies are listed in accordance with outlet box requirements.
2. Applicable Standards:

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- a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
- b. General Characteristics:
  - 1) Reference Standards: UL 514A and UL Category Control Number QCIT.

C. Metallic Device Boxes:

1. Description: Box with provisions for mounting wiring device directly to box.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. ABB (Electrification Products Division).
  - b. Eaton (Crouse-Hinds).
  - c. Hubbell Premise Wiring; Hubbell Incorporated, Commercial, and Industrial.
3. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL 514A and UL Category Control Number QCIT.
  - c. Options:
    - 1) Material: Sheet steel.
    - 2) Sheet Metal Depth: minimum 2 inch (50 mm).
    - 3) Luminaire Outlet Boxes and Covers: Nonadjustable, listed and labeled for attachment of luminaire weighing up to 50 lb (23 kg).

D. Metallic Extension Rings:

1. Description: Ring intended to extend sides of outlet box or device box to increase box depth, volume, or both.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. Eaton (B-line).
  - b. Pass & Seymour; Legrand North America, LLC.
  - c. Topaz Lighting & Electric.
  - d. Wiring Device-Kellems; Hubbell Incorporated, Commercial, and Industrial.
3. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL 514A and UL Category Control Number QCIT.

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**2.08 CABINETS, CUTOUT BOXES, JUNCTION BOXES, PULL BOXES, AND MISCELLANEOUS ENCLOSURES**

**A. Indoor Sheet Metal Cabinets:**

1. Description: Enclosure provided with frame, mat, or trim in which swinging door or doors are or can be hung.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [Eaton \(B-line\).](#)
  - b. [nVent \(Hoffman\).](#)
  - c. [Schneider Electric USA \(Square D\).](#)
  - d. [Siemens Industry, Inc. \(Building Technologies Division\).](#)
3. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL Category Control Number CYIV.
      - a) Non-Environmental Characteristics: UL 50.
      - b) Environmental Characteristics: UL 50E.

**B. Indoor Sheet Metal Cutout Boxes:**

1. Description: Enclosure that has swinging doors or covers secured directly to and telescoping with walls of enclosure.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [Eaton \(B-line\).](#)
  - b. [Eaton \(Crouse-Hinds\).](#)
  - c. [nVent \(Hoffman\).](#)
  - d. [Schneider Electric USA \(Square D\).](#)
  - e. [Siemens Industry, Inc. \(Building Technologies Division\).](#)
3. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL Category Control Number CYIV.
      - a) Non-Environmental Characteristics: UL 50.
      - b) Environmental Characteristics: UL 50E.

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C. Indoor Sheet Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [Eaton \(B-line\).](#)
  - b. [Hubbell Industrial Controls; Hubbell Incorporated, Commercial and Industrial.](#)
  - c. [nVent \(Hoffman\).](#)
  - d. [Schneider Electric USA \(Square D\).](#)
3. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL Category Control Number BGUZ.
      - a) Non-Environmental Characteristics: UL 50.
      - b) Environmental Characteristics: UL 50E.

D. Indoor Cast-Metal Junction and Pull Boxes:

1. Description: Box with a blank cover that serves the purpose of joining different runs of raceway or cable.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [Appleton - EGS; Emerson Electric Co., Automation Solutions.](#)
  - b. [Appleton - O-Z/Gedney; Emerson Electric Co., Automation Solutions.](#)
  - c. [Eaton \(Crouse-Hinds\).](#)
3. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL Category Control Number BGUZ.
      - a) Non-Environmental Characteristics: UL 50.
      - b) Environmental Characteristics: UL 50E.

E. Indoor Sheet Metal Miscellaneous Enclosures:

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
  - a. [ABB \(Electrification Products Division\).](#)

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- b. [Eaton \(B-line\).](#)
  - c. [nVent \(Hoffman\).](#)
  - d. [Schneider Electric USA \(Square D\).](#)
2. Applicable Standards:
- a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards:
      - a) UL 1773 and UL Category Control Number XCKT.
      - b) Non-Environmental Characteristics: UL 50.
      - c) Environmental Characteristics: UL 50E.

## 2.09 COVER PLATES FOR DEVICES BOXES

### A. Metallic Cover Plates for Device Boxes:

- 1. [Manufacturers:](#) Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - a. [Eaton \(Crouse-Hinds\).](#)
  - b. [Eaton \(Wiring Devices - Arrow Hart\).](#)
  - c. [Pass & Seymour; Legrand North America, LLC.](#)
  - d. [Wiremold; Legrand North America, LLC.](#)
- 2. Applicable Standards:
  - a. Regulatory Requirements: Listed and labeled in accordance with NFPA 70 and marked for intended location and use.
  - b. General Characteristics:
    - 1) Reference Standards: UL 514D and UL Category Control Numbers QCIT and QCMZ.
    - 2) Wallplate-Securing Screws: Metal with head color to match wallplate finish.
  - c. Options:
    - 1) Damp and Wet Locations: Listed, labeled, and marked for location and use. Provide gaskets and accessories necessary for compliance with listing.
    - 2) Wallplate Material: 0.032 inch (0.8 mm) thick Type 302/304 non-magnetic stainless steel with brushed finish or Steel with white baked enamel, suitable for field painting or as indicated on architectural Drawings.

## PART 2 - EXECUTION

### 2.01 SELECTION OF RACEWAYS

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- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of raceways. Consult Architect for resolution of conflicting requirements.
- B. Outdoors:
1. Exposed Conduit: ERMCM.
  2. Concealed Conduit, Aboveground: ERMCM or EMT.
  3. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC.
- C. Indoors:
1. Hazardous Classified Locations: ERMCM.
  2. Exposed and Subject to Physical Damage: ERMCM. Raceway locations include the following:
    - a. Loading docks.
    - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
    - c. Mechanical rooms.
    - d. Gymnasiums.
  3. Exposed, Not Subject to Physical Damage: ERMCM.
  4. Concealed in Ceilings and Interior Walls and Partitions: ERMCM or EMT.
  5. Damp or Wet Locations: ERMCM.
  6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFMC or FMC.
- D. Stub-ups to Above Recessed Ceilings: Provide EMT or ERMCM for raceways.
- E. Raceway Fittings: Select fittings in accordance with NEMA FB 2.10 guidelines.
1. ERMCM: Provide threaded type fittings unless otherwise indicated.

## 2.02 SELECTION OF BOXES AND ENCLOSURES

- A. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for selection of boxes and enclosures. Consult Architect for resolution of conflicting requirements.
- B. Degree of Protection:
1. Indoors:
    - a. Type 1 unless otherwise indicated.
    - b. Damp or Dusty Locations: Type 12.
    - c. Surface Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
    - d. Flush Mounted in Kitchens and Other Locations Exposed to Oil or Coolants: Type 12.
    - e. Locations Exposed to Airborne Dust, Lint, Fibers, or Flyings: Type 4.

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- f. Locations Exposed to Hosedown: Type 4.
- g. Locations Exposed to Corrosive Agents: Type 4X.

C. Exposed Boxes Installed Less Than 6.5 ft. (2 m) Above Floor:

- 1. Provide cast-metal boxes.
- 2. Provide exposed cover. Flat covers with angled mounting slots or knockouts are prohibited.

## 2.03 INSTALLATION OF RACEWAYS

A. Installation Standards:

- 1. Unless more stringent requirements are specified in Contract Documents or manufacturers' written instructions, comply with NFPA 70 for installation of raceways. Consult Architect for resolution of conflicting requirements.
- 2. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- 3. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for hangers and supports.
- 4. Comply with NECA NEIS 101 for installation of steel raceways.
- 5. Install raceways square to the enclosure and terminate at enclosures without hubs with locknuts on both sides of enclosure wall. Install locknuts hand tight, plus one-quarter turn more.
- 6. Terminate threaded conduits into threaded hubs or with locknuts on inside and outside of boxes or cabinets. Install bushings on conduits up to 1-1/4 inch (35 mm) trade size and insulated throat metal bushings on 1-1/2 inch (41 mm) trade size and larger conduits terminated with locknuts.
- 7. Raceway Terminations at Locations Subject to Moisture or Vibration:
  - a. Provide insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.

B. General Requirements for Installation of Raceways:

- 1. Complete raceway installation before starting conductor installation.
- 2. Provide stub-ups through floors with coupling threaded inside for plugs, set flush with finished floor. Plug coupling until conduit is extended above floor to final destination or a minimum of 2 ft. (0.6 m) above finished floor.
- 3. Install no more than equivalent of three 90-degree bends in conduit run. Support within 12 inch (300 mm) of changes in direction.
- 4. Make bends in raceway using large-radius preformed ells except for parallel bends. Field bending must be in accordance with NFPA 70 minimum radii requirements. Provide only equipment specifically designed for material and size involved.
- 5. Conceal conduit within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- 6. Support conduit within 12 inch (300 mm) of enclosures to which attached.

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7. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal interior of raceways at the following points:
  - a. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - b. Where an underground service raceway enters a building or structure.
  - c. Conduit extending from interior to exterior of building.
  - d. Conduit extending into pressurized duct and equipment.
  - e. Conduit extending into pressurized zones that are automatically controlled to maintain different pressure set points.
  - f. Where otherwise required by NFPA 70.
8. Keep raceways at least 6 inch (150 mm) away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
9. Cut conduit perpendicular to the length. For conduits 2 inch (53 mm) trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length. Ream inside of conduit to remove burrs.
10. Install pull wires in empty raceways. Provide polypropylene or monofilament plastic line with not less than 200 lb (90 kg) tensile strength. Leave at least 12 inch (300 mm) of slack at both ends of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.

C. Requirements for Installation of Specific Raceway Types:

1. Types EMT-A, ERMC-A, and FMC-A:
  - a. Do not install aluminum raceways or fittings.
2. Types ERMC:
  - a. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound that maintains electrical conductivity to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
3. Type ERMC-S-PVC:
  - a. Follow manufacturer's installation instructions for clamping, cutting, threading, bending, and assembly.
  - b. Provide PVC-coated sealing locknut for exposed male threads transitioning into female NPT threads that do not have sealing sleeves, including transitions from PVC couplings/female adapters to Type ERMC-S-PVC elbows in direct-burial applications. PVC-coated sealing locknuts must not be used in place of conduit hub. PVC-coated sealing locknut must cover exposed threads on Type ERMC-S-PVC raceway.
  - c. Coat field-cut threads on PVC-coated raceway with manufacturer-approved corrosion-preventing conductive compound prior to assembly.
4. Types FMC, LFMC:

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- a. Comply with NEMA RV 3. Provide a maximum of 36 inch (915 mm) of flexible conduit for recessed and semi recessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
5. Types PVC and EPEC:
  - a. Do not install Type PVC or Type EPEC conduit unless directed on drawings.
  - b. Comply with manufacturer's written instructions for solvent welding and fittings.
- D. Stub-ups to Above Recessed Ceilings:
  1. Provide EMT or ERMC for raceways.
  2. Provide a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- E. Raceway Fittings: Install fittings in accordance with NEMA FB 2.10 guidelines.
  1. ERMC-S-PVC: Provide only fittings listed for use with this type of conduit. Patch and seal joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Provide sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
  2. EMT: Provide compression, steel fittings. Comply with NEMA FB 2.10.
  3. Flexible Conduit: Provide only fittings listed for use with flexible conduit type. Comply with NEMA FB 2.20.
- F. Expansion-Joint Fittings:
  1. Install in runs of aboveground ERMC and EMT conduit that are located where environmental temperature change may exceed 100 deg F (55 deg C) and that have straight-run length that exceeds 100 ft. (30 m).
  2. Install type and quantity of fittings that accommodate temperature change listed for the following locations:
    - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F (70 deg C) temperature change.
    - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F (86 deg C) temperature change.
    - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F (70 deg C) temperature change.
  3. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F (0.0115 mm per meter of length of straight run per deg C) of temperature change for metal conduits.
  4. Install expansion fittings at locations where conduits cross building or structure expansion joints.
  5. Install expansion-joint fitting with position, mounting, and piston setting selected in accordance with manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- G. Raceways Penetrating Rooms or Walls with Acoustical Requirements:

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1. Seal raceway openings on both sides of rooms or walls with acoustically rated putty or firestopping.

#### **2.04 INSTALLATION OF BOXES AND ENCLOSURES**

- A. Provide boxes in wiring and raceway systems wherever required for pulling of wires, making connections, and mounting of devices or fixtures.
- B. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- C. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
- D. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- E. Locate boxes so that cover or plate will not span different building finishes.
- F. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
- G. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
- H. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
- I. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
- J. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:
  1. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
  2. Provide gaskets for wallplates and covers.

#### **2.05 FIRESTOPPING**

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

#### **2.06 PROTECTION**

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
  1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
  2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

#### **2.07 CLEANING**

- A. Boxes: Remove construction dust and debris from device boxes, outlet boxes, and floor-mounted enclosures before installing wallplates, covers, and hoods.

#### **END OF SECTION 260533**

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## SECTION 260553

### IDENTIFICATION FOR ELECTRICAL SYSTEMS

#### PART 2 - GENERAL

##### 2.01 SUMMARY

- A. Section Includes:
  - 1. Labels.
  - 2. Bands and tubes.
  - 3. Tapes and stencils.
  - 4. Signs.
  - 5. Cable ties.
  - 6. Miscellaneous identification products.

##### 2.02 ACTION SUBMITTALS

- A. Identification Schedule: For each piece of electrical equipment and electrical system components to be an index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.
- B. Delegated-Design Submittal: For arc-flash hazard study.

#### PART 2 - PRODUCTS

##### 2.01 PERFORMANCE REQUIREMENTS

- A. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- B. Comply with ANSI Z535.4 for safety signs and labels.
- C. Comply with NFPA 70E and Section 260573.19 "Arc-Flash Hazard Analysis" requirements for arc-flash warning labels.
- D. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- E. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

##### 2.02 COLOR AND LEGEND REQUIREMENTS

- A. Color-Coding for Phase- and Voltage-Level Identification, 600 V or Less: Use colors listed below for ungrounded feeder and branch-circuit conductors.
  - 1. Color shall be factory applied or field applied for sizes larger than No. 8 AWG if authorities having jurisdiction permit.
  - 2. Colors for 208/120-V Circuits:
    - a. Phase A: Black.
    - b. Phase B: Red.

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- c. Phase C: Blue.
- 3. Colors for 480/277-V Circuits:
  - a. Phase A: Brown.
  - b. Phase B: Orange.
  - c. Phase C: Yellow.
- 4. Color for Neutral: White or gray.
- 5. Color for Equipment Grounds: Green.
- B. Warning Label Colors:
  - 1. Identify system voltage with black letters on an orange background.
- C. Warning labels and signs shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: "DANGER - ELECTRICAL SHOCK HAZARD - EQUIPMENT HAS MULTIPLE POWER SOURCES."
- D. Equipment Identification Labels:
  - 1. Black letters on a white field.

## 2.03 LABELS

- A. Self-Adhesive Wraparound Labels: Preprinted, 3-mil- (0.08-mm-) thick, vinyl flexible label with acrylic pressure-sensitive adhesive.
  - 1. Self-Lamination: Clear; UV-, weather- and chemical-resistant; self-laminating, protective shield over the legend. Labels sized such that the clear shield overlaps the entire printed legend.
  - 2. Marker for Labels:
    - a. Machine-printed, permanent, waterproof, black ink recommended by printer manufacturer.
- B. Self-Adhesive Labels: Vinyl, thermal, transfer-printed, 3-mil- (0.08-mm-) thick, multicolor, weather- and UV-resistant, pressure-sensitive adhesive labels, configured for intended use and location.
  - 1. Minimum Nominal Size:
    - a. 1-1/2 by 6 inches (37 by 150 mm) for raceway and conductors.
    - b. 3-1/2 by 5 inches (76 by 127 mm) for equipment.
    - c. As required by authorities having jurisdiction.

## 2.04 TAPES AND STENCILS

- A. Marker Tapes: Vinyl or vinyl-cloth, self-adhesive wraparound type, with circuit identification legend machine printed by thermal transfer or equivalent process.
- B. Self-Adhesive Vinyl Tape: Colored, heavy duty, waterproof, fade resistant; not less than 3 mils (0.08 mm) thick by 1 to 2 inches (25 to 50 mm) wide; compounded for outdoor use.

## 2.05 SIGNS

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A. Baked-Enamel Signs:

1. Preprinted aluminum signs punched or drilled for fasteners, with colors, legend, and size required for application.
2. 1/4-inch (6.4-mm) grommets in corners for mounting.
3. Nominal Size: 7 by 10 inches (180 by 250 mm).

B. Laminated Acrylic or Melamine Plastic Signs:

1. Engraved legend.
2. Thickness:
  - a. For signs up to 20 sq. in. (129 sq. cm), minimum 1/16 inch (1.6 mm) thick.
  - b. For signs larger than 20 sq. in. (129 sq. cm), 1/8 inch (3.2 mm) thick.
  - c. Self-adhesive.
  - d. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.

## 2.06 CABLE TIES

A. General-Purpose Cable Ties: Fungus inert, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black, except where used for color-coding.

B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self-extinguishing, one piece, self-locking, and Type 6/6 nylon.

1. Minimum Width: 3/16 inch (5 mm).
2. Tensile Strength at 73 Deg F (23 Deg C) according to ASTM D638: 12,000 psi (82.7 MPa).
3. Temperature Range: Minus 40 to plus 185 deg F (Minus 40 to plus 85 deg C).
4. Color: Black.

## 2.07 MISCELLANEOUS IDENTIFICATION PRODUCTS

A. Paint: Comply with requirements in painting Sections for paint materials and application requirements. Retain paint system applicable for surface material and location (exterior or interior).

B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

## PART 2 - EXECUTION

### 2.01 PREPARATION

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- A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

## 2.02 INSTALLATION

- A. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.
- B. Install identifying devices before installing acoustical ceilings and similar concealment.
- C. Verify identity of each item before installing identification products.
- D. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.
- E. Apply identification devices to surfaces that require finish after completing finish work.
- F. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.
- G. System Identification for Raceways and Cables under 600 V: Identification shall completely encircle cable or conduit. Place identification of two-color markings in contact, side by side.
1. Secure tight to surface of conductor, cable, or raceway.
- H. Accessible Fittings for Raceways: Identify the covers of each junction and pull box of the following systems with the wiring system legend and system voltage. System legends shall be as follows:
1. "EMERGENCY POWER."
  2. "POWER."
- I. Self-Adhesive Wraparound Labels: Secure tight to surface at a location with high visibility and accessibility.
- J. Self-Adhesive Labels:
1. On each item, install unique designation label that is consistent with wiring diagrams, schedules, and operation and maintenance manual.
  2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high label; where two lines of text are required, use labels 2 inches (50 mm) high.
- K. Self-Adhesive Vinyl Tape: Secure tight to surface at a location with high visibility and accessibility.
1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.
- L. Tape and Stencil: Comply with requirements in painting Sections for surface preparation and paint application.
- M. Baked-Enamel Signs:
1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.

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2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on minimum 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use signs minimum 2 inches (50 mm) high.

N. Laminated Acrylic or Melamine Plastic Signs:

1. Attach signs that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
2. Unless otherwise indicated, provide a single line of text with 1/2-inch- (13-mm-) high letters on 1-1/2-inch- (38-mm-) high sign; where two lines of text are required, use labels 2 inches (50 mm) high.

O. Cable Ties: General purpose, for attaching tags, except as listed below:

1. Outdoors: UV-stabilized nylon.

## 2.03 IDENTIFICATION SCHEDULE

- A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.
- B. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.
- C. Accessible Fittings for Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive labels containing the wiring system legend and system voltage. System legends shall be as follows:
1. "EMERGENCY POWER."
  2. "POWER."
- D. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use self-adhesive vinyl tape to identify the phase.
1. Locate identification at changes in direction, at penetrations of walls and floors, at 50-foot (15-m) maximum intervals in straight runs, and at 25-foot (7.6-m) maximum intervals in congested areas.
- E. Control-Circuit Conductor Identification: For conductors and cables in pull and junction boxes, manholes, and handholes, use self-adhesive labels with the conductor or cable designation, origin, and destination.
- F. Control-Circuit Conductor Termination Identification: For identification at terminations, provide self-adhesive labels with the conductor designation.
- G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive labels.
1. Apply to exterior of door, cover, or other access.
  2. For equipment with multiple power or control sources, apply to door or cover of equipment, including, but not limited to, the following:
    - a. Power-transfer switches.
    - b. Controls with external control power connections.

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H. Arc Flash Warning Labeling: Self-adhesive labels.

I. Equipment Identification Labels:

1. Indoor Equipment: Self-adhesive label, Baked-enamel signs or Laminated acrylic or melamine plastic sign.
2. Outdoor Equipment: Laminated acrylic or melamine sign.
3. Equipment to Be Labeled:
  - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be in the form of a self-adhesive, engraved, laminated acrylic or melamine label.
  - b. Enclosures and electrical cabinets.
  - c. Access doors and panels for concealed electrical items.
  - d. Transformers: Label that includes tag designation indicated on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
  - e. Emergency system boxes and enclosures.
  - f. Enclosed switches.
  - g. Enclosed circuit breakers.
  - h. Enclosed controllers.
  - i. Contactors.

**END OF SECTION 260553**

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## SECTION 260923

### LIGHTING CONTROL DEVICES

#### PART 2 - GENERAL

##### 2.01 SUMMARY

- A. Section Includes:
  - 1. Indoor occupancy and vacancy sensors.
  - 2. Switchbox-mounted occupancy sensors.
  - 3. Conductors and cables.
- B. Related Requirements:
  - 1. Section 262726 "Wiring Devices" for wall-box dimmers, non-networkable wall-switch occupancy sensors, and manual light switches.

##### 2.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
  - 1. Show installation details for the following:
    - a. Occupancy sensors.
    - b. Vacancy sensors.
  - 2. Interconnection diagrams showing field-installed wiring.
  - 3. Include diagrams for power, signal, and control wiring.
- C. Field quality-control reports.
- D. Sample Warranty: For manufacturer's warranties.

##### 2.03 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in operation and maintenance manuals.

##### 2.04 WARRANTY

- A. Manufacturer's Warranty: Manufacturer and Installer agree to repair or replace lighting control devices that fail(s) in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Faulty operation of lighting control software.
    - b. Faulty operation of lighting control devices.
  - 2. Warranty Period: Two years from date of Substantial Completion.

#### PART 2 - PRODUCTS

##### 2.01 INDOOR OCCUPANCY AND VACANCY SENSORS

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A. General Requirements for Sensors:

1. Ceiling-mounted, solid-state indoor occupancy sensors.
2. Dual technology.
3. Separate power pack.
4. Hardwired connection to switch.
5. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
6. Power: Line voltage.
7. Power Pack: Dry contacts rated for 20-A LED load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
8. Mounting:
  - a. Sensor: Suitable for mounting in any position on a standard outlet box.
  - b. Relay: Externally mounted through a 1/2-inch (13-mm) knockout in a standard electrical enclosure.
  - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
9. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
10. Bypass Switch: Override the "on" function in case of sensor failure.

B. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. Detector Sensitivity: Detect occurrences of 6-inch- (150-mm-) minimum movement of any portion of a human body that presents a target of not less than 36 sq. in. (232 sq. cm), and detect a person of average size and weight moving not less than 12 inches (305 mm) in either a horizontal or a vertical manner at an approximate speed of 12 inches/s (305 mm/s).
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
4. Detection Coverage (Room, Wall Mounted): Detect occupancy anywhere within a 180-degree pattern centered on the sensor over an area of [**1000 square feet (110 square meters)**] [**2000 square feet (220 square meters)**] [**3000 square feet (330 square meters)**] when mounted 48 inches (1200 mm) above finished floor.

## 2.02 SWITCHBOX-MOUNTED OCCUPANCY SENSORS

A. General Requirements for Sensors: Automatic-wall-switch occupancy sensor with manual on-off switch, suitable for mounting in a single gang switchbox.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

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2. Occupancy Sensor Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn lights off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.
3. Operating Ambient Conditions: Dry interior conditions, 32 to 120 deg F (0 to 49 deg C).
4. Switch Rating: Not less than 800-VA LED load at 120 V, 1200-VA LED load at 277 V, and 800-W incandescent.

**B. Wall-Switch Sensor:**

1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of **2100 sq. ft (196 sq. m)**.
2. Sensing Technology: Dual technology - PIR and ultrasonic.
3. Capable of controlling load in three-way application.
4. Voltage: Dual voltage - 120 and 277 V.
5. Ambient-Light Override: Concealed, field-adjustable, light-level sensor from 10 to 150 fc (108 to 1600 lux). The switch prevents the lights from turning on when the light level is higher than the set point of the sensor.
6. Concealed, "off" time-delay selector at 30 seconds and 5, 10, and 20 minutes.
7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space and helps eliminate false "off" switching.
8. Color: White.
9. Faceplate: Color matched to switch.

**2.03 CONDUCTORS AND CABLES**

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables."

**PART 2 - EXECUTION**

**2.01 EXAMINATION**

- A. Examine lighting control devices before installation. Reject lighting control devices that are wet, moisture damaged, or mold damaged.
- B. Examine walls and ceilings for suitable conditions where lighting control devices will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

**2.02 INSTALLATION OF SENSORS**

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- A. Comply with NECA 1.
- B. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- C. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.

#### **2.03 INSTALLATION OF WIRING**

- A. Comply with NECA 1.
- B. Wiring Method: Comply with Section 260519 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
- C. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors in accordance with conductor manufacturer's written instructions.
- D. Size conductors in accordance with lighting control device manufacturer's written instructions unless otherwise indicated.
- E. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

#### **2.04 IDENTIFICATION**

- A. Identify components and power and control wiring in accordance with Section 260553 "Identification for Electrical Systems."
  - 1. Identify controlled circuits in lighting contactors.
  - 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

#### **2.05 FIELD QUALITY CONTROL**

- A. Perform the following tests and inspections:
  - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

#### **2.06 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting lighting control devices to suit actual occupied conditions.
  - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.

#### **END OF SECTION 260923**

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## SECTION 26 09 23.1

### LIGHTING CONTROL SYSTEMS

#### PART 2 - GENERAL

##### 1.1 SUMMARY

###### 1.1.1 Section Includes:

1.1.1.1 Low-voltage lighting control system.

1.1.1.2 Low voltage wall stations

1.1.1.3 Power interfaces

1.1.1.4 Wired sensors

###### 1.1.2 Related Requirements:

1.1.2.1 Section 26 05 19: Low-Voltage Electrical Power Conductors and Cables.

1.1.2.2 Section 26 05 33: Raceways and Boxes for Electrical Systems.

1.1.2.3 Section 26 24 16: Panelboards.

1.1.2.4 Section 26 09 23: Lighting Control Devices.

1.1.2.5 Section 26 51 19: LED Interior Lighting

##### 1.2 SUMMARY

1.2.1 The lighting controls system specified in this section shall provide time-based, sensor-based (both occupancy and daylight), and manual lighting control.

1.2.2 The system shall be capable of turning lighting loads on/off as well as dimming lights. Specific dimmers will be capable of "dimming lights to off".

1.2.3 All system devices shall be networked together, enable digital communication between devices, and shall be individually addressed.

1.2.4 The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity, even if network connectivity to the greater system is lost.

1.2.5 The system architecture shall facilitate remote operation via a computer station.

1.2.6 The system shall not require any centrally hardwired switching equipment.

1.2.7 The system shall be capable of wireless, wired, or hybrid wireless/wired architectures.

##### 1.3 SUBMITTALS

1.3.1 Submit a complete one-line diagram of the proposed system configuration for Architect/Engineer's review. The riser diagram shall identify but not be limited to wiring, equipment, components, interconnection with other systems, and location and type of raceways.

1.3.2 Manufacturer's Data: Submit catalog cuts and description of each system component.

1.3.3 Provide wiring diagrams and installation details for lighting control equipment.

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- 1.3.4 Shop Drawings: Submit a complete set of detailed Shop Drawings for the entire lighting control system; the shop drawings shall include but not be limited to relay panels with designations and dimensions, day light sensors locations based on manufacturer's recommendations, and system components with manufacturer's part numbers.
- 1.3.5 Installation Instructions: Submit manufacturer's written installation instructions, wiring diagrams. Instructions shall include recommendations for handling of equipment and parts, and protection and storage requirements.
- 1.3.6 Riser Diagrams – Typical per room type (detailed drawings showing device interconnectivity of devices).
- 1.3.7 Example Contractor Startup/Commissioning Worksheet – must be completed prior to factory startup.
- 1.3.8 Hardware and Software Operation Manuals.

#### **1.4 QUALITY ASSURANCE**

- 1.4.1 Components shall be listed and labeled by Underwriter's Laboratories (UL), or another Nationally Recognized Testing Laboratory (NRTL).
- 1.4.2 Lighting Control Systems shall comply with the state of California Building and Electrical Codes, and Title 24 energy requirements in effect at time of submittal for building permit.
- 1.4.3 Conduct a coordination meeting with the lighting control contractor, electrical contractor, EOR, Manufacturer Representative, and the OAR to validate the location of lighting control system components, including daylight sensors. Sensors shall be located based on manufacturer's recommendations.

#### **1.5 WARRANTY**

- 1.5.1 Manufacturer shall provide a five year material warranty.
- 1.5.2 Installer shall provide a two year installation warranty.
- 1.5.3 Technical support contact.

#### **1.6 SYSTEM REQUIREMENTS**

- 1.6.1 System shall have an architecture that is based upon three main concepts: 1) intelligent lighting control devices 2) standalone lighting control zones 3) network backbone for remote or time based operation.
- 1.6.2 Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.
- 1.6.3 Intelligent lighting control devices shall communicate digitally, require <7 mA of current to function (Graphic wall stations excluded), and possess RJ-45 style connectors.
- 1.6.4 Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher level network backbone.

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- 1.6.5 Devices within a lighting control zone shall be connected with CAT-5e low voltage cabling in any order.
- 1.6.6 Lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.
- 1.6.7 Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.
- 1.6.8 Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, controls enabled luminaires, or from the network backbone. Standalone “bus power supplies” shall not be required in all cases.
- 1.6.9 All switching and dimming for a specific lighting zone shall take place within the devices located in the zone itself (i.e. not in remotely located devices such as panels) to facilitate system robustness and minimize wiring requirements. Specific applications that require centralized or remote switching shall be capable of being accommodated.
- 1.6.10 System shall have one or more primary wall mounted network control “gateway” devices that are capable of accessing and controlling connected system devices and linking into an Ethernet LAN.
- 1.6.11 System shall use “bridge” devices that route communication and distribute power for up to 8 directly connected lighting zones together for purposes of decreasing system wiring requirements.
- 1.6.12 System shall have a web-based software management program that enables remote system control, status monitoring, and creation of lighting control schedules and profiles.
- 1.6.13 Individual lighting zones shall be capable of being segmented into several “local” channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.
- 1.6.14 Devices located in different lighting zones shall be able to communicate occupancy, photocell (non-dimming), and switch information via either the wired or Wi-Fi backbone.
- 1.6.15 Control software shall enable logging of system performance data and presenting this information in a web-based format and downloadable to .CSV files.
- 1.6.16 System shall provide the option of having pre-terminated plenum rated CAT-5e cabling supplied with hardware.
- 1.6.17 System software shall provide real time status of each relay, each zone and each group.
- 1.6.18 Lighting control system shall be able to be monitored and take commands from a remote Personal Computer (PC); should the remote PC go off-line system programming uploaded to the lighting control system shall continue to operate as intended. Systems requiring an online PC or server for normal operation are not acceptable
- 1.6.19 Devices shall be able to be pre-addressed at the factory. Systems requiring field addressing only are not acceptable.
- 1.6.20 Programs, schedules, time of day, etcetera, shall be held in non-volatile memory at power failure. At restoration of power, lighting control system shall implement programs required by current time and date.

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- 1.6.21 System shall be capable of flashing lighting OFF/ON for any relay or lighting zone prior to the lights being turned OFF. The warning interval time between the flash and the final lights off signal shall be definable for each zone. Occupant shall be able to override any scheduled OFF sweep using local lighting zone override switches within the zone or occupied space. Occupant override time shall be pre-programmed not to exceed two hours, or current California Title 24 requirements.

## **PART 2 - PRODUCTS**

### **2.1 LIGHTING CONTROL**

- 2.1.1 Lighting Control System shall be nLight by Acuity Controls or equal.
- 2.1.1.1 Shall be preprogrammed and preassembled with control equipment and relays as indicated on the lighting plans.
- 2.1.1.2 Each device shall be rated for 120 or 277 VAC.
- 2.1.1.3 Shall be preassembled, preprogrammed, and include relays capable of switching 20 amps lighting loads for 120 or 277 VAC.
- 2.1.1.4 Power packs, low voltage switches, interior light sensors, exterior light sensors, and associated control electronics shall be furnished by nLight by Acuity Controls , or equal.

### **2.2 CONTROL MODULE (GATEWAY)**

- 2.2.1 Control module shall be a device that facilitates communication and time-based control of downstream network devices and linking into an Ethernet network.
- 2.2.2 Devices shall have a user interface that is capable of wall mounting and powered by low voltage.
- 2.2.3 Control device shall have three RJ-45 ports for connection other backbone device bridges or directly to the lighting control devices, up to 128 per port.
- 2.2.4 Devices shall automatically detect all devices downstream of it, have a standard and astronomical internal time clock, one RJ-45 10/100 BaseT Ethernet connection, and USB port.
- 2.2.5 Each control gateway device shall be capable of linking 1500 devices to the management software, with reduced memory version capable of support up to 400 devices.

### **2.3 COMMUNICATION BRIDGES**

- 2.3.1 Device shall surface mount on a standard 4"x4" square junction box with 8 RJ-45 ports.
- 2.3.2 Device shall be capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to Control Gateway.
- 2.3.3 Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply or delivered via CAT-5 cabled connection.
- 2.3.4 Device shall be capable of redistributing power from its local supply and connect lighting controls zones with excess power to lighting control zones with insufficient local power. This architecture also enables loss of power to a particular area to be less impactful on network lighting system.

### **2.4 NETWORKED SYSTEM POWER (RELAYS) PACKS**

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- 2.4.1 Power Packs shall incorporate one Class 1 Relay, 0-10 VDC dimming output, and contribute low voltage power to the rest of the system. Secondary Packs shall incorporate the relay and 0-10 VDC or line voltage dimming output but shall not be required to contribute system power. Power Supplies shall provide system power only but are not required to switch line voltage circuit. Auxiliary Relay Packs shall switch low voltage circuits only.
- 2.4.2 Power Packs shall accept 120 or 277, be plenum rated, and provide Class 2 power to the system.
- 2.4.3 All devices shall have two RJ-45 ports.
- 2.4.4 Every Power Pack parameter shall be available and configurable remotely from the software and locally via the device push-button.
- 2.4.5 Power Pack shall be securely mounted to junction box location through a threaded 3/4" chase nipple or be capable of being secured within a luminaire driver channel. Plastic clips into junction box shall not be acceptable. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads.
- 2.4.6 Power Packs (Secondary) shall be available that provide up to 16 Amp switching of all lighting load types.
- 2.4.7 Power Packs shall be available to provide up to 5 amps switching of all lighting load types as well as 0-10VC dimming of LED drivers.
- 2.4.8 Specific Power/Secondary Packs shall be available that are UL 924 listed for switching of Emergency circuits.
- 2.4.9 Relays shall be nLight by Acuity Controls, or equal.

## 2.5 LOW VOLTAGE SWITCHES

- 2.5.1 Low voltage switches shall be wired per the lighting control manufactures requirements. Digital switches shall be part of the lighting control system network. Analog switches shall be wired to lighting control panel designated by manufacturer. Use nLight by Acuity Controls, or equal.
- 2.5.2 Keyed switches shall be analog or digital and connect to programmable inputs in the nearest lighting control system or be digital and connect to the lighting control system network.
- 2.5.3 Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
- 2.5.4 All devices shall have two RJ-45 ports.
- 2.5.5 All devices shall provide toggle switch control and raise/lower dimming control.
- 2.5.6 Devices shall be white in color.

## 2.6 OCCUPANCY SENSORS

- 2.6.1 Occupancy Sensors:
  - 2.6.1.1 Ceiling-Mounted Dual Technology Sensors:
    - 2.6.1.1.1 Sensors shall be dual technology infrared-ultrasonic capable of detecting presence in floor area to be controlled, by detecting Doppler shifts in transmitted ultrasound and infrared technology.

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- 2.6.1.1.2 Detection shall be maintained when a person moves only within a maximum distance of 12 inches, in either a horizontal or vertical manner, at approximate speed of 12 inches per second. Lights shall not go off when a person is reading or writing while seated at a desk.
- 2.6.1.1.3 Each sensor shall be furnished with a convenient shunt provision, which will enable a person to by-pass sensor in event of failure.
- 2.6.1.1.4 Sensitivity shall not change more than ten percent in temperature range of 0 degrees F. to 120 degrees F., and in humidity range of ten percent to 80 percent. Sensitivity adjustment shall be provided for each technology.
- 2.6.1.1.5 Time delay range shall be adjustable from 15 seconds to 15 minutes.
- 2.6.1.1.6 Sensors shall be available with one or two occupancy “poles”, each of which provides a programmable time delay.
- 2.6.1.1.7 Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
- 2.6.1.1.8 All sensors shall have two RJ-45 ports or capable of utilizing a splitter.
- 2.6.1.1.9 All sensors shall have the ability to detect when it is not receiving valid communication (via CAT-5) and blink its LED in a pattern to visually indicated a potential wiring issue.
- 2.6.1.1.10 Every sensor parameter shall be available and configurable remotely from the software and locally via the device push button.
- 2.6.1.1.11 Sensors shall be able to function together with other sensors in order to provide expanded coverage areas by simply daisy-chain wiring together the units with CAT-5 wiring.
- 2.6.1.1.12 Manufacturers: nLight by Acuity Controls, or equal.

### **PART 3 - EXECUTION**

#### **3.1 GENERAL**

- 3.1.1 Lighting control system shall not be used for any other purpose other than its intended use and application.
- 3.1.2 Provide required interconnections with other systems such as emergency power sources, fire alarm systems, and building management system as required or indicated on drawings.
- 3.1.3 Installation shall meet or exceed standard practice of workmanship and quality.
- 3.1.4 Drawings generally indicate work to be provided, but do not indicate bends, transitions, or special fittings required to clear beams, girders, or other work already in place. Investigate conditions where conduits are to be installed, and furnished and install required fittings.

#### **3.2 INSTALLATION AND SET-UP**

- 3.2.1 Verify that conduit for line voltage wires enters panel in line voltage areas and conduit for low-voltage control wires enters panel on low-voltage areas. Refer to manufacturer's drawings for location of line and low-voltage areas.
- 3.2.2 Digital switches and wire shall be according to lighting control manufactures requirements.

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- 3.2.3 Maintain the required bending radius of conductors inside cabinets.
- 3.2.4 To facilities start up, all devices daisy-chained together via CAT-5 shall automatically be grouped together into a functional lighting control zone.
- 3.2.5 All lighting control zones shall be capable to function according to default settings once adequate power is applied and before any system software is installed.
- 3.2.6 Once software is installed, system shall be able to auto-discover all system devices without requiring and commissioning.
- 3.2.7 All system devices shall be capable of being given user defined names.
- 3.2.8 All devices within the network shall be able to have their own firmware upgraded remotely and without being physically uninstalled for purpose of upgrading functionality at a later date.
- 3.2.9 All sensor devices shall have the ability to detect improper communication wiring and blink it's LED in a specific cadence as to alert installation/startup personnel.
- 3.2.10 Follow manufacturers' instructions for installation.
- 3.2.11 Contractor shall have a meeting with the manufacturer to review installation prior to rough in.
- 3.2.12 Programming shall be done by a manufacturer's representative.
- 3.2.13 Photocells shall be calibrated after furniture has been installed.

### 3.3 OPERATING/SERVICE MANUALS

- 3.3.1 Service and Operation Manuals:
  - 3.3.1.1 Submit operation and service manuals. Complete manuals shall be bound in flexible binders and data shall be typewritten or drafted.
  - 3.3.1.2 Provide a printed copy of the systems configuration as programmed, including system labeling codes, and passwords.
  - 3.3.1.3 Provide an electronic copy on compact disk of the system configuration program.
  - 3.3.1.4 Manuals shall include instructions necessary for proper operation and servicing of system and shall include complete wiring circuit diagrams of system, wiring destination schedules for circuits and replacement part numbers. Manuals shall include as-built cable Project site plot plans and floor plans indicating cables, both underground and in each building with conduit, and as-built coding used on cables. Programming forms of systems shall be submitted with complete information.
  - 3.3.1.5 Record Drawings: Provide a copy on vellum of Project site and building drawings, indicating location of equipment, conduit and cable runs, and other pertinent information.

### 3.4 PROTECTION

- 3.4.1 Protect the Work of this section until Substantial Completion.

### 3.5 TESTING

- 3.5.1 A. Set-up, commissioning and testing of the lighting control system, and Owner instruction shall include:
  - 3.5.1.1 Confirmation of system programming.

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- 3.5.1.2 Confirmation of operation of individual relays, switches, occupancy sensors and daylight sensors.
- 3.5.1.3 Operation of system's features under normal and emergency operations.
- 3.5.1.4 Before energizing check and demonstrate in the presence of the Project Inspector that cables and wire connections are free from short circuits, ground faults, and that there is continuity, and necessary insulation.
- 3.5.1.5 Confirm system operations and functionality.
- 3.5.1.6 Check system interface response to other systems such as fire alarm and emergency power system conditions.
- 3.5.1.7 Provide training to cover installation, maintenance, troubleshooting, programming, and repair and operation of the lighting control system.

### **3.6 INSTRUCTION PERIODS**

- 3.6.1 Before Substantial Completion, arrange and provide an eight hour Owner instruction period for designated personnel.

### **3.7 SPARE PARTS**

- 3.7.1 Provide a minimum of five percent spare parts of each type of relay, sensors, switches, and peripheral devices.

### **3.8 CLEANUP**

- 3.8.1 Remove rubbish, debris, and waste materials and legally dispose of off the Project site.

**END OF SECTION 26 09 23.1**

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## SECTION 262213

### LOW-VOLTAGE DISTRIBUTION TRANSFORMERS

#### PART 2 - GENERAL

##### 2.01 SUMMARY

- A. Section includes distribution, dry-type transformers with a nominal primary and secondary rating of 600 V and less, with capacities up to 1500 kVA.

##### 2.02 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and size of transformer.
  2. Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features, and performance for each type and size of transformer.
- B. Shop Drawings:
1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  2. Vibration Isolation Base Details: Detail fabrication including anchorages and attachments to structure and to supported equipment.
  3. Include diagrams for power, signal, and control wiring.

##### 2.03 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Seismic Qualification Data: Certificates, for transformers, accessories, and components, from manufacturer.
1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
  4. Certification: Indicate that equipment meets equipment seismic requirements.
- C. Source quality-control reports.
- D. Field quality-control reports.

##### 2.04 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

##### 2.05 DELIVERY, STORAGE, AND HANDLING

- A. Inspection: On receipt, inspect for and note any shipping damage to packaging and transformer.

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1. If manufacturer packaging is removed for inspection, and transformer will be stored after inspection, re-package transformer using original or new packaging materials that provide protection equivalent to manufacturer's packaging.
- B. Storage: Store in a warm, dry, and temperature-stable location in original shipping packaging.
- C. Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.
- D. Handling: Follow manufacturer's instructions for lifting and transporting transformers.

## **PART 2 - PRODUCTS**

### **2.01 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. ABB (Electrification Products Division).
  2. Eaton.
  3. Schneider Electric USA (Square D).
  4. Siemens Industry, Inc., Energy Management Division.
- B. Source Limitations: Obtain each transformer type from single source from single manufacturer.

### **2.02 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance: Transformers shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
  1. The term "withstand" means "the transformer will remain in place without separation of any parts when subjected to the seismic forces specified and the transformer will be fully operational after the seismic event."

### **2.03 GENERAL TRANSFORMER REQUIREMENTS**

- A. Description: Factory-assembled and -tested, air-cooled units for 60-Hz service.
- B. Comply with NFPA 70.
  1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and use.
- C. Transformers Rated 15 kVA and Larger:
  1. Comply with 10 CFR 431 (DOE 2016) efficiency levels.
  2. Marked as compliant with DOE 2016 efficiency levels by an NRTL.
- D. Shipping Restraints: Paint or otherwise color-code bolts, wedges, blocks, and other restraints that are to be removed after installation and before energizing. Use fluorescent colors that are easily identifiable inside the transformer enclosure.

### **2.04 DISTRIBUTION TRANSFORMERS**

- A. Comply with NFPA 70, and list and label as complying with UL 1561.

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- B. Cores: Electrical grade, non-aging silicon steel with high permeability and low hysteresis losses.
1. One leg per phase.
  2. Grounded to enclosure.
- C. Coils: Continuous windings without splices except for taps.
1. Coil Material: Aluminum or Copper.
  2. Internal Coil Connections: Brazed or pressure type.
  3. Terminal Connections: Welded or Bolted.
- D. Encapsulation: Transformers smaller than 30 kVA shall have core and coils completely resin encapsulated.
- E. Enclosure: Ventilated.
1. NEMA 250, Type 2: Core and coil shall be encapsulated within resin compound to seal out moisture and air.
  2. KVA Ratings: Based on convection cooling only and not relying on auxiliary fans.
  3. Wiring Compartment: Sized for conduit entry and wiring installation.
- F. Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
- G. Taps for Transformers 25 kVA and Larger: Two 2.5 percent taps above and two 2.5 percent taps below normal full capacity.
- H. Insulation Class, Smaller Than 30 kVA: 180 deg C, UL-component-recognized insulation system with a maximum of 115 deg C rise above 40 deg C ambient temperature.
- I. Insulation Class, 30 kVA and Larger: 220 deg C, UL-component-recognized insulation system with a maximum of 150 deg C rise above 40 deg C ambient temperature.
- J. Grounding: Provide ground-bar kit or a ground bar installed on the inside of the transformer enclosure.
- K. Wall Brackets when required: Manufacturer's standard brackets.

## **2.05 IDENTIFICATION**

- A. Nameplates: Engraved, laminated-acrylic, or melamine plastic signs for each distribution transformer, mounted with corrosion-resistant screws. Nameplates and label products are specified in Section 260553 "Identification for Electrical Systems."

## **2.06 SOURCE QUALITY CONTROL**

- A. Test and inspect transformers according to IEEE C57.12.01 and IEEE C57.12.91.
1. Resistance measurements of all windings at rated voltage connections and at all tap connections.
  2. Ratio tests at rated voltage connections and at all tap connections.
  3. Phase relation and polarity tests at rated voltage connections.
  4. No load losses, and excitation current and rated voltage at rated voltage connections.

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5. Impedance and load losses at rated current and rated frequency at rated voltage connections.
6. Applied and induced tensile tests.
7. Regulation and efficiency at rated load and voltage.
8. Insulation-Resistance Tests:
  - a. High-voltage to ground.
  - b. Low-voltage to ground.
  - c. High-voltage to low-voltage.
9. Temperature tests.

## **PART 2 - EXECUTION**

### **2.01 EXAMINATION**

- A. Examine conditions for compliance with enclosure- and ambient-temperature requirements for each transformer.
- B. Verify that field measurements are as needed to maintain working clearances required by NFPA 70 and manufacturer's written instructions.
- C. Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
- D. Verify that ground connections are in place and requirements in Section 260526 "Grounding and Bonding for Electrical Systems" have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
- E. Environment: Enclosures shall be rated for the environment in which they are located. Covers for NEMA 250, Type 4X enclosures shall not cause accessibility problems.
- F. Proceed with installation only after unsatisfactory conditions have been corrected.

### **2.02 INSTALLATION**

- A. Install wall-mounted transformers level and plumb with wall brackets fabricated by transformer manufacturer.
  1. Coordinate installation of wall-mounted and structure-hanging supports with actual transformer provided.
- B. Construct concrete bases according to Section 033000 "Cast-in-Place Concrete" and anchor floor-mounted transformers according to manufacturer's written instructions and requirements in Section 260529 "Hangers and Supports for Electrical Systems."
  1. Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified with concrete.
- C. Secure transformer to concrete base according to manufacturer's written instructions.
- D. Secure covers to enclosure and tighten all bolts to manufacturer-recommended torques to reduce noise generation.
- E. Remove shipping bolts, blocking, and wedges.

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## 2.03 CONNECTIONS

- A. Ground equipment according to Section 260526 "Grounding and Bonding for Electrical Systems."
- B. Connect wiring according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. 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-486B.
- D. Provide flexible connections at all conduit and conductor terminations and supports to eliminate sound and vibration transmission to the building structure.

## 2.04 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Small (Up to 167-kVA Single-Phase or 500-kVA Three-Phase) Dry-Type Transformer Field Tests:
  - 1. Visual and Mechanical Inspection.
    - a. Inspect physical and mechanical condition.
    - b. Inspect anchorage, alignment, and grounding.
    - c. Verify that resilient mounts are free and that any shipping brackets have been removed.
    - d. Verify the unit is clean.
    - e. Perform specific inspections and mechanical tests recommended by manufacturer.
    - f. Verify that as-left tap connections are as specified.
    - g. Verify the presence of surge arresters and that their ratings are as specified.
  - 2. Electrical Tests:
    - a. Measure resistance at each winding, tap, and bolted connection.
    - b. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Apply voltage according to manufacturer's published data. In the absence of manufacturer's published data, comply with NETA ATS, Table 100.5. Calculate polarization index: the value of the index shall not be less than 1.0.
    - c. Perform turns-ratio tests at all tap positions. Test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio. If test fails, replace the transformer.
    - d. Verify correct secondary voltage, phase-to-phase and phase-to-neutral, after energization and prior to loading.
- C. Remove and replace units that do not pass tests or inspections and retest as specified above.
- D. Test Labeling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

## 2.05 ADJUSTING

- A. Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding nameplate voltage plus 5 percent and not being lower than nameplate

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voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.

- B. Output Settings Report: Prepare a written report recording output voltages and tap settings.

## 2.06 CLEANING

- A. Vacuum dirt and debris; do not use compressed air to assist in cleaning.

**END OF SECTION 262213**

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## **SECTION 262416**

### **PANELBOARDS**

#### **PART 2 - GENERAL**

##### **2.01 SUMMARY**

- A. Section Includes:
  - 1. Distribution panelboards.
  - 2. Lighting and appliance branch-circuit panelboards.

##### **2.02 DEFINITIONS**

- A. ATS: Acceptance testing specification.
- B. GFCI: Ground-fault circuit interrupter.
- C. GFEP: Ground-fault equipment protection.
- D. MCCB: Molded-case circuit breaker.

##### **2.03 ACTION SUBMITTALS**

- A. Product Data: For each type of panelboard.
  - 1. Include materials, switching and overcurrent protective devices, SPDs, accessories, and components indicated.
  - 2. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
- B. Shop Drawings: For each panelboard and related equipment.
  - 1. Include dimensioned plans, elevations, sections, and details.
  - 2. Detail bus configuration, current, and voltage ratings.
  - 3. Short-circuit current rating of panelboards and overcurrent protective devices.
  - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices and auxiliary components.
  - 5. Include wiring diagrams for power, signal, and control wiring.
  - 6. Include time-current coordination curves for each type and rating of overcurrent protective device included in panelboards. Submit on translucent log-log graft paper; include selectable ranges for each type of overcurrent protective device. Include an Internet link for electronic access to downloadable PDF of the coordination curves.

##### **2.04 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For testing agency.
- B. Panelboard Schedules: For installation in panelboards.

##### **2.05 CLOSEOUT SUBMITTALS**

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- A. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Section 017823 "Operation and Maintenance Data," include the following:

1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

## **2.06 MAINTENANCE MATERIAL SUBMITTALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Keys: Two spares for each type of panelboard cabinet lock.

## **2.07 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: ISO 9001 or ISO 9002 certified.

## **2.08 DELIVERY, STORAGE, AND HANDLING**

- A. Remove loose packing and flammable materials from inside panelboards; install temporary electric heating (250 W per panelboard) to prevent condensation.
- B. Handle and prepare panelboards for installation according to NECA 407.

## **2.09 FIELD CONDITIONS**

- A. Environmental Limitations:

1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:

1. Ambient temperatures within limits specified.
2. Altitude not exceeding 6600 feet (2000 m).

- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:

1. Notify Owner no fewer than 10 days in advance of proposed interruption of electric service.
2. Do not proceed with interruption of electric service without Owner's written permission.
3. Comply with NFPA 70E.

## **2.010 WARRANTY**

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace panelboards that fail in materials or workmanship within specified warranty period.

1. Panelboard Warranty Period: 18 months from date of Substantial Completion.

## **PART 2 - PRODUCTS**

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## 2.01 PANELBOARDS COMMON REQUIREMENTS

- A. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Comply with NEMA PB 1.
- D. Comply with NFPA 70.
- E. Enclosures: Flush and Surface-mounted, dead-front cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Height: 84 inches (2.13 m) maximum.
  - 3. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover. Trims shall cover all live parts and shall have no exposed hardware.
  - 4. Skirt for Surface-Mounted Panelboards: Same gage and finish as panelboard front with flanges for attachment to panelboard, wall, and ceiling or floor.
  - 5. Finishes:
    - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.
    - b. Back Boxes: Same finish as panels and trim.
- F. Incoming Mains:
  - 1. Main Breaker: Main lug interiors up to 400 amperes shall be field convertible to main breaker.
- G. Phase, Neutral, and Ground Buses:
  - 1. Material: Tin-plated aluminum or Hard-drawn copper, 98 percent conductivity.
    - a. Plating shall run entire length of bus.
    - b. Bus shall be fully rated the entire length.
  - 2. Interiors shall be factory assembled into a unit. Replacing switching and protective devices shall not disturb adjacent units or require removing the main bus connectors.
  - 3. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
  - 4. Full-Sized Neutral: Equipped with full-capacity bonding strap for service entrance applications. Mount electrically isolated from enclosure. Do not mount neutral bus in gutter.
- H. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 1. Material: Tin-plated aluminum or Hard-drawn copper, 98 percent conductivity as required.
  - 2. Terminations shall allow use of 75 deg C rated conductors without derating.

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3. Size: Lugs suitable for indicated conductor sizes, with additional gutter space, if required, for larger conductors.
  4. Main and Neutral Lugs: Mechanical type, with a lug on the neutral bar for each pole in the panelboard.
  5. Ground Lugs and Bus-Configured Terminators: Mechanical type, with a lug on the bar for each pole in the panelboard.
  6. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
- I. NRTL Label: Panelboards or load centers shall be labeled by an NRTL acceptable to authority having jurisdiction for use as service equipment with one or more main service disconnecting and overcurrent protective devices. Panelboards or load centers shall have meter enclosures, wiring, connections, and other provisions for utility metering. Coordinate with utility company for exact requirements.
- J. Future Devices: Panelboards or load centers shall have mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
1. Percentage of Future Space Capacity: 10 percent.
- K. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals. Assembly listed by an NRTL for 100 percent interrupting capacity.
1. Panelboards and overcurrent protective devices rated 240 V or less shall have short-circuit ratings as shown on Drawings, but not less than 10,000 A rms symmetrical.
  2. Panelboards and overcurrent protective devices rated above 240 V and less than 600 V shall have short-circuit ratings as shown on Drawings, but not less than 14,000 A rms symmetrical.

## 2.02 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Panelboards shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.
1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified."

## 2.03 POWER PANELBOARDS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
  2. Schneider Electric USA (Square D).
  3. Siemens Industry, Inc., Energy Management Division.
- B. Panelboards: NEMA PB 1, distribution type.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes 125 A and Smaller: Bolt-on circuit breakers.
- E. Branch Overcurrent Protective Devices for Circuit-Breaker Frame Sizes Larger Than 125 A: Bolt-on circuit breakers.

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**2.04 LIGHTING AND APPLIANCE BRANCH-CIRCUIT PANELBOARDS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
  2. Schneider Electric USA (Square D).
  3. Siemens Industry, Inc., Energy Management Division.
- B. Panelboards: NEMA PB 1, lighting and appliance branch-circuit type.
- C. Mains: Circuit breaker.
- D. Branch Overcurrent Protective Devices: Bolt-on circuit breakers, replaceable without disturbing adjacent units.
- E. Doors: Door-in-door construction with concealed hinges; secured with multipoint latch with tumbler lock; keyed alike. Outer door shall permit full access to the panel interior. Inner door shall permit access to breaker operating handles and labeling, but current carrying terminals and bus shall remain concealed.

**2.05 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton.
  2. Schneider Electric USA (Square D).
  3. Siemens Industry, Inc., Energy Management Division.
- B. MCCB: Comply with UL 489, with interrupting capacity to meet available fault currents.
1. Thermal-Magnetic Circuit Breakers:
    - a. Inverse time-current element for low-level overloads.
    - b. Instantaneous magnetic trip element for short circuits.
    - c. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
  2. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with front-mounted, field-adjustable trip setting.
  3. Electronic Trip Circuit Breakers:
    - a. RMS sensing.
    - b. Field-replaceable rating plug or electronic trip.
    - c. Field-Adjustable Settings:
      - 1) Instantaneous trip.
      - 2) Long- and short-time pickup levels.
      - 3) Long and short time adjustments.
  4. GFCI Circuit Breakers: Single- and double-pole configurations with Class A ground-fault protection (6-mA trip).

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5. GFEP Circuit Breakers: Class B ground-fault protection (30-mA trip).
6. MCCB Features and Accessories:
  - a. Standard frame sizes, trip ratings, and number of poles.
  - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
  - c. Ground-Fault Protection: Integrally mounted relay and trip unit with adjustable pickup and time-delay settings, push-to-test feature, and ground-fault indicator.
  - d. Rating Plugs: Three-pole breakers with ampere ratings greater than 150 amperes shall have interchangeable rating plugs or electronic adjustable trip units.

## 2.06 IDENTIFICATION

- A. Panelboard Label: Manufacturer's name and trademark, voltage, amperage, number of phases, and number of poles shall be located on the interior of the panelboard door.
- B. Breaker Labels: Faceplate shall list current rating, UL and IEC certification standards, and AIC rating.
- C. Circuit Directory: Computer-generated circuit directory mounted inside panelboard door with transparent plastic protective cover.
  1. Circuit directory shall identify specific purpose with detail sufficient to distinguish it from all other circuits.

## 2.07 ACCESSORY COMPONENTS AND FEATURES

- A. Accessory Set: Include tools and miscellaneous items required for overcurrent protective device test, inspection, maintenance, and operation.

## PART 2 - EXECUTION

### 2.01 EXAMINATION

- A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.
- B. Receive, inspect, handle, and store panelboards according to NECA 407.
- C. Examine panelboards before installation. Reject panelboards that are damaged, rusted, or have been subjected to water saturation.
- D. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

### 2.02 INSTALLATION

- A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- B. Comply with NECA 1.

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C. Equipment Mounting:

1. Attach panelboard to the vertical finished or structural surface behind the panelboard.
- D. Mount top of trim 90 inches (2286 mm) above finished floor unless otherwise indicated.
- E. Mount panelboard cabinet plumb and rigid without distortion of box.
- F. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- G. Mount surface-mounted panelboards to steel slotted supports 5/8 inch (16 mm) in depth. Orient steel slotted supports vertically.
- H. Install overcurrent protective devices and controllers not already factory installed.
1. Set field-adjustable, circuit-breaker trip ranges.
  2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver per manufacturer's written instructions.
- I. Install filler plates in unused spaces.
- J. Stub four 1-inch (25 mm) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (25 mm) empty conduits into raised floor space or below slab not on grade.
- K. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

**2.03 IDENTIFICATION**

- A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads; incorporate Owner's final room designations. Obtain approval before installing. Handwritten directories are not acceptable. Install directory inside panelboard door.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
- D. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

**2.04 FIELD QUALITY CONTROL**

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
1. Test insulation resistance for each panelboard bus, component, connecting supply, feeder, and control circuit.
  2. Test continuity of each circuit.
- C. Tests and Inspections:
1. Perform each visual and mechanical inspection and electrical test for low-voltage air circuit breakers stated in NETA ATS, Paragraph 7.6 Circuit Breakers. Do not perform optional tests. Certify compliance with test parameters.

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2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.

D. Panelboards will be considered defective if they do not pass tests and inspections.

## 2.05 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as indicated.

**END OF SECTION 262416**

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## SECTION 265119

### LED INTERIOR LIGHTING

#### PART 2 - GENERAL

##### 2.01 SUMMARY

A. Section Includes:

1. Cylinder.
2. Downlight.
3. Recessed, linear.
4. Surface mount, linear.
5. Surface mount, nonlinear.
6. Suspended, linear.
7. Suspended, nonlinear.
8. Materials.
9. Luminaire support.

B. Related Requirements:

1. Section 260923 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
2. Section 260923.1 "Lighting Control Systems"

##### 2.02 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color Rendering Index.
- C. Fixture: See "Luminaire."
- D. IP: International Protection or Ingress Protection Rating.
- E. LED: Light-emitting diode.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

##### 2.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
1. Arrange in order of luminaire designation.
  2. Include data on features, accessories, and finishes.
  3. Include physical description and dimensions of luminaires.
  4. Include emergency lighting units, including batteries and chargers.

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5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
6. Photometric data and adjustment factors based on laboratory tests, complying with IES "Lighting Measurements Testing and Calculation Guides" for each luminaire type. The adjustment factors shall be for lamps and accessories identical to those indicated for the luminaire as applied in this Project.
  - a. Manufacturers' Certified Data: Photometric data certified by manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. Shop Drawings: For nonstandard or custom luminaires.
  1. Include plans, elevations, sections, and mounting and attachment details.
  2. Include details of luminaire assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
  3. Include diagrams for power, signal, and control wiring.
- C. Samples: For each luminaire and for each color and texture with standard factory-applied finish.
- D. Samples for Initial Selection: For each type of luminaire with custom factory-applied finishes.
  1. Include Samples of luminaires and accessories involving color and finish selection.
- E. Product Schedule: For luminaires and lamps. Use same designations indicated on Drawings.

## **2.04 INFORMATIONAL SUBMITTALS**

- A. Qualification Data: For testing laboratory providing photometric data for luminaires.
- B. Seismic Qualification Data: For luminaires, accessories, and components, from manufacturer.
  1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
  2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.
  3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Product Certificates: For each type of luminaire.
- D. Product Test Reports: For each type of luminaire, for tests performed by manufacturer and witnessed by a qualified testing agency.
- E. Sample warranty.

## **2.05 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
  1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

## **2.06 QUALITY ASSURANCE**

- A. Luminaire Photometric Data Testing Laboratory Qualifications:

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1. Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
  - B. Provide luminaires from a single manufacturer for each luminaire type.
- 2.07 DELIVERY, STORAGE, AND HANDLING**
- A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.
- 2.08 WARRANTY**
- A. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
  - B. Warranty Period: Five year(s) from date of Substantial Completion.

## **PART 2 - PRODUCTS**

### **2.01 PERFORMANCE REQUIREMENTS**

- A. Seismic Performance:
  1. Luminaires shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
  2. Luminaires and lamps shall be labeled vibration and shock resistant.
  3. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified."
- B. Ambient Temperature: **41 to 104 deg F (5 to 40 deg C)**.
  1. Relative Humidity: Zero to 95 percent.
- C. Altitude: Sea level to **1000 feet (300 m)**.

### **2.02 LUMINAIRE REQUIREMENTS**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
  1. Label shall include the following lamp characteristics:
    - a. "USE ONLY" and include specific lamp type.
    - b. Lamp diameter, shape, size, wattage, and coating.
    - c. CCT and CRI.
- C. Recessed luminaires shall comply with NEMA LE 4.

### **2.03 CYLINDER.**

- A. Nominal Operating Voltage: as indicated on drawings.
- B. Lamp:

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1. Minimum 250 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of 80. CCT of 3500 K.
4. Rated lamp life is a minimum of 35,000 hours to L70.
5. Dimmable from 100 percent to zero percent of maximum light output.
6. Internal driver.
7. User-Replaceable Lamps:
  - a. Bulb shape complying with ANSI C78.79.
8. Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.

C. Housings:

1. Extruded-aluminum housing and heat sink.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. With integral mounting provisions.

F. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

2.04 **DOWNLIGHT.**

A. Nominal Operating Voltage: dual rated 120/277Vac

B. Lamp:

1. Minimum 250 lm.
2. Minimum allowable efficacy of 80 lm/W.
3. CRI of 80. CCT of 3500 K.
4. Rated lamp life of 50,000 hours to L70.
5. Dimmable from 100 percent to zero percent of maximum light output.
6. Internal driver.
7. User-Replaceable Lamps:
  - a. Bulb shape complying with ANSI C78.79.
8. Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.

C. Housings:

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1. Extruded-aluminum housing and heat sink.
  2. Universal mounting bracket.
  3. Integral junction box with conduit fittings.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Standards:
1. ENERGY STAR certified.
  2. RoHS compliant.
  3. UL Listing: Listed for damp location.
  4. Recessed luminaires shall comply with NEMA LE 4.

## **2.05 RECESSED, LINEAR.**

- A. Nominal Operating Voltage: dual voltage 120/277 Vac.
- B. Lamp:
1. Minimum 1,500 lm.
  2. Minimum allowable efficacy of 85 lm/W.
  3. CRI of 80. CCT of 3500 K.
  4. Rated lamp life of 50,000 hours to L70.
  5. Dimmable from 100 percent to zero percent of maximum light output.
  6. Internal driver.
  7. User-Replaceable Lamps:
    - a. Bulb shape complying with ANSI C78.79.
  8. Lens Thickness: At least 0.125-inch (3.175-mm) minimum unless otherwise indicated.
- C. Housings:
1. Extruded-aluminum housing and heat sink.
  2. With integral mounting provisions.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Standards:
1. ENERGY STAR certified.
  2. RoHS compliant.

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3. UL Listing: Listed for damp location.
4. NEMA LE 4.

## **2.06 SURFACE MOUNT, LINEAR.**

- A. Nominal Operating Voltage: dual 120/277Vac.
- B. Lamp:
  1. Minimum 750 lm.
  2. Minimum allowable efficacy of 80 lm/W.
  3. CRI of 80. CCT of 3500 K.
  4. Rated lamp life of 50,000 hours to L70.
  5. Dimmable from 100 percent to zero percent of maximum light output.
  6. Internal driver.
  7. User-Replaceable Lamps:
    - a. Bulb shape complying with ANSI C78.79.
- C. Housings:
  1. Extruded-aluminum housing and heat sink.
  2. With integral mounting provisions.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Standards:
  1. ENERGY STAR certified.
  2. RoHS compliant.
  3. UL Listing: Listed for damp location.

## **2.07 SURFACE MOUNT, NONLINEAR**

- A. Nominal Operating Voltage: dual rated 120/277Vac.
- B. Lamp:
  1. Minimum 750 lm.
  2. Minimum allowable efficacy of 80 lm/W.
  3. CRI of 80. CCT of 3500 K.
  4. Rated lamp life of 50,000 hours to L70.
  5. Dimmable from 100 percent to zero percent of maximum light output.
  6. Internal driver.

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7. User-Replaceable Lamps:
  - a. Bulb shape complying with ANSI C78.79.

C. Housings:

1. Extruded-aluminum housing and heat sink.
2. With integral mounting provisions.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.
3. UL Listing: Listed for damp location.

**2.08 SUSPENDED, LINEAR**

A. Nominal Operating Voltage: dual rated 120/277Vac.

B. Lamp:

1. Minimum 1,500 lm.
2. Minimum allowable efficacy of 85 lm/W.
3. CRI of 80. CCT of 3500 K.
4. Rated lamp life of 50,000 hours to L70.
5. Dimmable from 100 percent to zero percent of maximum light output.
6. Internal driver.
7. User-Replaceable Lamps:
  - a. Bulb shape complying with ANSI C78.79.

C. Housings:

1. Extruded-aluminum housing and heat sink.
2. With integral mounting provisions.

D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.

E. Standards:

1. ENERGY STAR certified.
2. RoHS compliant.

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3. UL Listing: Listed for damp location.

## **2.09 SUSPENDED, NONLINEAR**

- A. Nominal Operating Voltage: dual rated 120/277 Vac.
- B. Lamp:
  1. Minimum 1,500 lm.
  2. Minimum allowable efficacy of 85 lm/W.
  3. CRI of 80. CCT of 3500 K.
  4. Rated lamp life of 50,000 hours to L70.
  5. Dimmable from 100 percent to zero percent of maximum light output.
  6. Internal driver.
  7. User-Replaceable Lamps:
    - a. Bulb shape complying with ANSI C78.79.
- C. Housings:
  1. Extruded-aluminum housing and heat sink.
  2. Universal mounting bracket.
  3. Integral junction box with conduit fittings.
- D. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Components are designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- E. Standards:
  1. ENERGY STAR certified.
  2. RoHS compliant.
  3. UL Listing: Listed for damp location.

## **2.010 MATERIALS**

- A. Metal Parts:
  1. Free of burrs and sharp corners and edges.
  2. Sheet metal components shall be steel unless otherwise indicated.
  3. Form and support to prevent warping and sagging.
- B. Steel:
  1. ASTM A36/A36M for carbon structural steel.
  2. ASTM A568/A568M for sheet steel.
- C. Stainless Steel:

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1. Manufacturer's standard grade.
  2. Manufacturer's standard type, ASTM A240/240M.
- D. Galvanized Steel: ASTM A653/A653M.
- E. Aluminum: ASTM B209.

#### **2.011 METAL FINISHES**

- A. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

#### **2.012 LUMINAIRE SUPPORT**

- A. Comply with requirements in Section 260529 "Hangers and Supports for Electrical Systems" for channel and angle iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch (13-mm) steel tubing with swivel ball fittings and ceiling canopy. Finish same as luminaire.
- C. Wires: ASTM A641/A641M, Class 3, soft temper, zinc-coated steel, **12 gage (2.68 mm)**.
- D. Rod Hangers: 3/16-inch (5-mm) minimum diameter, cadmium-plated, threaded steel rod.
- E. Hook Hangers: Integrated assembly matched to luminaire, line voltage, and equipment with threaded attachment, cord, and locking-type plug.

### **PART 2 - EXECUTION**

#### **2.01 EXAMINATION**

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **2.02 INSTALLATION**

- A. Comply with NECA 1.
- B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.
- C. Install lamps in each luminaire.
- D. Supports:
1. Sized and rated for luminaire weight.
  2. Able to maintain luminaire position after cleaning and relamping.
  3. Provide support for luminaire without causing deflection of ceiling or wall.
  4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.
- E. Flush-Mounted Luminaires:

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1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaires:

1. Attached to structural members in walls or Attached to a minimum 20 gauge backing plate attached to wall structural members.
2. Do not attach luminaires directly to gypsum board.

G. Suspended Luminaires:

1. Ceiling Mount:
  - a. Two 5/32-inch- (4-mm-) diameter aircraft cable supports adjustable to **10 feet (3 m)** in length.
2. Pendants and Rods: Where longer than 48 inches (1200 mm), brace to limit swinging.
3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
4. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and wire support for suspension for each unit length of luminaire chassis, including one at each end.
5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure.

H. Ceiling-Grid-Mounted Luminaires:

1. Secure to any required outlet box.
2. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

## 2.03 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 260553 "Identification for Electrical Systems."

## 2.04 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:

1. Operational Test: After installing luminaires, switches, and accessories, and after electrical circuitry has been energized, test units to confirm proper operation.
2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

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C. Prepare test and inspection reports.

**END OF SECTION 265119**

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