



# **GROSSMONT UNION HIGH SCHOOL DISTRICT**

## **HELIX CHARTER HIGH SCHOOL NEW RESTROOM AND STORAGE BUILDINGS**

### **PROJECT MANUAL**

**DSA Submittal**

**A# 04-119024**

**February 11, 2020**

**PREPARED FOR:**

**GROSSMONT UNION HIGH SCHOOL DISTRICT  
P.O. BOX 1043  
LA MESA, CA 91944**

**PREPARED BY:**

**HED**

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225 Broadway, Suite 1300  
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**Project No. 2019-05629-000**

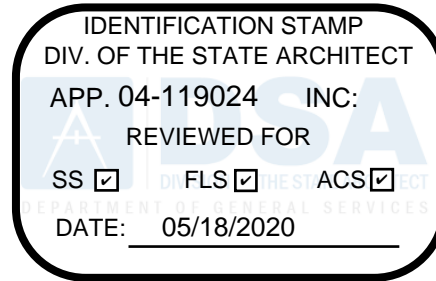
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## SECTION 00 01 07

## CERTIFICATIONS AND SEALS

## ARCHITECT

I hereby certify that the Project Drawings and the Project Manual were prepared by me or under my direct supervision and that I am a duly registered Architect under the laws of the State of California.



## STRUCTURAL ENGINEER

I hereby certify that the Project Drawings and the Project Manual were prepared by me or under my direct supervision and that I am a duly registered Engineer under the laws of the State of California.



## MECHANICAL / PLUMBING ENGINEER

I hereby certify that the Project Drawings and the Project Manual were prepared by me or under my direct supervision and that I am a duly registered Engineer under the laws of the State of California.



**GROSSMONT UNION HIGH SCHOOL DISTRICT  
HELIX C.H.S. NEW RESTROOM AND STORAGE BUILDINGS**

**FEBRUARY 11, 2020**

**ELECTRICAL ENGINEER**

I hereby certify that the Project Drawings and the Project Manual were prepared by me or under my direct supervision and that I am a duly registered Engineer under the laws of the State of California



**END OF SECTION**



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SECTION 01 25 00

SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: General requirements for the proposal of substitutions.

1.02 MATERIAL

- A. Equipment, materials, and articles incorporated into the work shall be new and suitable for the purposes intended.
- B. Reference to equipment, material, article, or patented process by trade name or catalog number shall not be construed as limiting competition.
  - 1. In cases where the Specifications designate a material, product, thing, or service by specific proprietary brand or trade name, and there is only one brand or trade name listed, the item involved is:
    - a. Used as a standard of quality which must be satisfied without compromise, or
    - b. The only brand or trade name known to the Owner and Architect.
  - 2. Wherever in the Contract Documents a material, article, or process is indicated or specified by trade, patent, proprietary name, or name of manufacturer, such indication shall be deemed to be followed by the words, **"or equivalent, as accepted in writing by the Architect"**.
    - a. Contractor shall submit a substitution request for Architect's written acceptance.
  - 3. If the phrase "NO SUBSTITUTIONS" is used, the product is required to be used since it is a unique product application.
- C. The naming of more than one manufacturer in a Section does not imply that all products of named manufacturers are acceptable for use on the Project. Where more than one proprietary name is specified, provide materials or equipment of any one of the manufacturers specified, only if full compliance with other portions of the Specifications can be provided.
- D. Construction shall be in compliance with the cited standards for the materials specified.

1.03 SUBSTITUTIONS

- A. Should the Contractor wish to substitute an item purported to be equal to the one specified, then the Contractor shall, no later than 35 days after Award of Contract, furnish to the Architect the name of the manufacturer, model number, color options and other pertinent data and information respecting the "or equivalent" item which has been proposed in the bid and which the Contractor contemplates incorporating in the work. If the "or equivalent" item is not found by the Architect to be, in fact, equivalent or better, then the item specified in the Contract Documents shall be furnished.  
When colors have been indicated prior to Bid, Contractor shall be required to provide a

custom color to match. See Section 01 33 00, Submittal Procedures.

- B. When required by the Contract Documents, or when directed by the Owner, furnish full information concerning the material or article proposed for incorporation into the work. Testing of a proposed substitute material to assure compliance with the Specifications may be required by the Owner at the Contractor's expense. When so directed, submit samples for acceptance. Equipment, material, and articles installed or used without required acceptance shall be at the risk of subsequent rejection, and replacement at Contractor's cost.
- C. Substitutions shall comply with, or exceed, requirements of dimension, function, structure, durability, and appearance without exception. Use of accepted substitutions shall in no way relieve the Contractor from responsibility for compliance with the Contract Documents after installation. It shall be incumbent upon the Contractor using accepted substitutions to assume extra costs caused by the use of such substitutions where they affect other work.
- D. Do not substitute materials, equipment, or methods unless such substitution has been reviewed and approved by the Architect. **Substitutions shall be submitted to the Division of the State Architect for approval prior to acceptance by Architect.**
- E. "Or Equivalent":
  - 1. Where the phrase "or equivalent", "or approved equivalent", or "or equivalent as approved by the Architect" occurs in the Contract Documents, do not assume that materials, equipment, or methods will be accepted as equal unless the item has been specifically accepted, in writing, for the Work by the Architect **and by the Division of the State Architect, Office of Regulation Services for items which "affect health, safety or welfare."**
- F. Failure to place orders for specified equipment or material sufficiently in advance of the scheduled installation date will not be considered a valid reason upon which the Contractor may base his request for substitutions or for deviations from the Drawings and Specifications.
- G. In the event the Contractor requests changes or revisions requiring drawings or services of the Architect or the Architect's consultants, to facilitate installation or erection of any portion of the work, the Contractor shall accept the responsibility to hire and pay for the Architect's or Consultant's services. A standard hourly rate, as agreed upon, shall be paid by the Contractor whether the change is accepted or rejected. In the event the change is approved, this fee shall be deducted, and paid, from the Contract Sum.
- H. Redesigning by the Contractor: Redesigning shall be by an Engineer licensed, in the State of California, to perform such work. In the event approval is required from authorities having jurisdiction, such approval shall be obtained by the Contractor at the Contractor's expense before submitting the revised design or substitution to the Architect.
- I. Revision after Approval: When a submittal has been reviewed by the Architect, resubmittal for substitution of materials or equipment will not be considered unless accompanied by an explanation acceptable to the Architect as to the reason substitution is considered necessary. Changes in Plans and Specifications, which effect safety, health or welfare, shall be made by Addenda or Construction Change Document approved by the Division of the State Architect.

1.04 SUBSTITUTION REQUEST FORM:

**FEBRUARY 11, 2020**

**GROSSMONT UNION HIGH SCHOOL DISTRICT  
HELIX CHS RESTROOM AND STORAGE BLDGS**

- A. Submittal of the requested information shall be accompanied by the attached Substitution Request Form. Submit six copies of each request to the Architect. Architect will distribute as appropriate.

**PART 2 - PRODUCTS**

(Not Applicable)

**PART 3 - EXECUTION**

(Not Applicable)

**END OF SECTION**

**ATTACHMENT:** Substitution Request Form

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## SUBSTITUTION REQUEST FORM

Re: \_\_\_\_\_  
Project Name\_\_\_\_\_  
Project Manual Section Number\_\_\_\_\_  
ItemTo: \_\_\_\_\_  
ArchitectFrom: \_\_\_\_\_  
Contractor

Reviewed for timeliness and completeness by General Contractor:

We hereby submit for your consideration the following product comparisons of the specified item and the proposed substitution:

A.	Comparison	Specified Item	Substitution
1.	Product Name/Model	_____	_____
2.	Manufacturer	_____	_____
	Address	_____	
	Address	_____	
	Phone Number	_____	
3.	Product Cost	_____	
	Installation/Labor Cost	_____	
4.	Delivery Time	_____	
	Installation Time	_____	
5.	Product Characteristics	_____	
6.	Dimensions	_____	
	Effects	_____	
7.	Guarantee/Warranty	_____	
8.	ICC No.	_____	
9.	UL Rating	_____	

**B. Substantiating Data:**

Attach manufacturer's literature for both specified item and substitution.

**C. Samples:** Provide samples for both specified item and substitution, if applicable.

**D. Similar Projects for Reference:**

1. \_\_\_\_\_  
Name Date

\_\_\_\_\_  
Address

\_\_\_\_\_  
Address

\_\_\_\_\_  
Contact

\_\_\_\_\_  
Telephone

2. \_\_\_\_\_  
Name Date

\_\_\_\_\_  
Address

\_\_\_\_\_  
Address

\_\_\_\_\_  
Contact

\_\_\_\_\_  
Telephone

**E. Maintenance Service/Parts/Supplier:**

\_\_\_\_\_  
Name

\_\_\_\_\_  
Address

\_\_\_\_\_  
Address

\_\_\_\_\_  
Telephone

F. What effect does this substitution have on applicable code requirements?

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G. Change Data:

Attach complete information for changes to be made to Drawings and Project Manual.

\* \* \* \* \*

- \* Certification of equal performance and assumption of liability for equal performance.
- \* The Contractor shall agree to pay for costs involved in changing the building design; including engineering, drafting and detail cost caused by the proposed substitution.

Submitted by:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Firm Name

\_\_\_\_\_  
Date

\_\_\_\_\_  
Address

\_\_\_\_\_  
Address

\_\_\_\_\_  
City State Zip

\_\_\_\_\_  
Telephone

Remarks:

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*Signature must be by persons having authority to legally bind his firm to the above terms. Failure to provide legally binding signature will result in retraction of approval.*

Product substitution of \_\_\_\_\_

for \_\_\_\_\_

Specifications Section \_\_\_\_\_  
(number) (name)

For Use by Owner's Representative:

☐ Accepted ☐ Not Accepted

Owner's Consultant:

By: \_\_\_\_\_

Date: \_\_\_\_\_

☐ Accepted ☐ Not Accepted

School District:

By: \_\_\_\_\_

Date: \_\_\_\_\_

SECTION 01 33 00

SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes:

1. Wherever possible throughout the Contract Documents, the minimum acceptable quality of workmanship and materials has been defined by manufacturer's name and catalog number, reference to recognized industry and government standards, or description of required attributes and performance.
2. To help ensure that the specified products are furnished and installed in accordance with design intent, submit design product and data in advance for review by the Architect. Review by the Architect and the design consultants in no way relieves the contractor or subcontractor or supplier from providing the products or construction as described in the Contract Documents.
3. Make submittals required by the Contract Documents. Revise and resubmit when requested to establish compliance with the specified requirements.

B. Related Work Described Elsewhere: Additional requirements for submittals are described in other Sections of these Specifications and the General Conditions.

1.02 QUALITY ASSURANCE

A. Coordination of Submittals: Prior to each submittal, review and coordinate each item being submitted and verify that each item and the submittal conform with the requirements of the Contract Documents. **By affixing the Contractor's signature to each submittal, certify that this coordination has been performed.**

B. Certificates of Compliance:

1. Certify that materials used in the Work comply with specified provisions thereof. Certification shall not be construed as relieving the Contractor from furnishing satisfactory materials if, after tests are performed on selected samples, the material is found not to meet specified requirements.
2. Show on each certification the name and location of the Work, name and address of Contractor, quantity and date or dates of shipment or delivery to which the certificate applies, and name of the manufacturing or fabricating company. Certification shall be in the form of letter or company-standard forms containing required data. Certificates shall be signed by an officer of the manufacturing or fabricating company.
3. In addition to the above information, laboratory test reports submitted shall show the date or dates of testing, the specified requirements of which testing was performed, and results of the test or tests.

1.03 SUBMITTALS

A. Contractor shall submit all shop drawings, samples, requests for substitutions, mix designs, and other items, in accordance with this Section. Submit schedule indicating

- timing of all required submittals.
- B. Prior to submittal of the Contractor's first application for payment, submit a schedule of all submittals required by the Contract Documents.
- C. Submittals shall be submitted per the following time schedule for the following specific items. Failure to submit by these dates will be considered sufficient grounds to delay Architect's certification of Contractor's Application for Payment until these items are received in proper order.
1. Within **15 calendar days** after Award of Contract:
    - a. **All Requests for Substitutions:** After this date, no further requests for substitution will be considered, and Contractor shall be obligated to provide the specified products - **NO EXCEPTIONS.**
  2. Within **20 calendar days** after Notice to Proceed:
    - a. Concrete mix design, steel connectors to be embedded in concrete foundations and slabs, materials for underground site plumbing, sewer, storm drainage, and underground site electrical.
  3. Within **30 calendar days** after Notice to Proceed:
    - a. Hollow metal, door hardware, fire alarm system, fire sprinkler system, glu-lam beams and other structural lumber, structural steel, miscellaneous structural connectors, mechanical, plumbing and electrical materials, and equipment and fixtures.
    - b. All materials requiring a color selection by the Owner and Architect.
    - c. All casework.
  4. Within **45 calendar days** prior to installation:
    - a. All other items not specifically mentioned in 1, 2 and 3 above.
- D. Provide required submittals for the following products to interface with other portions of the Work. Submit data to verify compliance only.
1. For products specified only by reference standard, select product meeting that standard, by manufacturer.
  2. For products specified by naming several products or manufacturers, select one of the products or manufacturers named.
  3. For products specified by naming one or more products or manufacturers and stating "or other approved", or "or approved equivalent", or other such wording on drawings or within specifications sections, submit a request for substitutions for product or manufacturer which is not specifically named, but only after submitting bid on specified products and systems.

## PART 2 - PRODUCTS

### 2.01 SHOP DRAWINGS AND COORDINATION DRAWINGS

- A. Scale and Measurements: Make shop drawings to a scale sufficiently large to shown

pertinent aspects of the item and its method of connection to the Work.

- B. Type of Prints Required: When contractor desires a reproducible shop drawing, submit shop drawings in the black and white paper and PDF format.
- C. Reproduction of Reviewed Shop Drawings: Printing and distribution of reviewed shop drawings for the Architect's use will be by the Architect.
- D. Review comments of the Architect will be shown on the sepia transparency when it is returned to the Contractor. The Contractor shall make and distribute copies required for his purposes.

## 2.02 MANUFACTURERS' LITERATURE

- A. General: Where submitted literature from manufacturers includes data not pertinent to the submittal, indicate which portion of the contents is being submitted for review. Submittals not clearly marked will be returned without review.
- B. Number of Copies Required: Nine (9) total, three (3) for Contractor plus six (6) copies to be retained by the Architect. The Architect will distribute stamped copies to the Consultant, D.S.A., the Inspector, and two (2) to the Owner.
- C. The Contractor shall make and distribute copies required for his purposes.

## 2.03 SAMPLES

- A. Accuracy of Samples: Precise article proposed to be furnished shall be labeled with a submittal number, and project name.
- B. Number of Samples Required: Submit quantity required to be returned plus one each retained by the Architect, the Inspector, D.S.A., and the Owner, unless otherwise noted.
- C. Reuse of Samples: In situations accepted by the Architect, the Architect's retained sample may be used in the construction as one of the installed items.
- D. Size of Samples: Samples shall be 6" x 6", or manufactured width by 12 inches, unless otherwise required by the pertinent Specification section.

## 2.04 COLORS AND PATTERNS

- A. When the precise color and pattern is not specifically described in the Contract Documents, and whenever a choice of color or pattern is available in a specified product, submit accurate color and pattern charts to the Architect for review and selection. Submit data to verify compliance only. If the color is specifically described in the Contract, submit only that color for verification and approval.

# PART 3 - EXECUTION

## 3.01 IDENTIFICATION OF SUBMITTALS

- A. General: Consecutively number submittals within the respective specification section. Accompany each submittal with transmittal cover letters attached to the end of this Section. Fill out each transmittal cover letter completely, number sequentially, include specification section, name of supplier or installer, and contact person and telephone number.

- B. Internal Identification: On the first page of each copy of each submittal, and elsewhere as required for positive identification, indicate the submittal number.
- C. Resubmittals: When material is resubmitted, transmit under a new letter of transmittal and with same submittal number plus a "alphabetic" suffix indicating its a re-submittal, e.g. 05500-1A, 05500-1B.
- D. Submittal Log: Maintain submittal log for the duration of the Contract. Show current status of submittals, with columns showing "approved", "approved as corrected", etc, to match Architect's categories. Make the submittal log available for the Architect's review upon request. Log shall be available and will be reviewed at each project meeting.

### **3.02 COORDINATION OF SUBMITTALS**

- A. The Contractor's Project Engineer shall be responsible to coordinate and review all submittals prior to forwarding to Architect. All submittals shall be stamped with Contractor's stamp, signed and dated, stating:
  - 1. Contractor has reviewed submittal for compliance with requirements of the Contract Documents.
  - 2. Contractor has reviewed submittal for proper interfacing with other trades.
- B. General: Prior to making submittals, coordinate materials including, but not necessarily limited to:
  - 1. Determine and verify interface conditions, catalog numbers, and similar data,
  - 2. Coordinate with other trades as required,
  - 3. Clearly indicate deviations from requirements of the Contract Documents. Deviations which are not clearly called out as a deviation and which subsequently become a part of an approved submittal can under no circumstances be considered legitimate grounds for an additive change order.
- C. Grouping of Submittals: Make submittals in groups containing associated items to ensure that information is available for checking each item when it is received. Partial submittals may be rejected as not complying and the Contractor shall be strictly liable for occasioned delays.
- D. Color selections for materials in the same space or same elevation shall be submitted at one time. "Piece meal" submission of the color samples or charts is unacceptable and will be returned awaiting a "complete" submission.

### **3.03 TIMING OF SUBMITTALS**

- A. General: Make submittals far enough in advance of dates scheduled for installation to provide time required for reviews; for possible revisions and resubmittals; and for placing orders and securing delivery, and as otherwise required by Part 1.03 of this Section.
- B. Architect's Review Time: In scheduling, allow at least 20 calendar days for review by the Architect following his receipt of the submittal or as otherwise may be required under each Specification section. Allow an additional 10 days for reviews involving Architect's consultants or as otherwise may be required under each Specification section.



- C. Delays: Delays caused by tardiness in making submittals or resubmittals will not be an acceptable basis for extension of the Contract completion time.

**3.04 ARCHITECT'S REVIEW**

- A. General: Corrections or comments made on Shop Drawings during his review shall not relieve the Contractor from compliance with requirements of the Drawings and Specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the Contract Documents. The Contractor is responsible for confirming and correlating quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of other trades, and performing his work in a safe and satisfactory manner.
1. Authority to Proceed: The notations "Furnish as Submitted" or "Furnish as Corrected" authorize the Contractor to proceed with fabrication, purchase, or both or the items so noted, subject to the revisions, if any, required by the Architect's review comments.
  2. Revisions: The notation "Revise and Resubmit" or "Submit Specified Item" means make revisions required by the Architect and resubmit. If the Contractor considers required revision to be a change, he shall so notify the Architect as provided for under "Changes" or "Changes in the Work" in the General Conditions. Show each drawing revision by number, date, and subject in a revision block on the drawing. Make only those revisions directed by or accepted by the Architect.
  3. Rejection: The notation "Rejected" means the submission does not meet requirements of project contract documents. Make new submission meeting project contract documents.

**END OF SECTION**

**Attachment:** Contractor's Form - Shop Drawings / Submittal Transmittal Letter  
Cover Sheet referenced herewith.

# SHOP DRAWINGS / SUBMITTAL TRANSMITTAL LETTER

School:	Specification Section:
Project:	Submittal No.:
District:	Submittal Description:
DSA Application No.:	Date:

Contractor:	Subcontractor:
Address:	Address:
Phone No.:	Phone No.:
Contact:	Contact:

**FIRM NAME**

Address

Phone No.

**SUBMITTAL HISTORY**

**ARCHITECT/ENGINEER'S SHOP DRAWING STAMP**

REMARKS:

SECTION 01 42 19

REFERENCE STANDARDS

PART 1 - GENERAL

1.01 SUMMARY

- A. Throughout the Contract Documents, reference is made to codes and standards which establish qualities and types of workmanship and materials, and methods for testing and reporting on the pertinent characteristics.
- B. Provide materials and workmanship which meet or exceed the specifically named code or standard.
- C. Deliver to the Architect required proof that the materials or workmanship, or both, meet or exceed the requirements of the specifically named code or standard. Such proof shall be in the form requested by the Architect and will generally be required to be copies of a certified report of tests conducted by a testing agency acceptable for that purpose to the Architect.

1.02 RELATED WORK SPECIFIED ELSEWHERE

- A. Specific naming of codes or standards occurs on the Drawings and in other Sections of these Specifications. Comply with laws, ordinances, and regulations of authorities having jurisdiction. Proof of compliance with laws, ordinances, and regulations shall be by the signed approval of the respective authorities having jurisdiction. Costs relative thereto shall be borne by the Contractor.

1.03 QUALITY ASSURANCE

- A. Familiarity with Pertinent Codes and Standards: Verify the requirements of the specifically named codes and standards as well as requirements mandated by law, ordinance and authority. Verify that the items procured and installed in this Work meet or exceed the specified requirements.
- B. Rejection of Noncomplying Items: The Architect reserves the right to reject items incorporated into the Work which fail to meet such minimum requirements.

1.04 APPLICABLE CODES

- A. Work of the project shall conform to the following list of the **2019, Title 24, California Code of Regulations (CCR)**, a List of Codes, copies of which shall be maintained at the job site by the Contractor throughout the duration of the work.
- B. **Applicable Codes as of January 1, 2017:**
  - 1. **2019 California Administrative Code (CAC)**, Part 1, Title 24, California Code of Regulations (CCR).
  - 2. **2019 California Building Code (CBC)**, Volumes 1 and 2, Part 2, Title 24, California Code of Regulations (CCR) with 2019 California Amendments.
  - 3. **2019 California Electrical Code (CEC)**, Part 3, Title 24, California Code of Regulations (CCR) with 2019 California Amendments.

4. **2019 California Mechanical Code** (CMC), Part 4, Title 24, California Code of Regulations (CCR) with 2019 California Amendments.
5. **2019 California Plumbing Code** (CPC), Part 5, Title 24, California Code of Regulations (CCR).
6. **2019 California Energy Code**, Part 6, Title 24, California Code of Regulations (CCR).
7. **2019 California Historical Building Code**, Part 8, Title 24, California Code of Regulations (CCR).
8. **2019 California Fire Code**, Part 9, Title 24, California Code of Regulations (CCR).
9. **2019 California Existing Building Code**, Part 10, Title 24, California Code of Regulations (CCR).
10. **2019 California Green Building Standards Code**, Part 11, Title 24, California Code of Regulations (CCR)
11. **2019 California Reference Standards Code**, Part 12, Title 24, California Code of Regulations (CCR). Title 19, CCR, Public Safety, State Fire Marshal Regulations.

C. **Partial List of Applicable Standards:**

Reference code section for NFPA Standards, 2019 CBC (SFM)

NFPA 13	Installation of Sprinkler Systems, 2019 Edition
NFPA 14	Installation of Standpipes and Hose Systems, 2019 Edition
NFPA 17	Dry Chemical Extinguishing Systems, 2017 Edition
NFPA 17a	Wet Chemical Extinguishing Systems, 2017 Edition
NFPA 20	Installation of Stationary Pumps for Fire Protection, 2019 Edition
NFPA 24	Installation of Private Fire Service Mains and their Appurtenances, 2019 Edition
NFPA 72	National Fire Alarm and Signaling Code, (California Amended) 2019 Edition (Note, see UL Standard 1971 for "Signaling Devices for the Hearing Impaired")
NFPA 253	Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source, 2019 Edition
NFPA 2001	Clean Agent Fire Extinguishing Systems, 2018 Edition

1.05 REFERENCE STANDARDS

- A. Standards referenced in the Specifications are usually referred to by the abbreviation of the organization's name and the designation of the document (e.g., ASTM A36). Documents in common use may be referred to by their own designation (e.g., the

California Electrical Code is published by the National Fire Protection Association as NFPA-70 but is referred to as CEC, and is part of a series of documents or standards referred to as the National Fire Code). References are to the latest issue of the publication available on the date stipulated for the receipt of bids.

#### STANDARDS ORGANIZATIONS

AA	Aluminum Association
AAMA	American Architectural Manufacturer's Association
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AGA	American Gas Association
AISC	American Institute of Steel Construction
AITC	American Institute of Timber Construction
AMCA	Air Movement and Control Association, Inc.
ANSI	American National Standards Institute, Inc.
APA	APA-The Engineered Wood Association
ARI	Air-Conditioning and Refrigeration Institute
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWPA	American Wood Protection Association
AWPB	American Wood Preservers' Bureau
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders Hardware Manufacturers Association
CBC	California Building Code, 2019
CDA	Copper Development Association
CEC	California Electrical Code
CEQA	California Environmental Quality Act
CGA	Compressed Gas Association
CISPI	Cast Iron Soil Pipe Institute

CMC	California Mechanical Code - See IAPMO
CPC	California Plumbing Code - See IAPMO
CPSC	Consumer Product Safety Commission
CRSI	Concrete Reinforcing Steel Institute
CS	Commercial Standard of U.S. Dept. of Commerce
CTIOA	Ceramic Tile Institute of America (former CTI)
CSMA	Chemical Specialties Manufacturing Association
FGMA	Flat Glass Marketing Association
FM	Factory Mutual Global (former FMS)
FS	Federal Specification
GA	Gypsum Association
HI	Hydraulic Institute
HRI	Hydraulics Research Institute
IAPMO	International Association of Plumbing and Mechanical Officials
ICC	International Code Council (former ICBO)
IEEE	Institute of Electrical and Electronics Engineers
IES	Illuminating Engineering Society of North America
MIL-STD	Military Specifications (former MIL)
ML/SFA	Metal Lath/Steel Framing Association
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry
NAAMM	National Association of Architectural Metal Manufacturers
NIST	National Institute of Standards and Technology (former NBS)
NEBB	National Environmental Balancing Bureau
NEMA	National Electrical Manufacturers Association
N FLUID PA NFPA	National Fluid Power Association National Fire Protection Association
NRCA	National Roofing Contractors Association
NSF	National Sanitation Foundation
NWWDA	National Wood Window and Door Association

PS	Voluntary Product Standard (of NIST former NBS)
SMACNA	Sheet Metal and Air Conditioning Contractors National Association
SDI	Steel Deck Institute
SJI	Steel Joist Institute
SSPC	The Society for Protective Coatings (former SSPC)
TCNA	Tile Council of North America, Inc. (former TCA)
TSIB	Technical Services Information Bureau (former WLPDIA)
UL	Underwriters Laboratories, Inc.
WI	Woodwork Institute (former WIC)
TITLE	Title 24, California Code of Regulations, Part 1, 2, 3, 4, 5, 6, 8, & 9
TITLE	Title 19, California Code of Regulations

**1.06 REFERENCE COPIES**

- A. A minimum of one copy of Codes, Regulations, and Standards referenced in the drawings or the specifications, or applicable to the work, shall be furnished to the Owner's Representative at least (2) two weeks prior to the commencement of work affected by such codes, regulations or standards.

**PART 2 - PRODUCTS**

(Not Applicable)

**PART 3 - EXECUTION**

(Not Applicable)

**END OF SECTION**

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SECTION 01 45 23

TESTING AND INSPECTING SERVICES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Cooperate with the Owner's selected testing agency, the Owner's assigned Inspector, and others responsible for testing and inspecting the Work, and assist the Owner by coordinating such testing and inspecting services as specified in this Section and/or elsewhere in the Contract Documents.
- B. Related Work Specified Elsewhere:
  - 1. Requirements for testing may be required in other Sections of these Specifications.
  - 2. Where no testing requirements are specified or required by reference standards or authorities having jurisdiction, the Owner may require such testing to be performed under current pertinent standards for testing. Payment for such testing will be made as described herein.
- C. Work Not Included:
  - 1. The Owner will select a pre-qualified independent testing laboratory and Inspector as approved by the Division of the State Architect (DSA), Department of General Services, Architect and Structural Engineer.
  - 2. The Owner will pay for initial services of the testing laboratory as further described hereinafter.

1.02 QUALITY ASSURANCE

- A. The Owner will select an independent testing laboratory to conduct the tests. Selection of the material required to be tested shall be by the laboratory or the Owner's representative and not by the Contractor.
- B. Qualifications of Testing Laboratory: The testing laboratory, approved by DSA, shall be qualified to the Owner's acceptance in accordance with ASTM E329. The testing laboratory shall be qualified by the Division of the State Architect.
- C. Codes and Standards: Testing, when required, will be in accordance with pertinent codes and regulations and with selected standards of the American Society for Testing and Materials and other organizations or agencies which publish recognized codes, standards, or tests. Refer to Article 3.04 - Required Testing of this Section.

1.03 TEST REPORT DISTRIBUTION

- A. Promptly process and distribute required copies of test reports and related instructions to ensure necessary retesting and/or replacement of materials with the least possible delay in progress of the Work.
- B. One copy of Test Reports shall be forwarded to the Division of the State Architect by the testing agency. Such reports shall include tests made, regardless of whether such tests

indicate that the material is satisfactory or unsatisfactory. Samples taken but not tested shall also be reported. Records of special sampling operations as required shall also be reported. The reports shall show that the material or materials were sampled and tested in accordance with the requirements of Title 24 and with the approved specifications. Test reports shall show the specified design strength. They shall also state definitely whether or not the material or materials tested comply with requirements.

- C. Each Testing Agency shall submit to the Division of the State Architect a verified report in duplicate covering tests which are required to be made by that agency during the progress of the project. Such report shall be furnished each time that work on the project is suspended, including tests up to that time, and at the completion of the project.

#### **1.04 PAYMENT FOR TESTING SERVICES**

- A. Initial Services: The Owner will pay for initial testing and inspection except as specifically modified herein- after or as specified otherwise in technical sections, provided the results of inspection indicate compliance with the Contract Documents.
- B. Retesting: When initial tests or inspection indicate noncompliance with the Contract Documents, subsequent retesting or reinspection occasioned by the noncompliance shall be performed by the same testing laboratory or Inspector and the costs thereof will be deducted by the Owner from the Contract Sum. Retesting and reinspection will continue until test or inspection results indicate compliance.
- C. Code Compliance Testing: Inspections and tests required by codes or ordinances, or by authorities having jurisdiction and made by a legally constituted authority, shall be the responsibility of and shall be paid for by the Owner, but backcharged to the Contractor in case of retesting due to non-compliance.
- D. Specified Inspections and Tests: Tests and inspections specified in the Specifications, directly or by reference, shall be coordinated by the Contractor at his expense and paid for by the Owner. Corrections of noncompliance and test failures shall be paid for by the Owner, but shall be backcharged to the Contractor. Reinspection and retesting shall be in accordance with paragraph 1.04-B.
- E. Contractor's Convenience Testing: Inspecting or testing performed exclusively for the Contractor's convenience shall be the sole responsibility of and at the expense of the Contractor.

#### **1.05 INSPECTION BY THE OWNER**

- A. The Owner and his representatives will have access, for the purpose of inspection, to parts of the work and to the shops wherein the work is in preparation, and the Contractor shall maintain proper facilities and provide safe access for such inspection.
- B. The Owner shall have the right to reject materials and workmanship which are defective, and to require their correction. Rejected workmanship shall be satisfactorily corrected and rejected materials shall be removed from the premises without charge to the Owner. If the Contractor does not correct such rejected work within a reasonable time, fixed by written notice, the Owner may correct rejected work and charge the expense to the Contractor.
- C. Should it be considered necessary or advisable by the Owner at any time before final acceptance of the entire work to make an examination of work already completed by removing or tearing out the same, the Contractor shall on request promptly furnish necessary facilities, labor and materials. If such work is found to be defective in respect

due to fault of the Contractor or his subcontractor, he shall defray expenses of such examinations and of satisfactory reconstruction. If, however, such work is found to meet the requirements of the contract, the additional cost of labor and material necessarily involved in the examination and replacement will be allowed the Contractor.

#### 1.06 OWNER'S INSPECTOR

- A. An Inspector employed by the Owner, approved by DSA in accordance with the requirements of the State of California Administrative Code, Title 24, Part 1, and qualified in accordance with Division of the State Architect will be assigned to the work. Reference DSA IR A-7 and IR A-8 for project Inspector certification and approval and duties and performance rating by DSA. The inspector duties are specifically defined in Title 24, Part 1, Section 4-342, reprinted herein:

##### " 4-219 Duties of the Project Inspector

- (a) **General.** The project inspector shall act under the direction of the architect or registered engineer and under the supervision of the enforcement agency.
- (b) **Duties.** The general duties of the project inspector in fulfilling project inspection responsibilities are as follows:
1. **Continuous inspection requirement.** The project inspector must have actual personal knowledge obtained by personal and continuous inspection of the work of construction in all stages of its progress that the requirements of the approved plans and specifications are being executed.  
  
Continuous inspection means complete inspection of every part of the work. Work, such as concrete work or masonry work which can be inspected only as it is placed, shall require the constant presence of the project inspector. Other types of work which can be completely inspected after the work is installed may be carried on while the project inspector is not present. In any case, the project inspector must personally inspect every part of the work. In no case shall the inspector have or assume any duties that will prevent him or her from providing continuous inspection.  
  
The project inspector may obtain personal knowledge of the work of construction, either on-site or off-site, from the inspections performed by special inspectors or approved assistant inspectors and from the reporting of others on testing and inspection of materials and workmanship for compliance with the plans, specifications, and applicable standards. The exercise of reasonable diligence to obtain the facts shall be required.
  2. **Relations with the architect or engineer.** The project inspector shall work under the general direction of the architect or registered engineer. Any uncertainties in the inspector's comprehension of the plans and specifications shall be reported promptly to the architect or registered engineer for his/her interpretation and instructions. In no case shall the instructions of the architect or registered engineer be construed to cause work to be done which is not in conformity with the DSA approved plans, specifications and documents authorizing changes.
  3. **Job file.** The project inspector shall keep a file of approved plans and specifications (including all approved documents authorizing changes)

on the job at all times.

4. **Construction procedure records.** The project inspector shall keep a record of certain construction procedures including, but not limited to the following:
  - A. Concrete pouring operations. The records show the time and date of placing concrete and the time and date of removal of forms in each portion of the structure.
  - B. Welding operations. The record shall include identification marks of welders, lists of defective welds, manner of correction of defects, etc.
  - C. Penetration under the last ten (10) blows for each pile when piles are driven for foundations. All such records of construction procedures shall be kept on the job until the completion of the work. These records shall be made a part of the permanent records of the owner.
5. **Deviations.** The project inspector shall notify the contractor, in writing, of any deviations from the approved plans and specifications which are not immediately corrected by the contractor when brought to the contractor's attention. Copies of such notice shall be forwarded immediately to the architect or registered engineer and to the enforcement agency.

Failure on the part of the project inspector to notify the contractor of deviations from the approved plans and specifications shall in no way relieve the contractor of any responsibility to complete the work covered by his or her contract in accordance with the approved plans and specifications and all laws and regulations.
6. **Verified reports.** The project inspector shall submit to the enforcement agency verified reports as required in Section 4-214.
- (c) **Violations.** Failure, refusal or neglect on the part of the project inspector to notify the contractor of any work which does not comply with the requirements of the approved plans and specifications, or failure, refusal or neglect to report immediately, in writing any such violation to the architect or registered engineer, to the owner and to the enforcement agency shall constitute a violation of the Act and shall be cause for the enforcement agency to take action, which may result in withdrawal of the inspector's approval.

**Authority:** Health and Safety Code Section 16022.

**Reference:** Health and Safety Code Section 16017 and 16021. "

- B. The work of construction in stages of progress shall be subject to the personal continuous observation of the Inspector as continuous observation is defined by Title 24. He shall have free access to all parts of the work at any time. The Contractor shall furnish the Inspector reasonable facilities for obtaining such information as may be necessary to keep him fully informed respecting the progress and manner of the work and the character of the materials. Inspection of the work shall not relieve the Contractor from obligation to fulfill this Contract.

1.07 OWNER'S OTHER PERSONNEL

- A. From time to time, other personnel in the employ of the Owner may inspect the Work when the Work is in progress but shall have no authority to direct the Contractor or request changes in the Work except as may be provided elsewhere in the Contract Documents.
- 1.08 REPRESENTATIVE OF THE DIVISION OF THE STATE ARCHITECT
- A. Architect shall have access to the site in accordance with Title 24.
  - B. Field Engineers and Inspectors from DSA. Structural Safety Section, Fire & Life Safety Review and Access Compliance shall have access to the site in accordance with Title 24.

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

**PART 3 - EXECUTION**

3.01 COOPERATION WITH TESTING LABORATORY AND INSPECTORS

- A. Inspectors and representatives of the testing laboratory shall have access to the work. Provide facilities for such access in order that the testing, inspection, and the obtaining of samples may be done properly.
- B. Contractor shall deliver material specimens to the Owner's testing lab, which must by terms of the Contract be tested prior to inclusion in the Project, at least 45 days prior to scheduled delivery to the job site.
- C. Material shipped by the Contractor from the source of supply prior to having satisfactorily passed such testing and inspection or prior to the receipt of notice from said representative that such testing and inspection will not be required shall not be incorporated in the job.

3.02 TAKING SPECIMENS

- A. Field specimens and samples for testing, unless otherwise provided in these Contract Documents, shall be selected and taken by the Testing Laboratory or Inspector and not the Contractor. Sampling equipment and personnel will be provided by the testing laboratory. Deliveries of specimens and samples to the testing laboratory will be performed by the testing laboratory. Soil samples for approval of import fill shall be delivered to the Testing Laboratory by the Contractor, as directed by the Testing Laboratory.

3.03 SCHEDULES FOR TESTING

- A. Establishing Schedule:
  - 1. By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its findings.
  - 2. Provide required time within the Construction Schedule.
- B. Revising Schedule: When changes of construction schedule are necessary during

construction, coordinate such changes of schedule with the testing laboratory as required.

- C. Adherence to Schedule: When the testing laboratory is ready to test according to the determined schedules, but is prevented from testing or taking specimens due to incompleteness of the work, extra charges for testing attributable to the delay may be back-charged to the Contractor and will be deducted by the Owner from the Contract Sum.

**3.04 REQUIRED TESTING**

Tests and inspections for the following items will be required in accordance with referenced Sections/Chapters of California Building Code, Title 24, Part 2:

**A. FOUNDATIONS**

Sitework, Demolition & Construction (Chapters **17A** and **18A**)

- |    |                       |                |
|----|-----------------------|----------------|
| 1. | Earth Fill Compaction | 1804A, 1705A.6 |
| 2. | Excavation and Fills  | 1804A          |

**B. CONCRETE (Chapters **17A** and **19A**):**

**1. MATERIALS:**

- |    |                        |           |
|----|------------------------|-----------|
| a. | Portland Cement        | 1910A.1   |
| b. | Concrete Aggregates    | 1903A.5   |
| c. | Reinforcing Bars       | 1903A.8   |
| d. | Batch Plant Inspection | 1705A.3.3 |

**2. CONCRETE QUALITY:**

- |    |                           |                              |
|----|---------------------------|------------------------------|
| a. | Proportions of Concrete   | 1904A, ACI 318 26.4.3        |
| b. | Strength Test of Concrete | 1905A.1.16,<br>ACI 318 26.12 |
| c. | Concrete Curing           | ACI 318 26.5.3               |

**3. CONCRETE INSPECTION:**

- |    |                                       |                      |
|----|---------------------------------------|----------------------|
| a. | Job Site Inspection                   | 1705A.3.5, 1705A.3.6 |
| b. | Batch Plant or Weighmaster Inspection | 1705A.3.3            |
| c. | Reinforcing Bar Welding Inspection    | 1705A.3.1            |
| d. | Clean Rough Construction Joints       | ACI 318 26.5.6       |
| e. | Waiver of Batch Plant Inspection      | 1705A.3.3            |

**C. STRUCTURAL STEEL (Chapter **17A** and **22A**):**

**1. MATERIALS:**

- |    |                                     |                                  |
|----|-------------------------------------|----------------------------------|
| a. | Structural Steel, Cold Formed Steel | 2203A, 2205A, 2210A and<br>2211A |
| b. | Material Identification             | 2203A.1                          |

**2. TESTS AND INSPECTION OF STRUCTURAL STEEL:**

- |    |                           |           |
|----|---------------------------|-----------|
| a. | Tests of Structural Steel | 1705A.2.1 |
|----|---------------------------|-----------|

- b. Welding inspection (by AWS-CWI approved by DSA) 1705A.2.5
- c. Shop fabrication inspection 1704A.2.5
- d. Tests of high strength bolts, nuts, washers 1705A.2.1, 2213A.1
- e. Tests of end-welded studs 2213A.2
- f. Automatic end-welded stud shear connector Inspection 1705A.2.1
- g. High Strength Bolt Inspection 1705A.2.1
- h. Tension test for drilled-in anchor or chemical type anchors 1910A.5
- i. Non-destructive weld testing 1705A.2.1

F. EXPANSION BOLTS OR EPOXY-TYPE ANCHORS IN CONCRETE  
(Hard Rock)

- 1. Tension Testing 1910A.5
- 2. Failure/Quality Assurance 1910A.5.5

**END OF SECTION**

**Attachment: DSA form: 103 Structural Tests & Inspections**

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SECTION 01 50 00

TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Construction facilities and temporary controls including:
  - 1. Temporary utilities such as heat, water, electricity, and telephone.
  - 2. Field offices and storage areas, including offices for Architect and Inspector.
  - 3. Sanitary facilities for construction personnel.
  - 4. Enclosures such as tarpaulins, barricades, and canopies.
  - 5. Provision of fire safety and fire fighting facilities.
- B. Related Work Specified Elsewhere:
  - 1. Installation and connections to existing utility lines are described in the Sections of these Specifications relative to permanent connections required.
  - 2. Requirements for storage areas

1.02 QUALITY ASSURANCE

- A. Conform with the following criteria of the California Fire Code, Chapter 33 – Fire Safety During Construction, And Demolition:
  - 1. Section 3301.1 SCOPE
  - 2. Section 3302 DEFINITIONS
  - 3. Section 3303 TEMPORARY HEATING EQUIPMENT
  - 4. Section 3304 PRECAUTIONS AGAINST FIRE
  - 5. Section 3305 FLAMMABLE AND COMBUSTIBLE LIQUIDS
  - 6. Section 3306 FLAMMABLE GASES
  - 7. Section 3307 EXPLOSIVE MATERIALS
  - 8. Section 3308 OWNER'S RESPONSIBILITY FOR FIRE PROTECTION
  - 9. Section 3309 FIRE REPORTING
  - 10. Section 3310 ACCESS FOR FIRE FIGHTING
  - 11. Section 3311 MEANS OF EGRESS
  - 12. Section 3312 WATER SUPPLY FOR FIRE PROTECTION
  - 13. Section 3313 STANDPIPES
  - 14. Section 3314 AUTOMATIC SPRINKLER SYSTEM

- 15. Section 3315 PORTABLE FIRE EXTINGUISHERS
- 16. Section 3316 MOTORIZED CONSTRUCTION EQUIPMENT
- 17. Section 3317 SAFEGUARDING ROOFING OPERATIONS

END OF CHAPTER 33

1.03 PROJECT CONDITIONS

- A. Make required connections to existing utility systems with minimum disruption to services.
- B. When disruption of the existing service is required, do not proceed without the Owner's and Architect's review and, when required, provide alternate temporary service.
- C. Environmental Requirements: Provide and maintain heat, fuel, materials, and services necessary to protect work and materials against injury from extreme heat, cold, dry winds, dust, or dampness as follows:
  - 1. During the placing, setting and curing of concrete and cement work, provide sufficient heat to ensure the heating of spaces involved do not fall to less than 50 degrees Fahrenheit.
  - 2. Suspend operations on work when subject to damage by climatic conditions, flooding, or because of insufficient curing or drying of surfaces or materials.
  - 3. Take necessary action to protect site and Work from wind, flood, and storm damage.

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. Construction facilities shall be subject to the Architect's review and approval.

2.02 UTILITIES

A. Water:

- 1. Provide necessary temporary water lines and water supply and, upon completion of the work, remove temporary facilities.
- 2. Furnish water needed for construction. Comply with the regulations of local water authority including transport of reclaimed water for construction.

B. Electricity:

- 1. Provide necessary temporary wiring and, upon completion of the work, remove temporary facilities.
- 2. Provide area distribution boxes so located that the individual trades may use 100 feet maximum length extension cords to obtain adequate power and artificial lighting at points where required for the work, for inspection and for safety.

- 3. Furnish electricity needed for construction.
- C. Heating: Provide and maintain heat needed for proper conduct of operations included in the work.
- D. Telephone: Make necessary arrangements and pay costs for operation and installation of separate telephone service at locations approved by the District's Inspector.
- E. Utilities for Testing: Normal quantities required to make final tests of installed permanent systems shall be furnished at no cost to the Owner.
- F. Temporary facilities in the public right-of-way are subject to approval. Obtain and pay for any permits required.

2.03 SIGNAGE

- A. Bid Package No. 1, shall provide a 4' x 8' self-supporting temporary sign per the Drawing at the end of this Section. Supporting posts to be wood 4 x 4's embedded minimum four feet into tamped (compacted) soil to discourage easy removal. Verify text with Architect and Owner prior to fabrication. Sign shall remain the property of the School District at the completion of the Work. Remove sign and deliver to the District to location directed by the Owner when the temporary office facilities are removed.
- B. Location of signs shall be as directed by the Architect.

**PART 3 - EXECUTION**

3.01 MAINTENANCE AND REMOVAL

- A. Maintain facilities and temporary controls as long as needed for the safe and proper completion of the work.
- B. Remove such construction facilities and temporary controls as rapidly as progress of the work will permit, or as directed by the Architect.

**END OF SECTION**

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SECTION 01 73 29

**CUTTING AND PATCHING**

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section Includes: Administrative and procedural requirements for cutting and patching.
- B. Related Work Specified Elsewhere:
  - 1. Refer to other Sections for specific requirements and limitations applicable to cutting and patching individual parts of the work.
  - 2. Requirements of this Section apply to mechanical and electrical installations. Refer to Division 22 through Division 28, Sections for other requirements and limitations applicable to cutting and patching plumbing, mechanical and electrical installations.

1.02 SUBMITTALS

- A. Before commencing alteration or demolition work, submit for review by the Architect and approval of the Owner, a Schedule showing the commencement, the order and the completion dates for the various parts of this work. Where approval of procedures for cutting and patching is required before proceeding, submit a proposal describing procedures well in advance of the time cutting and patching will be performed and request approval to proceed. Include the following information, as applicable, in the proposal:
  - 1. Describe the extent of cutting and patching required and how it is to be performed; indicate why it cannot be avoided.
  - 2. Describe anticipated results in terms of changes to existing construction; include changes to structural elements and operating components as well as changes in the building's appearance and other significant visual elements.
  - 3. List products to be used and firms or entities that will perform Work.
  - 4. Indicate dates when cutting and patching is to be performed.
- B. List utilities that will be disturbed or affected, including those that will be relocated and those that will be temporarily out-of-service. Indicate how long service will be disrupted. Before starting work relating to existing utilities (electrical, sewer, water, heat, gas, fire lines, etc.) that will temporarily discontinue or disrupt service to the existing building, notify the Architect and the Owner 72 hours in advance and obtain the Owner's approval in writing before proceeding with this phase of the work.
- C. Where cutting and patching involves addition of reinforcement to structural elements, submit details and engineering calculations to show how reinforcement is integrated with the original structure. All cutting of structural elements subject to acceptance of the Structural Engineer and approval of the Division of the State Architect prior to execution.
- D. Approval by the Architect to proceed with cutting and patching does not waive the Architect's right to later require complete removal and replacement of a part of the Work

found to be unsatisfactory. Subject to approval by the Division of the State Architect.

- E. All cutting and patching of existing hard scape or landscaping for installation or modification, shall be reinstalled in kind. When new utilities are shown or utility modifications are shown on the plans and specific cutting and patching notes are not shown, the contractor shall assume that the existing hardscape shall be saw cut, material removed and disposed, trenches prepared in accordance with local water district or county regulations, and all existing hardscape shall be returned to existing condition or better.

#### **1.03 QUALITY ASSURANCE**

- A. Requirements for Structural Work: Do not cut or notch any structural elements unless specifically detailed on the Drawings.
- B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace Work cut and patched in a visually unsatisfactory manner.
- D. If possible, retain the original installer or fabricator to cut and patch the following categories of exposed Work, or if it is not possible to engage the original installer or fabricator, engage another recognized experienced and specialized firm:

Processed concrete finishes  
Stucco and ornamental plaster

### **PART 2 - PRODUCTS**

#### **2.01 MATERIALS**

- A. Use materials that are identical to existing materials. Materials and workmanship employed in the alterations, unless otherwise shown or specified, shall conform to that of the original work, or to new construction as specified elsewhere in these specifications. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.
- B. It is intended that interior finish materials, or existing surfaces to be removed, be re-used insofar as reasonable in areas necessary to match existing surfaces. Care in removal and stockpiling shall be exercised to ensure re-use.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

- B. Before proceeding, meet at the site with entities involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

### 3.02 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Make such explorations and probes as are necessary to ascertain required protective measures before proceeding with demolition and removal. Give particular attention to shoring and bracing requirements so as to prevent damage to existing construction.
- C. Provide, erect, and maintain catch platforms, lights barriers, weather protection, warning signs and other items as required for proper protection of the public, occupants of the building, workmen engaged in demolition operations, and adjacent construction.
- D. Provide and maintain weather protection at exterior openings so as to fully protect the interior premises against damage from the elements until such openings are closed by new construction.
- E. Provide and maintain temporary protection of the existing structure designated to remain where demolition, removal and new work is being done, connections made, materials handled, or equipment moved.
- F. Take necessary precautions to prevent dust and dirt from rising by wetting demolished masonry, concrete, plaster and similar debris. Protect unaltered portions of the existing building affected by the operations under this Section by dustproof partitions and other adequate means.
- G. Provide adequate fire protection in accordance with local Fire Departments, and with Section 01 50 00.
- H. Do not close or obstruct walkways, passageways or stairways. Do not store or place materials in passageways, stairs, or other means of egress. Conduct operations with minimum traffic interference.
- I. Be responsible for damage to the existing structure or contents by reason of the insufficiency of protection provided.
- J. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the Project that might be exposed during cutting and patching operations.
  - 1. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
  - 2. Take precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

### 3.03 PERFORMANCE

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

1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible review proposed procedures with the original installer; comply with the original installer's recommendations.
  1. In general, where cutting is required use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces. [New detail for asphalt and concrete](#)
  3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill. Provide pilot holes at corners and do not overcut.
  4. Comply with requirements of applicable Sections of Division 2 where cutting and patching requires excavating and backfilling.
  5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specific tolerances.
  1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
  2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
  3. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary to achieve uniform color and appearance.
    - a. Where patching occurs in a smooth painted surface, extend final paint coat over entire unbroken containing the patch, after the patched area has received primer and second coat.
  4. Patch, repair or rehang existing ceilings as necessary to provide an even plane surface of uniform appearance.
- D. Perform demolition, removal and alteration work with due care, including shoring, bracing, etc. Be responsible for damage which may be caused by such work to part or parts of existing structures or items designated for re-use. Perform patching, restoration and new work in accordance with applicable technical sections of the Specifications.



- E. Materials and/or items designated to become the property of the Owner shall be as shown. Remove such items with care, under the supervision of the trade responsible for reinstallation; protect and store until required. Replace material and/or item damaged in its removal with approved similar and equal new material.
  - F. Materials and/or items demolished and not designated to become the property of the Owner or to be reinstalled shall become the property of the Contractor and shall be removed from the Owner's property. Storage or sale of removed items on site will not be permitted.
  - G. Execute the work in a careful and orderly manner, with the least possible disturbance to the public and to the occupants of the building.
  - H. Where alterations occur, or new and old work join, cut, remove, patch, repair or refinish the adjacent surfaces or so much thereof as is required by the involved conditions, and leave in as a good a condition as existed prior to the commencing of the work. The alteration work shall be performed by the various respective trades which normally perform the particular items of work.
  - I. Finish new and adjacent existing surfaces as specified for new work. Clean existing surfaces of dirt, grease, loose paint, etc. before refinishing.
  - J. Where existing equipment and fixtures are indicated to be re-used, repair such equipment and fixtures and refinish to put in perfect working order. Refinish as directed.
  - K. Cut out embedded anchorage and attachment items as required to properly provide for patching and repair of the respective finishes.
  - L. Confine cutting of existing roof areas designated to remain to the limits required for the proper installation of the new work. Cut and fold back existing built-up roofing. Cut and remove insulation, etc. Provide temporary weathertight protection as required until new roofing and flashings are applied.
- 3.04 CLEANING
- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

**END OF SECTION**

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SECTION 01 77 00

CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Operations and submittals required to establish Substantial Completions, Project Acceptance, and filing of Notice of Completion.
- B. Contract Completion Date is the day established by the Agreement, the Special Conditions, and the Notice to Proceed as the calendar date by which all Work must be completed in accordance with the Contract Documents. Once established, the Contract Completion Date can only be altered by Change Order. If Work is not complete in accordance with the Contract Documents by the Contract Completion Date, Contractor is obligated to pay liquidated damages to the Owner. In accordance with the terms of the Contract.
- C. Substantial Completion: The Date of Substantial Completion is the date on which the Architect certifies to the Owner that construction is sufficiently complete, in accordance with the Contract Documents, that the District may occupy the Project for the use intended, and all agencies and authorities have provided written acceptance of the portions of the Work over which they have jurisdiction.
- D. Project Acceptance: The District will accept completion of the Contract after the entire Work shall have been completed to the satisfaction of the District and after issuance of the Certificate of Substantial Completion. The Work may only be accepted as complete by formal action of the Governing Board of the School District. Acceptance of the Project by the Governing Board establishes the formal and official Completion Date for the Project, to be compared against the Contract Completion Date. Project Acceptance must occur prior to Contract Completion Date to preclude assessment of liquidated damages.
- E. Notice of Completion: The date of record for the Notice of Completion shall be the date stamped on the Notice by the County Recorder at the time the County Recorder registers the Notice (note: this is normally not the same date as the date the Owner actually files the Notice of Completion with the Recorder office).

1.02 CLOSEOUT SCHEDULE AND PROCEDURE

- A. Requirements Preparatory to Project Acceptance:
  - 1. Contractor shall deliver certifications to Architect that no new materials containing asbestos have been included in the work.
  - 2. Temporary facilities shall be removed from site as specified in Section 01 50 00, Temporary Facilities and Controls.
  - 3. Entire site shall be thoroughly cleaned of all construction debris.
  - 4. Record drawings shall be completed, signed by Contractor and Inspector and submitted to Architect.
  - 5. Guarantees and warranties shall be submitted to Architect as specified in General conditions and Section 01 78 30 – Warranties.

6. Contractor's Final Verified Report (Form DSA-6) and other Reports and Affidavits required by the Division of State Architect shall be submitted.
  7. Operating and maintenance data shall be submitted and instruction sessions completed as outlined in Section 01 78 23 – Operating and Maintenance Data and as required in CBC 2019 Section 110.3.10.2.
  8. Contractor to provide a copy of cleaning and maintenance recommendations for countertops to the underneath side of furniture, in addition to requirements listed above and outlined in Section 01 78 23 – Operating and Maintenance Data.
- B. Project Acceptance Requirements, Division of the State Architect:
1. Upon completion of construction of the project, the following reports are required to be submitted before the Division of the State Architect will issue a letter to certificate of compliance of the work:
    - a. A copy of the Notice of Completion filed by the School District.
    - b. Final Verified Report Form DSA 6 A/E certifying all work is 100% complete from the Architect, Structural Engineer, Mechanical Engineer and the Electrical Engineer.
    - c. Contractor's Documents and Field Reports:
      - 1) Final Verified Report Form DSA 6, certifying all work is 100% complete, from the Contractors (or Contractors), the Inspector of Record, and Special Inspector(s).
      - 2) Verified Reports of Testing and Inspection as specified on the approved drawings and specifications (i.e., Final Laboratory Report, Welding, Glued-laminated Timber, etc.).
      - 3) Weighmaster's Certificate (if required by approved drawings and specifications).
      - 4) If responsibility was changed in any area during construction, the change must be supported by appropriate documentation and termination reports filed by the individuals originally charged with responsibility.
- C. Procedure for Project Acceptance:
1. Contractor shall complete all Work as required by the Contract Documents, to the best standards of the industry and the trades involved. It shall be the Contractor's responsibility to provide a new, complete, properly operating, professionally finished, detailed, cleaned, high-quality project. There shall be no loose, untrue, or ill-fitting materials, unsightly gaps, voids, or holes, misalignments, mis-adjustments, shoddy workmanship, or damaged, missing, inoperable, or incomplete work. Work shall be free of smudges, spots, stains, dirt, nicks, tears, cracks, scratches, paint runs, flaws, oversprays, and all other unsightly blemishes.
  2. Completion lists and correction lists for items described in the paragraph above, as opposed to short lists of a few minor corrective items that may have

inadvertently been missed by the Contractor, shall be the responsibility of the Contractor, and not the Architect, Inspector, or District. By entering into this Contract, Contractor agrees that quality control is the responsibility of the Contractor. "Punch" list generated by the Architect is under no circumstances to be considered a vehicle to compel subcontractors to complete contract work.

3. Contractor shall prepare a comprehensive and complete list of corrective items for himself and his subcontractors, and shall verify that these items have been corrected prior to notifying the Architect of completion. Copies of the Contractor's list(s) shall be made available to the Architect and Inspector upon request.
4. Contractor shall notify the Architect *in writing* when Contractor, with concurrence of Inspector, feels the project is one-hundred percent complete and is ready to leave the Project. Architect shall then commence the construction review and prepare a "Punch List", or list of minor corrective items to be issued to Contractor. For convenience, reviews may be phased for various portions of the work, as each distinct portion becomes one-hundred percent (100%) complete.
5. Architect will arrange for Engineering Consultants to make their construction reviews, to be completed before Architect will make his construction review. Contractor and his principal superintendent, authorized to act in behalf of the Contractor, as well as principal subcontractors that the Architect may request to be present, shall accompany the Architect/Engineers during the construction reviews.
6. Excessive amounts of corrective ("punch list") items, as judged by the Architect, shall be grounds to terminate the construction review until such time as the Contractor is deemed sufficiently complete to once again start the review. As a rule of thumb, more than four minor items per typical room will be considered excessive.
7. If Owner elects to occupy the Project after the Contract Completion Date, but before the Contractor has completed the Work, Architect must make a comprehensive construction review prior to Owner's occupancy. Contractor shall reimburse Architect and Engineers for their time in conducting such review, and for the time of their clerical staffs in preparing the review documents, at the Architect's/Engineer's standard hourly rates for extra services. Contractor will be billed at the time of Contractor's Application for Payment. Payments to the Architect not received within 30 days will be deducted from subsequent Contractor's Applications for Payment in accordance with the General Conditions.
8. After completion of "Punch List" work, Contractor shall notify Architect in writing to perform an acceptance tour. Notice shall be issued at least seven (7) days in advance of the time the acceptance tour is to be performed.
9. Contractor and his principal superintendent, authorized to act in behalf of Contractor, as well as principal subcontractors that Architect may request to be present, shall accompany Architect and Inspector on acceptance tour.
  - a. If work has been completed in accordance with Contract Documents, and no further corrective measures are required, Architect will issue a Certificate of Substantial Completion, and recommend that Owner accept Project and file Notice of Completion.

- b. If work is judged to be substantially completed in accordance with Contract Documents, and only a few corrective measures are required, Architect will issue a Certificate of Substantial Completion, (Article 64 of the General Conditions), and recommend that Owner conditionally accept Project and file Notice of Completion. Owner may conditionally accept project and withhold amount for completion per Article 64 of the General Conditions, Contractor shall issue a written notice of intent to complete the corrective measures by a specific named date agreed to by District.
- c. If work has not been substantially completed in accordance with Contract Documents, and several or many corrective measures are still required, Architect will recommend that Owner not accept project and not file Notice of Completion. Instead, based on information gathered from acceptance tour, Contractor will be required to complete corrective measures and then call for another project acceptance tour following procedure outlined above. Contractor will compensate Architect and Inspector for additional acceptance tour and deduct amount paid from final payment to Contractor.
10. After Substantial Completion, Contractor shall issue an Application for Payment in accordance with bid documents. All administrative actions and submittals, including conditions, outlined therein outlined must be complete prior to Owner's release of payment, **and MUST BE COMPLETED PRIOR TO AGENDIZING FOR PROJECT ACCEPTANCE BY THE OWNER'S GOVERNING BOARD.**
11. Upon Contractor completing all administrative actions and submittals, and meeting all conditions, Owner will agendize acceptance of the Work for the next official meeting of the Governing Board. Official action by the Governing Board shall constitute Project Acceptance. Upon acceptance, Contractor shall immediately remove trailers and other remaining temporary facilities.
12. District shall file Notice of Completion with the County Recorder as soon as practicable following Project Acceptance. The date of record for the Notice of Completion shall be the date stamped on the Notice by the Recorder at the time the County Recorder registers the Notice.
13. **The date stamped on the Notice of Completion by the County Recorder shall be the date for commencement of all warranties and guarantees, and the date the Owner becomes responsible for security, maintenance, heating and cooling, utilities, damage to the work (unless done by Contractor's forces working on corrective items), and insurance.**
- Contractor shall remain responsible for these items prior to this date.**  
The Owner will inform the Contractor by letter immediately after receiving confirmation in writing from the Recorder's office of registration of the Notice of Completion. Contractor is hereby notified that the process of registering, stamping, and receipt of confirmation from the County has been known to take as much as four weeks from the time of filing.
14. Upon acceptance of Project by Owner, Contractor shall submit his request for final payment. Payment of retention will not be made by Owner until 35 days after Notice of Completion has been registered by the County Recorder.

In addition, retention payment will not be made until Contractor has filed the required Form DSA 6 with Division of the State Architect, with copy to the Architect.

**FEBRUARY 11, 2020**

**GROSSMONT UNION HIGH SCHOOL DISTRICT  
HELIX CHS RESTROOM AND STORAGE BLDGS**

**PART 2 - PRODUCTS**

(Not Applicable)

**PART 3 - EXECUTION**

(Not Applicable)

**END OF SECTION**

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SECTION 01 78 23

**OPERATION AND MAINTENANCE DATA**

**PART 1 - GENERAL**

1.01 SUMMARY:

- A. Related Documents: Drawings and general provisions of the Contract, including General and Supplemental Conditions and Division 1 Specifications Sections, apply to this section, and including all Technical Specifications Sections, and the Operating and Maintenance Requirements.
- B. Section Includes:
  - 1. Compilation of product data and related information appropriate for Owner's maintenance and operation of products and equipment furnished under the Contract per CBC 2019 Section 110.3.10.2.
  - 2. Instruction of Owner's personnel in the maintenance of products and in the operation of equipment and systems.

1.02 SUBMITTAL PROCEDURES

- A. Preliminary: Submit one copy of proposed manuals to Architect at least 15 days prior to final inspection or acceptance.
- B. Final: Following the indoctrination and instruction of the Owner's operating and maintenance personnel, review proposed revisions to the manual with the Architect.
  - 1. Submit three copies of accepted data in final form 10 days after final inspection. Approval of submittal is a pre-requisite at Substantial Completion prior to Owner's agendizing project for acceptance by the Governing Board.

**PART 2 - PRODUCTS**

2.01 FORMAT

- A. Size: Minimum 4 inch, three-ring binders for 8-1/2" x 11" punched pages, completely clear plastic covered for insertion of labels on spines and covers.
- B. Provide identifying tabbed pages. Classify by Division and by Section. All tabbing shall be in numerical order.
- C. Drawings:
  - 1. Provide reinforced punched binder tab. Bind drawings with text.
  - 2. Fan fold larger drawings to size of text pages, for easy foldout.
- D. Cover: Identify each volume with typed or printed label, List:
  - 1. Title of Project

2. Identity of separate structures as applicable.
3. Identity of general subject matter covered in the manual.
- E. Spine: Identify each volume with typed or printed label stating OPERATING AND MAINTENANCE INSTRUCTIONS, GUARANTEES AND SERVICE CONTRACTS and the following information:
  1. Title of Project.
  2. Divisions and Sections included within volume.
  3. Volume number (i.e. "1 of 4")
- F. For each item A to E above, also provide in PDF format, saved in flash drive(s), with clearly marked Project Name and content.

### **PART 3 - EXECUTION**

#### **3.01 CONTENT OF MANUAL**

- A. Table of Contents:
  1. List of each product indexed to the content of the volume.
  2. List with each product the name, address, and the telephone number of:
    - a. Subcontractor and installer.
    - b. Maintenance contractor, as appropriate.
    - c. Local sources of supply for parts and replacement.
- B. Product Data: Annotate each sheet to clearly identify the data applicable to the installation. Delete references to inapplicable information.
- C. Drawings:
  1. Supplement product data with Drawings as necessary to illustrate the following:
    - a. Relationship of component parts of equipment and systems.
    - b. Control and flow diagrams.
  2. Do not include Project Record Drawings as maintenance drawings.
- D. Instructions: Provide written text, as required to supplement product data for the particular installation.
- E. Warranties, Guaranties, Bonds, and Service Contracts: Include a copy of each warranty, guaranty, bond, and service contract issued.
  1. Provide information sheet for Owner's personnel describing the following:
    - a. Proper procedures in the event of failure or emergencies.
    - b. Circumstances under which the validity of warranties, guaranties, or bonds might be compromised.

3.02 MANUAL FOR MATERIALS AND FINISHES

A. Instructions for Care and Maintenance: Include Manufacturer's data as follows:

1. Recommendations for types of cleaning agents and methods.
2. Cautions against cleaning agents and methods which are detrimental to the product:
3. Recommended schedule for cleaning and maintenance.

B. Energy Conservation Features:

1. Provide a list of energy conservation features, materials, components, and mechanical devices installed in the building.

3.03 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Content, for each unit of mechanical equipment and system, as appropriate:

1. Description of unit and component parts:
  - a. Function, normal operating characteristics, and limiting conditions.
  - b. Performance curves, engineering data, and tests.
  - c. Complete nomenclature and commercial number of replaceable parts.
2. Operating Procedures:
  - a. Start-up, break-in, routine, and normal operating instructions.
  - b. Regulation, control, stopping, shut-down, and emergency instructions.
  - c. Summer and winter operating instructions.
3. Maintenance Procedures:
  - a. Routine operations.
  - b. Guide to "trouble-shooting".
  - c. Disassembly, repair, and reassembly.
  - d. Alignment, adjusting, and checking.
4. Servicing and lubrication schedule including list of lubricants required.
5. Manufacturers' printed operating and maintenance instructions.
6. Description of sequence of operation by control manufacturer.
7. Original manufacture's parts list, illustrations, assembly drawings, and diagrams required for maintenance, including:

- a. Predicted life of parts subject to wear.
  - b. Items recommended to be stocked as spare parts.
- 8. Control diagrams by manufacturer of controls as installed in project.
- 9. Coordination drawings and color coded piping diagrams.
- 10. Charts of valve tag numbers, with the location and function of each valve.
- B. Content, for each electric and electronic system as appropriate.
  - 1. Description of system and component parts:
    - a. Function, normal operating characteristics, and limiting conditions.
    - b. Performance curves, engineering data, and tests.
    - c. Complete nomenclature and commercial number of replaceable parts.
  - 2. Circuit directories of panelboards:
    - a. Electrical service.
    - b. Controls.
    - c. Communications.
  - 3. As-installed color coded wiring diagrams.
  - 4. Operating procedures:
    - a. Routine and normal operating instructions.
    - b. Sequences required.
    - c. Special operating instructions.
  - 5. Maintenance procedures:
    - a. Routine operations.
    - b. Guide to "trouble-shooting."
    - c. Disassembly, repair and reassembly.
    - d. Adjustment and checking.
  - 6. Manufacturer's printed operating and maintenance instructions.
  - 7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

**3.04 INSTRUCTION OF OWNER'S PERSONNEL**

- A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment, and systems installed in project.
  - 1. Provide services of factory trained instructors from the manufacturer of each major item of equipment or system.
  - 2. Provide for each instruction session or "in-service", a DVD Camcorder operator and **DVD Camcorder** to record the session. DVD recordings shall be clearly labeled as to project, subject, and date. Submit DVDs in triplicate.
- B. Operating and maintenance manual shall constitute the basis of instruction.
  - 1. Review contents of manual with personnel in full detail to explain all aspects of operation and maintenance.
  - 2. Review instructions on how to efficiently use state required energy conservation features, materials, components, and mechanical devices.

**END OF SECTION**

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SECTION 01 78 30

**WARRANTIES, GUARANTEES, AND BONDS**

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section Includes: General requirements for written warranties, guaranties, and bonds required by the Contract Documents.
- B. Referenced Sections:
  - 1. Section 01 77 00 – Closeout Procedures: Submittal of Final Verified Reports and Notice of Completion, as a condition of project acceptance and payment.
  - 2. Section 01 78 23 – Operation and Maintenance Data: Incorporation of warranties, guaranties, and bonds into instruction manuals.
- C. Approval of the warranties, guaranties, and bonds by the Owner is a prerequisite to payment at Substantial Completion and agendizing for acceptance by the Governing Board of the Owner.

1.02 TIME PERIOD

- A. Deliver manufacturers' warranties, guaranties, and bonds required by Contract Documents, with Owner named as beneficiary. Where manufacturers' warranty or guaranty extends for a longer time period than the Contractor's warranty and guaranty, deliver manufacturer's warranties or guaranties in same manner.

1.03 WARRANTY/GUARANTY FORM

- A. Submit written warranties and guaranties, except manufacturer's standard printed warranties and guaranties, on the Contractor's, subcontractors', material suppliers', or manufacturers' own letterhead, addressed to Owner, in the form attached to this Section.
- B. Submit warranties and guaranties in duplicate, and in the form indicated, signed by cognizant entities, and by Contractor in every case, with modifications as approved by Owner to suit the conditions pertaining to the warranty or guaranty.

1.04 SUBMITTALS

- A. Collect and assemble written warranties and guaranties into bound booklet form, and PDF format, and deliver bound books and Flash Drives to Architect for delivery to Owner for final review and approval.
  - 1. See Sections 01 77 00 and 01 78 23 for additional submittal requirements.

**ATTACHMENT:** Warranty/Guaranty Form

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**WARRANTY/GUARANTY FORM**

FOR \_\_\_\_\_ WORK

We, the undersigned, do hereby warranty and guaranty that the parts of the work described above which we have furnished or installed for:

(PROJECT NAME)

are in accordance with the Contract Documents and that all said work as installed will fulfill or exceed all the Warranty and Guaranty requirements. We agree to repair or replace work installed by us, together with any other work which is displaced or damaged by so doing, that proves to be defective in workmanship, material, or operation within a period of \_\_\_\_\_ ( ) year(s) from the date Notice of Completion is registered with the San Diego County Recorder, ordinary wear and tear and unusual neglect or abuse excepted.

In the event of our failure to comply with the above-mentioned conditions within a reasonable time period determined by the Owner, after notification in writing, we, the undersigned, all collectively and separately, hereby authorize the Owner to have said defective work repaired and/or replaced and made good, and agree to pay to the Owner upon demand all moneys that the Owner may expend in making good said defective work, including all collection cost and reasonable attorney fees.

Date: \_\_\_\_\_  
(Subcontractor, Sub-subcontractor, Manufacturer or Supplier)

By: \_\_\_\_\_

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

State License No: \_\_\_\_\_

Local Representative: For maintenance, repair, or replacement service, contact:

Name: \_\_\_\_\_

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

Phone Number: \_\_\_\_\_

**END OF SECTION**

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SECTION 024119

**SELECTIVE DEMOLITION**

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section includes: Project site and building demolition work to prepare for addition of new improvements, as indicated on the Drawings and specified herein. General and Special Conditions and Division 1 specification sections apply to this section.
- B. Related Sections:
  - 1. Section 01 73 29, Cutting and Patching
  - 2. Section 01 50 00, Temporary Facilities and Controls
  - 3. Section 01 77 00, Closeout Procedures

1.02 DEFINITIONS

- A. "Remove": Remove and legally dispose of items except those indicated to be reinstalled, salvaged, or to remain the Owner's property.
- B. "Removed and Salvaged": Items to remain the Owner's property shall be removed, cleaned, and packed or crated to protect against damage.
  - 1. Identify contents of containers and deliver to Owner's designated storage area.
- C. "Existing to Remain" Protect construction indicated to remain against damage and soiling during demolition. When permitted by the Architect, items may be removed to a suitable, protected storage location during demolition and then cleaned and reinstalled in their original locations.
- D. "Remove and Reinstall": Remove items indicated; clean, service, and otherwise prepare them for reuse; store and protect against damage. Reinstall items in locations indicated.
- E. Salvaged Materials (not wanted by Owner): Items which the Owner does not want and is of salvable value to Contractor may be removed from structure as work progresses. Owner and CBC 2019 require a minimum of 50% (by weight) of all non-hazardous construction materials be recycled, composted and/or salvaged. Salvage shall conform to the following:
  - 1. Contractor shall submit salvage plan showing how all materials are to be sorted, salvaged and recycled. Plan must include all final destinations for each type of material.
  - 2. Salvaged items must be transported from site as they are removed, unless materials are to be reused on site.
  - 3. Storage or sale of removed items on site will not be permitted, unless materials are to be reused on site.
  - 4. Contractor shall provide certification for all salvaged materials. Certifications may take the form of receipts from recycling facilities, manufacturers, or any

other legitimate form of certification. Certification types shall be outlined in salvage plan and approved by Owner.

**1.03 MATERIALS OWNERSHIP**

- A. Except for items or materials indicated to be reused, salvaged or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition by the Contractor(s) in a legal disposal area appropriate to the materials being disposed.

**1.04 SUBMITTALS**

- A. Submit each item in this Article according to the Conditions of the Contract and Specifications Section 01 33 00, unless otherwise indicated.
- B. Proposed Dust Control Measures.
- C. Proposed Noise Control Measures.
- D. Schedule of demolition activities indicating the following:
  - 1. Detailed sequence of demolition, salvage, and removal work, with starting and ending dates for each activity.
  - 2. Dates for shutoff, capping, and continuation of utility services.
- E. Salvage Plan - Inventory of items to be removed and salvaged. Salvage plan shall show how all materials are to be sorted, salvaged and recycled. Plan must include all final destinations for each type of material.
- F. Inventory of items to be removed and salvaged, and deliver to Owner's designated storage area.
- G. Photographs or videotape, sufficiently detailed, of existing conditions of adjoining construction and improvements that might be misconstrued as damage caused by demolition operations.
- H. Record drawings at project closeout according to specifications section 01 77 00 - Closeout Procedures shall identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

**1.05 QUALITY ASSURANCE**

- A. Demolition Firm Qualifications: Engage an experienced firm that has successfully completed demolition work similar to that indicated for this Project.
- B. Regulatory Requirements: Comply with governing EPA notification regulations before starting demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Predemolition Conference: Conduct conference at Project site with Owner, Architect and Construction Manager.

**1.06 PROJECT CONDITIONS**

- A. Building, where partial wall will be demolished, will be vacated and its use discontinued

before start of the Work.

- B. Conditions, existing at time of inspection for bidding purpose, will be maintained by Owner as far as practical.
- C. Hazardous Materials: If applicable, a Hazardous Materials Study was performed on site and a specification for removal of said materials is incorporated into the project documents.

**1.07 SCHEDULING**

- A. Arrange demolition and salvage schedule so as not to interfere with Owner's on-site operations.

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

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- C. Inventory and record the conditions of items to be removed and reinstalled and items to be removed and salvaged.
- D. Survey condition of the building to determine whether removing any element might result in a structural deficiency or unplanned collapse of any portion of the structure or adjacent structures during demolition.
- E. Perform surveys as the Work progresses to detect hazards resulting from demolition activities.

**3.02 UTILITY SERVICES**

- A. Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
- B. Do not interrupt existing utilities serving occupied or operating facilities, except when authorized in writing by Owner, and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to governing authorities.
- B. Provide not less than 72 hours notice to Owner if shutdown of service is required during changeover.
- D. Utility Requirements: Refer to Division 22 through Division 26 sections for shutting-off, disconnecting, removing, and sealing or capping utility services. Do not start demolition work until utility disconnecting and sealing have been completed and verified in writing.

**3.03 PREPARATION**

- A. Conduct demolition operations and remove debris to ensure minimum interference with roads, streets, walks, and other adjacent occupied and used facilities.
  - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- B. Conduct demolition operations to prevent injury to people and damage to adjacent buildings and facilities to remain. Ensure safe passage of people around demolition area.
  - 1. Erect temporary protection, such as walks, fences, railings, canopies, and covered passageways.
  - 2. Protect existing site improvements, appurtenances, and landscaping to remain.
- C. Provide and maintain interior and exterior shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of building to remain.
  - 1. Strengthen or add new supports when required during progress of demolition.

**3.04 EXPLOSIVES**

- A. The use of explosives will not be permitted.

**3.05 POLLUTION CONTROLS**

- A. Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
  - 1. Do not create hazardous or objectionable conditions, such as flooding, and pollution, when using water.
- B. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 1. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level.
- C. Clean adjacent buildings and improvements of dust, dirt, and debris caused by demolition operations. Return adjacent areas to condition existing before start of demolition.

**3.06 DEMOLITION**

- A. Demolish partial building wall, concrete and/or asphalt paving, interior finishes, fixtures and accessories, as required to prepare for new construction, and remove from the site.
- B. Locate demolition equipment throughout the building and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
- C. Dispose of demolished items and materials promptly. On-site storage or sale of removed items is prohibited.
- D. Fill below-grade areas and voids resulting from demolition of building elements and pavements and soil materials according to requirements specified in Section 31 20 00 –

Earth Moving and/or geotechnical report.

- E. Promptly repair damages to adjacent facilities caused by demolition operations.

**3.07 DISPOSAL OF DEMOLISHED MATERIALS**

- A. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
- B. Burning demolished materials is not allowed.
- C. Transport demolished materials off Owner's property and legally dispose of these materials.

**END OF SECTION**

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SECTION 03 10 00

CONCRETE FORMING AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes: Completion of subgrade preparation, formwork, ties, shoring, bracing, anchorage and blockouts as indicated on the Drawings and specified herein.
- B. Related Sections:
  - 1. Concrete Reinforcing; refer to Section 03 20 00.
  - 2. Cast-in-Place Concrete; refer to Section 03 30 00.

1.02 REFERENCED STANDARDS

- A. Refer to Section 01 42 19 for information concerning availability and use of references.
  - ACI 117-90 - Tolerances for Concrete Construction & Materials
  - ACI 347R-94 - Formwork for Concrete
  - ANSI/AHA A135.4 - Basic Hardboard
  - ASTM D1751 - Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous types)
  - CRD-C-572-74 - Polyvinyl chloride Waterstops
  - DOC PS-1-95 - Construction and Industrial Plywood
  - WCLIB Std. No. 17. - Grading Rules for West Coast Lumber
  - WWPA - Western Lumber Grading Rules 2011 with Supplements
- B. Conform to the requirements of Section 01 45 23 – Testing and Inspection Services.
- C. Construct and erect formwork in accordance with ACI 318 and 347, and Section 1905A of the California Building Code (CBC) 2019, Title 24, Part 2.
- D. Design forms and falsework to adequately support live and dead loads, including equipment, concrete drops, pressures of foundations, etc.
- E. Follow recommendations of ACI 318 and 347.
- F. Title 24, Parts 1 and 2, California Building Code.

1.03 ARCHITECT'S REVIEW

- A. Architect will review formwork for architectural suitability where exposed concrete finish occurs. Contractor shall be responsible for design of formwork for structural stability and sufficiency.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Earthen Forms: Provide earthen forms for footings only where the soil is firm and stable and the concrete will not be exposed, and subject to approval of the Division of the State Architect. Cut earthen forms square, neat and accurate to size. Clean bottoms of excavations.
- B. Wood Forms: Provide wood forms, based on PS 1-95 Plywood or B-B Class I exterior, high density overlaid one side for forms, sound, undamaged, and clean, 5/8-inch thick minimum for exposed concrete work.
  - 1. Lumber: Provide Douglas fir, construction grade lumber for framing, studding and bracing.
  - 2. For site walls provide HDO or HDO 7 layer minimum grade B-B for all exposed walls.
- C. Exposed Architectural Concrete: HDO or HDO B-B 7 Ply minimum for a smooth architectural finish. Seal all joints and edges.

**2.02 COMPONENTS**

- A. Formed Construction Joints: Provide minimum 24 gage galvanized steel foam filled type, with release tape sealed slots, bent tab anchors, securable to formwork.

**2.03 ACCESSORIES**

- A. Provide accessories and anchorages required, of sufficient strength, length and character to maintain formwork during pouring operations.
- B. Use anchors and hangers which do not leave exposed metal at surface.
- C. Use snap-off, removable, or adjustable type metal ties, hot-dip galvanized. Provide standard metal form clamp assembly, spreader type leaving no metal within 1 inch of concrete exposed face. Leave inner tie rod within concrete when forms are removed.
- D. Provide colorless mineral oil type form coating, non-grain raising and non-staining type, Nox-Crete Company Nox-Crete Form Coating, or other approved equal.
- E. Rigid foam plastic fillets may be used for chamfered corners.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Prior to commencing work, inspect the work of others and verify that such work has been properly completed and installed to allow for proper installation of materials and methods required of this section.
- B. Inspect forms in accordance with Title 24, Part 2, Section 1705A.3.5, California Building Code.

## 3.02 PREPARATION

- A. Earthen Forms: Trench earthen forms at least two inches wider than footing widths shown on drawings. Construct wood edge strips at each side of trench at top to secure reinforcing and prevent trench from caving. Form sides of footings where earth caves. Tap form and clean debris and loose materials in earthen forms before depositing concrete.
- B. Design of forms and shoring in excess of 3 feet in height, shall be by a California State registered Civil Engineer.
- C. Verify accuracy of lines, levels, and centers.
- D. All embedded items must be installed prior to placement of concrete - **NO EXCEPTIONS.**

## 3.03 APPLICATION

- A. Construct formwork and appurtenances to meet design and code requirements. Construct of sound materials, of correct shape and dimensions, mortar tight, and of sufficient strength to prevent sagging, buckling, movement and failures. Provide adequate shores of wood or metal to safely carry imposed loads and adjustable to prevent displacements during the work.
- B. Align joints and make them watertight.
- C. Set reinforcing accurately and ensure secure placement.
- D. Maintain tolerances of ACI 347, within 1/8-inch in 10 feet and 1/4" maximum deviation from theoretical dimensions. Exposed concrete may require tighter specifications.
- E. Assist in setting and placing blockouts and sleeves for materials and products to be embedded in and passing through concrete.
- F. Set screeds and establish levels for tops of concrete for finish surfaces. Shape surfaces as indicated on drawings.
- G. Screenshot supports for concrete over waterproof membranes or vapor barriers shall be of a cradle, pad, or base type which will not puncture membrane.
- H. Wet formwork prior to placing concrete and keep wet during concrete curing process.

## 3.04 PROTECTION

- A. Do not remove formwork, shoring and bracing until such time as masonry and concrete has gained sufficient strength to carry its own weight, and construction and design loads which are liable to be imposed upon.  
  
Verify strengths by compressive strength test results. Loosen forms carefully. Do not wedge pry bars, hammers or other tools against masonry and concrete surfaces.
- B. In addition to California Building Code Section 1905A, the following are minimum times for forms and shoring to remain in place prior to removal:
  - 1. Footings and grade beams - 5 days.

**END OF SECTION**

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**SECTION 03 20 00**

**CONCRETE REINFORCING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: Completion of reinforcing steel bars, welded wire fabric, support chairs, bolsters, bar supports and spacers as indicated on the drawings and specified herein.
- B. Related Sections:
  - 1. Curbs, Gutters, Sidewalks and Driveways; refer to Section 32 16 00.
  - 2. Concrete Forming and Accessories; refer to Section 03 10 00.
  - 3. Cast-in-Place Concrete; refer to Section 03 30 00.

**1.02 QUALITY ASSURANCE**

- A. Conform to the testing and inspection requirements of Section 01 45 23 – Testing and Inspection Services.
- B. Perform reinforcing work in strict conformance with Chapter 19A, Title 24, California Building Code (CBC) 2019, and CRSI, 2009, unless specified otherwise or required otherwise by local code jurisdiction.

**1.03 REFERENCES STANDARDS**

- A. Refer to Section 01 42 19 – Reference Standards for information concerning availability and use of references.
  - ACI SP-66(04) - Detailing Manual
  - ACI 318-14 - Building Code Requirements for Structural Concrete
  - ASTM A82 - Steel Wire, Plain, for Concrete Reinforcement
  - ASTM A185 - Steel Welded Wire Reinforcement, Plain, for Concrete
  - ASTM A497 - Steel Welded Wire Reinforcement, Deformed, for Concrete
  - ASTM A615 - Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement
  - ASTM A706 - Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
  - CRSI MSP, 28<sup>th</sup> Edition, 2009 - Manual of Standard Practice
  - AWS A5.1: 2004 - Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
  - AWS A5.5: 2006 - Specification for Low-Alloy Steel Electrodes for Shielded Metal Arc Welding
  - AWS D1.4: 2017 - Structural Welding Code---Reinforcing Steel

- B. In addition to CRSI specifications, follow ACI 315 and 318, AWS welding codes and qualifications, and ASTM A185, A615 and A706.
- C. Testing of bars in accordance with Title 24, Section 1910A.2, Part 2.

**1.04 TESTING**

- A. Comply with Title 24, Section 1910A.2.
- B. Where samples are taken from bundles as delivered from the mill, with the bundles identified as to heat number, and provided that the mill analysis accompany the report, then one tensile test and one bend test shall be made from a specimen from each 10 tons or fraction, of each size of reinforcing steel.
- C. Where positive identification of the heat number cannot be made or where random samples are to be taken, then one series of tests shall be made from each 2-1/2 tons or fraction, of each size of reinforcing steel.

**1.05 SUBMITTALS**

- A. The Contractor shall be responsible for providing steel reinforcing as indicated on the Drawings for concrete reinforcing and as specified herein. Prepared Shop Drawings shall be reviewed by the Architect or Structural Engineer.

**1.06 DELIVERY, STORAGE AND HANDLING**

- A. Do not allow reinforcing materials to have direct contact with the ground. Cover materials adequately to prevent rusting, and contact with materials or construction injurious to proper bonding.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Reinforcing Bars: Deformed billet steel reinforcing bars, ASTM A615, plain finish see Drawings for grade.
  - 1. Where called for, provide ASTM A706.

**2.02 ACCESSORIES**

- A. Provide minimum 16 gauge galvanized annealed tie wires, and chairs, bolsters, bar supports, and spacers sized and shaped for strength and support of reinforcing. Plastic accessories may be acceptable if approved by Architect prior to use.

**2.03 FABRICATION**

- A. Fabricate in accordance with details shown.
- B. Accurately bend, cut and place bars as shown on Drawings and in accordance with the requirements of Title 24, Part 2, Section 1903A and ACI 318. Bend bars cold; heating of bars is not permissible. Do not bend or straighten bars in any manner that will injure materials.

**PART 3 - EXECUTION****3.01 EXAMINATION**

- A. Prior to commencing work of this section, inspect work of others and verify that such work has been properly completed and installed to allow for proper installation of all materials and methods required of this section.

**3.02 INSTALLATION**

- A. Fabricate reinforcing in accordance with ACI 315. Locate reinforcing splices not shown on drawings, at points of least stress. Where shown or required, weld reinforcing bars in accordance with AWS D1.4.
- B. Place reinforcing supported and secured against displacement. Do not deviate from true alignment.
- C. Ensure that reinforcing used is clean, free of scale, dirt, dust, rust and other matter.
- D. Provide lap splices for bars noted as "cont.". Provide a Class "B" lap splice in concrete. Wire all laps and splices in welded wire mesh and provide side and end laps of at least 6 inches.
  - 1. Spacing - minimum center-to-center distance between parallel reinforcing bars is to be in compliance with that shown on drawings, or in the absence of such information on drawings, the clear spacing is to be one bar diameter, but in no case less than 1-1/2 inch, nor less than 1-1/3 times the maximum size of aggregate.
  - 2. Where possible, stagger splices of adjacent vertical bars.
- E. Only splice reinforcing where shown or noted. Splices at other locations must be approved by the Architect. Provide continuous reinforcement between splice locations in vertical walls. No splices of vertical wall reinforcing may occur except at foundations, unless specifically approved by Division of the State Architect, and the Architect.
  - 1. Securely tie reinforcing with 16 gage tie wire at all splices and intersections, and as may be directed.
  - 2. Point ends of wire ties away from forms.
- F. Stagger splices in adjacent horizontal wall reinforcing bars a minimum of 4 feet.
- G. Provide the minimum coverage of reinforcing by concrete:

MINIMUM COVER:  
Inches (mm)

- 1. Cast against and permanently exposed to earth..... 3 (76)
- 2. Concrete exposed to earth or weather:  
No. 6 through No. 18 bar..... 2 (51)

No. 5 bar, W31 or D31 wire, and smaller..... 1-1/2 (38)

3. Concrete not exposed to weather or in contact with ground: Slab, walls, Joists:

No. 14 and No. 18 bar..... 1-1/2 (38)

No. 11 bar and smaller..... 3/4 (19)

4. Beams & Columns:

Primary reinforcement, ties, stirrups, spirals..... 1-1/2 (38)

H. Reinforcing bars shall not be re-bent.

### 3.03 APPLICATION

- A. Correction during concreting: Maintain capable steel workers during placement of concrete for properly resetting reinforcement displaced by runways, workers, or other causes.
- B. Reinforcement: As a minimum for slab reinforcement, provide 6 x 6 W4.0 x W4.0 wire mesh ASTM A185, if no other reinforcement is indicated.

### 3.04 DEFECTIVE WORK

- A. The following reinforcing work will be considered defective and may be ordered by Owner to be removed and replaced at no additional expense to Owner:
1. Bars with kinks or bends not shown on Drawings.
  2. Bars injured due to bending or straightening.
  3. Bars heated for bending.
  4. Reinforcement not placed in accordance with Drawings or Specifications.
  5. Rusty or oily reinforcement.

### 3.05 FIELD QUALITY CONTROL

- A. Refer to Section 01 45 23 - Testing and Inspection Services for requirements.
- B. Prior to pouring concrete, notify all parties to the inspections, that reinforcing is ready for inspections. Secure approvals by testing laboratory and inspector before concrete operations commence.

### 3.06 CURING

- A. Concrete (other than high-early-strength) shall be maintained above 50 degrees F. and in a moist condition for at least the first seven (7) days after placement, except when cured in accordance with Section 26.5.3, ACI 318-14.

**END OF SECTION**



**SECTION 03 30 00**

**CAST-IN-PLACE CONCRETE**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: Completion of sand bed, vapor barrier, cast-in-place concrete, and finishes as indicated on the drawings and specified herein.
- B. Related Sections:
  - 1. Concrete Forming and Accessories; refer to Section 03 10 00.
  - 2. Formwork, Earthen forms: See Section 03 10 00 Concrete Forming and Accessories.
  - 3. Concrete Reinforcing: See Section 03 20 00.

**1.02 QUALITY ASSURANCE/SUBMITTALS**

- A. Perform concrete work in accordance with ACI 301 and 318, unless specified otherwise. Provide continuous inspection and testing for concrete placement in accordance with Sections 1701A and 1910A Title 24, Part 2, California Building Code.
- B. Submit design mixes to Architect for Structural Engineer, and Testing Lab review and approval. Contractor shall pay for review of more than two (2) designs for each strength required.

**1.03 REFERENCE STANDARDS**

- A. Refer to Section 01 42 19 – Reference Standards for information concerning availability and use of references.
  - ACI 318 - Building Code Requirements for Structural Concrete and Commentary
  - ASTM C33 - Standard Specification for Concrete Aggregates
  - ASTM C94 - Standard Specification for Ready-Mixed Concrete
  - ASTM C171 - Standard Specification for Sheet Materials for Curing Concrete
  - ASTM C227 - Standard Test Method for Potential Alkali Reactivity of Cement-Aggregate Combinations (Mortar-Bar Method)
- B. All work under this section shall be in accordance with applicable provisions of CBC, 2019, Title 24, Part 2, Chapter 19A.
- C. Refer to the following information for compliance of materials, products, and installation techniques: ASTM C33, C94, C150, C260, C494 and ACI 301, 304R-00 and 305R-99.
- D. Handling and Placing: Concrete transported and placed as per ACI 318. Concrete shall be thoroughly compacted and worked into forms around reinforcing steel using suitable equipment. Vibrating of formwork will not be permitted.

- E. Where conditions make placing difficult or reinforcing is congested, batches containing the same proportions of sand and cement used in the concrete plus a maximum of 50 percent of coarse aggregate shall be used.
- F. Inspections: Notify the Architect at least forty-eight hours in advance of the first pour of concrete and sufficiently in advance of subsequent pours, see 1704A, Title 24, Part 2, California Building Code and chapter 7, section 7-145, Title 24, Part 1, California Administrative Code.
- G. Embedded Items: Pipes and conduit in concrete, located, sized and if required, sleeved in accordance with the requirements of ACI 318. Bolts and anchorage devices embedded in concrete to fastened sills, tie-down columns and other structural and framing members to concrete installed and secured in place before concrete is placed.
  - 1. Concrete shall be placed in a continuous operation between predetermined joint locations. Location of construction joints shall be as shown on the drawings or at locations approved by the Engineer and the Division of the State Architect.
  - 2. Joints shall be straight, exactly horizontal or vertical and the surface of the concrete shall be level wherever a run is stopped. Reinforcement shall be extended through joints or dowels to develop the full strength of the reinforcement. Construction joints shall be per ACI 318.

**1.04 TESTING**

- A. Provide free access to work. Provide laboratory design mix. No substitutions will be accepted. Cement and aggregates shall be tested.
- B. Cement: Test Portland cement in accordance with Sections 1910A.1, Title 24, Part 2, and Section 26.4.1.1, ACI 318.
- C. Batch Plant Inspection: Provide in accordance with Section 1705A.3.3, Title 24, Part 2.
- D. Placing Record: Keep records of placing in accordance with Section 1705A.3.6, Title 24, Part 2.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Aggregates:
  - 1. Base and Aggregate base shall conform to the State of California, Department of Transportation (CALTRANS) Standard Specifications, Current Edition. All base, whether called out as aggregate base or base shall be in conformance with CALTRANS Section 26 for Class 2 Aggregate Base, 3/4-inch maximum. The maximum percentage of recycled material allowable shall not exceed 50% of the total volume of aggregate used.
  - 2. Base and Aggregate Base shall be provided by a licensed commercial materials supplier. Certifications shall be submitted with each submittal. Use of on-site asphalt materials in aggregate base or base is strictly prohibited. The use of Crushed Miscellaneous Base is strictly prohibited.
  - 3. Aggregates: ASTM C33, 1-inch maximum conforming to CBC 2019, Title 24,

Part 2, 1903A.5 Aggregates and ACI 318.

B. Curing Materials:

1. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per square yard, complying with AASHTO M182, Class 2.
2. Moisture-Retaining Cover: One of the following, complying with ASTM C171:
  - a. Curing paper
  - b. Polyethylene film
  - c. Burlap Polyethylene-coated

D. Water: Provide clean water free from injurious substances, per Section 26.4.1.3, ACI 318.

2.02 COMPONENTS

- A. Non-Shrink Grout: Premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents, capable of developing non-shrink characteristics in both the horizontal and vertical direction with minimum compressive strength of 4,800 p.s.i. in two (2) days, and 6,000 p.s.i. in twenty-eight (28) days.
1. Provide Embeco Grout as manufactured by BASF, or other approved by Five Star, Dayton Superior, or Sika.
- B. Cement Grout and Drypack: Precision support grout shall be BASF Masterflow® 713 Grout as manufactured by Master Builders, Cleveland, Ohio consisting of a hydraulic cementitious system, specially graded and processed natural fine aggregate and additional technical components. Other products will only be acceptable providing written approval of the Engineer is obtained prior to bidding. Acceptance will be granted only upon satisfactory evidence proving that the substitute material meets the following requirements, conforming to CRD C-621 Corps of Engineers.
1. Free of gas producing or releasing agents.
  2. Free of oxidizing catalysts.
  3. Free of inorganic accelerators, including chlorides.
  4. Drypack: Pre-mixed grout shall be used. Use only enough water to make a stiff mix consistency. Pre-mixed grout shall be used under base plates per manufacturer's recommendations, and packed solid under pressure treated mudsills, per Structural Details, so as to obtain a continuous bearing. Minimum compressive strength of 6000psi.

**PART 3 - EXECUTION**

3.01 EXAMINATION

- A. Certifications: Provide legible copies of the delivery tickets of each load of concrete with the following information:
1. Name and location of plant.
  2. Serial number of ticket.

3. Date and truck number.
4. Name of contractor.
5. Name of project.
6. Type of class of concrete and how to be used.
7. Amount of concrete.
8. Time loaded, time of arriving and unloading at project site.
9. Water added at site and total water content.
10. Type, name and amount of admixtures.
11. Name and signature of person making slump tests.
12. Testing number of test cylinders.

**3.02 PREPARATION FOR PLACEMENT**

- A. Remove foreign debris and matter which may have accumulated within forms, and close ports and openings left in formwork.
- B. Thoroughly clean tools used in transportation, placing and consolidating concrete immediately after each pour.
- C. Ensure that required inspections have taken place prior to pour.

**3.03 APPLICATION**

- A. Mixes: The minimum concrete ultimate twenty-eight (28) day compressive strength to be per structural drawings and shall be controlled by the following method:
  1. Designed Mix: Concrete mixes shall be based upon previously proven mixes and material tests made by a recognized testing agency. The design of such mixes shall be based on the ultimate strength of the concrete assumed in the design of the structure and shall take into consideration both the workability of the mix and the durability of the concrete. Refer to Sections 1903A.1 and ACI 318.
  2. When strengths in excess of 3,000 pounds per square inch are required, or special aggregates not having a record of satisfactory performance are used, or admixtures are used to reduce the cement content, ACI 318, shall be used to determine the mix.
  3. Where design criteria in Title 24, Part 2, chapter 19A and ACI 318 Section 26.4.2, provide for the use of a splitting tensile strength value of concrete as a modifier, laboratory tests shall be made in accordance with the CBC to establish the value of  $f_{ct}$  corresponding to the specified value of  $f'_c$ .
  4. The maximum water to cement ratio shall not exceed 0.5 (50%).
- B. Control Density Fill: Provide batch plant design mix of 4000 p.s.i., flowable concrete composed of 3000 lbs aggregate, 45 gals water, 50 lbs of cement and 400 lbs of flyash. Adjust proportions for materials as necessary and submit to Architect, for information.

**3.04 CONVEYING**

- A. Handle concrete from mixer to location of placing as rapidly as practical, avoiding separation or loss of ingredients and rehandling. Use carts, wheelbarrows, concrete pumps, conveyors or buggies to deliver concrete to location of placement.
- B. Do not permit a free fall of more than 4 feet when placing concrete.

- C. Use elephant trunk spouts for placing concrete in vertical elements. Space so that concrete does not exceed 4 foot flow horizontally.

### 3.05 PLACEMENT

- A. In general, place concrete in accordance with ACI 301, and in the presence of the inspecting personnel required.
- B. Ensure that anchors, seats, plates, and other items to be cast into concrete are placed, held securely, and will not cause hardship in placing concrete.
- C. Maintain records of poured concrete. Record date, location, quantity, air temperatures, and test samples taken.
- D. Ensure that reinforcement, inserts, embedded parts, and formed joints are not disturbed during concrete placement.
- E. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.
- F. Pour concrete continuously between predetermined construction, control and expansion joints. Pour in a checkerboard pattern, unless otherwise directed.
- G. Excessive honeycomb and embedded debris is not acceptable.
- H. Conform to ACI 305R-10 when concreting in hot weather.
- I. Screed slabs and concrete bases level to a tolerance of 1/8-inch in 10 feet. Vary slab thickness as required to maintain top of slab elevation as design. Maintain top of slab elevation within  $\pm 3/8$ " of intended elevation. Continually survey top of concrete elevations during concrete pour.
- J. Inspect concrete surfaces immediately upon removal of forms. Patch imperfections.
- K. Modify or replace concrete not conforming to required lines, details, shapes and elevations. Do not patch, fill, touch-up, repair, or replace exposed architectural concrete except upon express direction of Architect.
- L. Provide smooth rubbed finish on concrete surfaces to be left exposed such as concrete walls, columns, beams, and joists, except as otherwise indicated.
- N. Beginning immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete. Moisture cure for seven (7) days minimum all interior slabs.

### 3.08 CONCRETE FINISHES

- A. Steel Trowel Finish: Interior slabs shall receive a monolithic steel trowel finish. Surfaces shall be screeded, wood floated, and steel-troweled. Finish shall be a smooth, hard, dense, impervious surface, free of defects. Finishers shall work from knee boards laid flat upon the surface. Mechanical troweling machines may be used if the desired finish and level tolerances can be obtained by their use, but finishing shall be by hand troweling.

3.09 CONCRETE CURING AND PROTECTION

- A. Concrete (other than high-early-strength) shall be maintained above 50 degrees F. and in a moist condition for at least the first seven (7) days after placement, except when cured in accordance with Section 26.5.3, ACI 318.

3.10 PROTECTION

- A. Fill-in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Exposed Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
  - 1. Equipment Bases and Foundations: Provide machine and equipment bases and foundations, as shown on drawings. Set anchor bolts for machines and equipment to template at correct elevations, complying with certified diagrams or templates of manufacturer furnishing machines and equipment.
  - 2. Grout base plates and foundations as indicated, using specified non-shrink grout. Use non-metallic grout for exposed conditions, unless otherwise indicated.
- C. Concrete Surface Repairs: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.
  - 1. Cut out honeycomb, rock pockets, voids over 1/4 inch in dimension, and holes left by tie rods and bolts, down to solid concrete but, in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
  - 2. For exposed-to-view surfaces, blend white Portland cement and standard Portland cement so that, when dry, patching mortar will match color surrounding. provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- D. Repair of Unformed Surfaces:
  - 1. Repair finished unformed surfaces that contain defects which affect durability of concrete. Surface defects, as such, include crazing, cracks in excess of 0.01-inch wide or which penetrate to reinforcement or completely through non-reinforced sections regardless of width, spalling, pop-outs, honeycomb, rock pockets, and other objectionable conditions.
  - 2. Correct high areas in unformed surfaces by grinding, after concrete has cured at least 14 days.
  - 3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with fresh concrete. Finish repaired areas to blend into adjacent concrete. Proprietary

patching compounds may be used when acceptable to Architect.

E. Repair Defective Areas:

1. Repair defective areas, except random cracks and single holes not exceeding 1 inch diameter, by cutting-out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4 inch clearance around.
2. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
3. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut-out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
4. Site walls: Remove cracked, honeycombed or defective concrete as required by the Architect from joint to joint. Patching, calking, filling or repairing will not be permitted
5. Perform structural repairs with prior approval of Architect or Structural Engineer for method and procedure, using specified epoxy adhesive and pressure grouting.
6. Repair method not specified above may be used, subject to acceptance of Architect.

**END OF SECTION**

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**SECTION 06 10 00**

**ROUGH CARPENTRY**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: Plywood Sheathing, miscellaneous blocking and rough hardware.
- B. Related Sections:
  - 1. Finish Hardware, see Section 08 71 00 – Door Hardware.
  - 2. Millwork and other finish carpentry.

**1.02 REFERENCE STANDARDS**

- A. Softwood Lumber: PS 20 - American Softwood Lumber Standard.
- B. NFPA - National Forest Products Association, National Design Specifications for Stress Grade Lumber and its Fastening.
- C. West Coast Lumber Inspection Bureau (WCLIB), Standard No. 17 Grading Rules for West Coast Lumber.
- D. Chapter 23, Part 2, Section 2303, Title 24, California Building Code, 2019.
- E. Chapters 7, 23 and 35, California Building Code, 2019.
- F. Plywood: U.S. Product Standard PS 1-09.
- G. Lumber: U.S. Product Standard, PS 20-10.

**1.03 QUALITY ASSURANCE**

- A. Provide lumber with visible grade stamp of an approved agency certified by NFPA.

**1.04 DELIVERY, STORING AND HANDLING**

- A. Deliver and store materials at job site in a safe area, out of traffic and shored up, off ground surface.
- B. Identify framing lumber by grades and store grades separately from each other.
- C. Protect products with adequate waterproofing.
- D. Exercise care in off-loading lumber to prevent damages, splitting and breaking.
- E. Seasoning:
  - 1. Deliver materials at earliest date possible to allow maximum; drying time on site.
  - 2. Pile and strip lumber at site to allow free circulation of air with pile protected from sun and moisture.
  - 3. Air-season lumber for at least 60 days before covering with finish materials.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. Lumber: PS 20 and WCLIB Standard Number 17; Douglas Fir/Larch; graded in accordance with NFPA Grading Rules; maximum moisture content of 19 percent, grades as scheduled on drawings.
  - 1. Douglas fir shall bear WCLIB grade stamp.
  - 2. Pressure treated Douglas fir shall be No. 2 minimum and bear the AWPAs quality mark. Cuts and holes shall be treated per AWPAs Standard U1 (statements such as "or to refusal" are not permitted).
  - 3. Comply with provisions of Title 24, CBC, 2019, Part 2, Section 2303.
- B. Plywood:
  - 1. Plywood for Roofs, Walls, and Floor Sheathing: PS 1-09 Structural I grade, APA C-D, exterior glue, except B-D for electrical and telephone panels.
  - 2. Comply with CBC, 2019, Section 2303.
  - 3. Roof and shearwall plywood shall be nominally 4 ft. x 8ft. in size. Do not use sheets less than 8 square feet, nor less than dimensions noted in paragraph 3.08 Plywood Placement.

### 2.02 ACCESSORY MATERIALS

- A. Nails, Spikes, and Staples: Common (with standard lengths), except as otherwise indicated, galvanized for exterior locations, high humidity within conditioned spaces, and treated wood; plain finish for other interior locations; size and type to suit application.
- B. Steel Hardware and Stock Framing Products by Connectors: ASTM A36 steel, galvanized for exterior applications, Simpson Strong-Tie Company. Products by KC Metal Products, or other approved manufacturer, may be substituted if shown to be equal and approved by structural engineer. Comply with CBC, 2019, Title 24, Part 2, Chapter 23.
- C. Lag Bolts: ANSI/ASME B18.2.1 and ASME B18.18.1.
- D. Wood Preservative: Wolmanizing treatment at least two weeks prior to delivery to site. Treatment shall meet or exceed AWPAs P5.
- E. Machine Bolts: ASTM A307.
- F. Pressure Treatment: Sills and plates in contact with concrete or masonry within 48 inches of the ground, and wood posts and columns bearing directly on concrete shall be water-borne preservative pressure treated in accordance with paragraph, CBC 2019, Title 24, Part 2, Chapter 23.
  - 1. At cuts, holes, notches and other field operations which expose a surface not factory treated with preservative, field apply preservative material compatible with original material shall bear mark AWPAs Standard U1.

2. Meet local Air Quality Control Board Standards for field applied preservative treatment.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Selection of Lumber: Carefully select members. Ensure that exposed members are free of heart center. Select members so that knots and obvious defects will not interfere with placement of bolts, proper nailing or making proper connections, and not impair achievement of proper finished appearances where to be exposed.
- B. Cut out and discard defects which will render a piece unable to serve its intended function. Lumber may be rejected by Architect, whether or not it has been installed, for excessive warp, twist, bow, crook, mildew, fungus, or mold, as well as for improper cutting and fitting.

#### **3.02 SHIMMING**

- A. Do not shim framing member except where specifically shown or required by drawings.

#### **3.03 BLOCKING**

- A. Install blocking required to support items of finish and to cut off concealed draft openings, both vertical and horizontal, between ceiling and floor.

#### **3.04 ALIGNMENT**

- A. On framing members to receive a finished surface, align finish sub-surface to vary not more than 1/8-inch from plane of surface of adjacent framing and furring members.

#### **3.05 PLYWOOD PLACEMENT**

- A. All installed plywood shall be in 4' x 8' sheets except where restricted by boundaries or changes.
- B. Minimum Plywood Panel Sizes shall be as follows:
  1. In horizontal plywood diaphragms, no panel less than 24 inches wide or 48 inches long shall be used.
  2. In vertical plywood diaphragms, no panel less than 16 inches wide shall be used.
- C. Center joints accurately over support unless otherwise shown on Drawings. Provide gapping of plywood substrate of 1/8-inch at abutting joints at all wall.
- D. Protect plywood from moisture until succeeding component or materials are installed to cover plywood. Delaminating plywood shall be removed and replaced.

#### **3.06 FASTENING**

- A. Use only common wire nails or spikes of standard lengths and gages as specified Table 2304.10.1, of the California Building Code, 2019.

- B. For conditions not covered on drawings, Contractor to request clarification or provide penetration into piece receiving point not less than 1/2 length of the nail or spike, provided that 16d nails may be used to connect two pieces of nominal 2 inch thickness as specified by the Architect, and/or Structural Engineer and approved by the Division of the State Architect.
- C. For bolts, drill holes 1/32-inch to 1/16-inch larger in diameter than bolts being used. Drill straight and true from one side only.
- D. Bolt threads shall not bear on wood. Use washers under head and nut where both bear on wood. Use washers under nuts.
- E. For lag-screws, and wood screws, pre-bore holes in accordance with CBC 2019, Title 24, Part 2, Chapter 23.
- F. Screw, do not drive, lag screws and wood screws.
- G. Nailing schedule shall be per CBC 2019, Title 24, Part 2, Chapter 23.

**END OF SECTION**

SECTION 07 13 00

**SHEET WATERPROOFING**

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section includes: Extent of sheet membrane waterproofing work as shown on the Drawings and is hereby defined to include all sheet materials applied with sealed joints and flashings as needed to form concealed waterproof membranes.

1.02 SUBMITTALS

- A. Comply with pertinent provisions of Section 01 33 00 – Submittal Procedures.
- B. Product Data: Submit specifications, installation instructions and general recommendations from waterproofing manufacturer, for sheet membrane waterproofing.

1.03 QUALITY ASSURANCE

- A. Manufacturer: Obtain primary waterproofing materials of each type required from a single manufacturer to greatest extent possible. Provide secondary materials only as recommended by manufacturer of primary materials.
- B. Installer: Firm shall have not less than 3 years of successful experience in installation of waterproofing sheets similar to requirements for this project, and which is acceptable to, or licensed by, manufacturer of primary waterproofing materials.

1.04 PROJECT CONDITIONS

- A. Substrate: Proceed with work of this section only after substrate construction, openings, and penetrating work have been completed.
- B. Weather: Proceed with waterproofing an associated work only when existing forecasted weather conditions will permit work to be performed in accordance with manufacturer's recommendations and warranty requirements.

1.05 SPECIAL PROJECT WARRANTY

- A. Provide written warranty agreeing to replace/repair defective materials and workmanship. Warranty includes responsibility for removal and replacement of other work which conceals sheet waterproofing.
  - 1. Warranty period is 5 years after date of substantial completion.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A. Use one of the following products, except on horizontal surface where water test is required. Do not use the 'bentonite' type.
  - 1. Asphalt/Polyethylene Sheet Waterproofing: Self-adhering membrane of rubberized asphalt integrally bonded to polyethylene sheeting, formed into

uniform flexible sheets of no less than 56 mils thickness, in widths of no less than 36 inches, and complying with the following:

- a. Tensile Strength (ASTM D412): 250 psi minimum
- b. Ultimate Elongation (ASTM D412): 200% minimum
- c. Brittleness Temperature (ASTM D746)" -25 degrees F. (-32 degrees C.)
- d. Hydrostatic Head Resistance: 75 feet minimum
- e. Water Absorption (ASTM D570): Not more than 0.5% weight gain for 48 hours of immersion at 70 degrees F. (21 degrees C.).
- f. Products/Manufacturers: Provide one of the following, or approved equal:

Bituthene®: W.R. Grace & Co.  
Polyguard No. 650: Polyguard Products, Inc.  
Mel-rol: W.R. Meadows, Inc.

- 2. Bentonite Butyl Rubber/Polyethylene Sheet Waterproofing: Self-adhering membrane of rubberized bentonite adhered to polyethylene sheeting, formed into 36 inch wide sheets of 60 mils thickness, complying with the following:
  - a. Pliability (ASTM D146): Unaffected by 180° bend over 1" mandrel at -25°F.
  - b. Tensile strength-membrane (ASTM D412 [DIEC]) modified: 260 psi minimum.
  - c. Permeability (ASTM E96 Method B): 0.1 perms maximum.
  - d. Specific gravity (ASTM D71): 1.57 at 77°F.
  - e. Flash point (ASTM D93-10a): 465.
  - f. Penetration (ASTM D217): 150 GTL is 58; 300 GTL is 85.
  - g. Products/Manufacturer: CETCO Swelltite® Dual Membrane Waterproofing Protection System by AMCOL International Corp., or approved equal.

## **2.02 ACCESSORIES**

- A. Adhesives: Provide types of adhesive compound and tapes recommended by waterproofing sheet manufacturer, for bonding to substrate (if required), for waterproof sealing of seams in membrane, and for waterproofing sealing of joints between membrane and flashings, adjoining surfaces and projections through membrane.
- B. Primers: Provide type of concrete primer recommended by manufacturer of sheet waterproofing material for applications required.
- C. Flashing Materials: Except as otherwise indicated, provide types of flexible sheet material recommended by waterproofing sheet manufacturer for flashing.

- D. Protection Course: Provide type recommended by waterproofing sheet manufacturer, include adhesive recommended by Manufacturer.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A. Inspect substrate and conditions under which waterproofing work is to be performed. Do not proceed until unsatisfactory conditions have been corrected.

#### **3.02 PREPARATION**

- A. Prior to installation of waterproofing and associated work, meet at project site with Waterproofing Materials Manufacturer's Representative, and Inspection and Testing Agency Representative (if any), for purpose of reviewing material selections and procedures to be followed in performing work.
- B. On concrete decks, immediately before placement of waterproofing sheet, grind surface lightly with terrazzo grinder or similar device, to ensure removal of projections which might penetrate sheet. Clean deck of loose material.
- C. Apply primer to concrete and masonry surfaces at rate and when recommended by manufacturer of primary waterproofing materials. Prime only area which will be covered by waterproofing membrane in same working day; reprime areas not covered by waterproofing membrane within 24 hours.

#### **3.03 INSTALLATION**

- A. Comply with manufacturer's instructions for handling and installation of sheet waterproofing materials, except where more stringent requirements are shown or specified.
- B. Coordinate installation of waterproofing materials and associated work to provide complete system complying with recommendations of manufacturer. Schedule installation to minimize period of exposure of sheet waterproofing materials.
- C. Extend waterproofing sheet and flashings as shown to provide complete membrane over area indicated to be waterproofed. Seal to projections through membrane and seal seams. Bond to vertical surfaces and also, where shown or recommendations by manufacturer, bond to horizontal surfaces.
- D. Install protection course of type indicated over completed membrane, complying with manufacturer's recommendations for both waterproofing sheet and protection course materials.

#### **3.04 PERFORMANCE REQUIREMENTS**

- A. It is required that waterproof membranes be watertight and not deteriorate in excess of limitations published by manufacturer.
- B. In-Place Testing: Before completed membranes on horizontal surfaces are covered by protection course or other work, test for leaks with 2 inch depth of water maintained for 24 hours. Repair all leaks revealed by examination of substructure and repeat test until no leakage is observed.

**3.05 PROTECTION**

- A. Institute all required procedures for protection of completed membrane during installation of work over membrane and throughout remainder of construction period. Do not allow traffic of any type on unprotected membrane.

**END OF SECTION**



SECTION 07 21 00

**THERMAL INSULATION**

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section includes: Thermal, fire, and acoustical insulation and isolation materials as indicated on the Drawings and specified herein.
- B. Related Sections:
  - 1. Framing to which insulation is to be attached, see Division 6.
  - 2. Roofing, see Division 7.

1.02 REFERENCE STANDARDS

- A. Ensure installation compliance with CBC 2019, Title 24.
- B. ASTM C553 and E84.

1.03 SUBMITTALS

- A. Submit manufacturer's product literature and installation instructions for each type of insulation material required.
- B. Submit certified test reports showing compliance with performance values, including r-ratings (aged for plastic insulations), densities, compression strengths, fire performance characteristics, perm ratings, water absorption ratings and similar properties.

1.04 QUALITY ASSURANCE

- A. Provide a certification of insulation and post on project, stating that work of this section conforms to the requirements of this section of specifications and Title 24.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A. Batt Insulation at Horizontal Locations:
  - 1. Provide CertainTeed Corporation, CertaPro Batts, Kraft Faced or Foil Faced, flanged (or approved equal), in thicknesses necessary to meet aged **R-30** value (unless otherwise noted), expressed as average in and out value.
  - 2. Flame Spread Rating: 25 or less in accordance with ASTM E84.
  - 3. Smoke Density Developed Rating: 50 or less in accordance with ASTM E84.
- B. Batt Insulation at Vertical Locations:
  - 1. Provide CertainTeed Corporation, CertaPro Batts, Kraft Faced or Foil Faced, flanged (or approved equal), in thickness necessary to meet aged **R-21** value (unless otherwise noted), expressed as average in and out value.

2. Flame Spread Rating: 25 or less in accordance with ASTM E84.

Note: Specified R-values are for materials only and are not to include installation values.

3. Smoke Density Factor: Not to exceed 450.

## **2.02 ACCESSORIES**

- A. Sag Wires: At all types of batt insulation, provide 18 gage galvanized wire at 16 inches on center. Staple wire at wood structure or sheet metal screw to metal structure to underside of structure, minimum three (3) per connection. Sag wires are not required where gypsum board is attached to the underside of roof framing.
- B. Impaling and stick-pins, including washers, are to be provided as recommended in writing by insulation manufacturer.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Batt Insulation:
  1. Insulate exterior areas adjacent and contiguous to spaces unheated, except where shown otherwise by Drawings.
  2. Ensure secure attachment so that insulation will not sag over time. Friction fitting is not sufficient. Mechanically attach insulation. Double sided tape attachment is not acceptable.
    - a. Install foil and paper facing on warmer side of area being insulated.
    - b. Where insulated walls and underside of structure are being left exposed and unfinished, install sag wires at 16" o.c. (minimum) to support insulation.
    - c. Where insulation is being installed using impaling pins, ensure that washers are installed over pins after insulation is in place. Space pins as necessary to provide insulation installation which will not sag over time, and as recommended in writing by insulation manufacturer.
  3. Ensure the continuous insulation of the building envelope. Tape joints, both ends and sides.
  4. Provide two layers of insulation lapping openings by 14 inches or more where intended to be of sound resistive construction at locations such as telephone outlets, electrical, mechanical, or plumbing penetrations.

### **3.02 DEMONSTRATION**

- A. Comply with State of California Noise Insulation Standards.
- B. Upon completion of installation of building envelope, certify compliance with requirements for Title 24.

**END OF SECTION**

**SECTION 07 27 13**

**MODIFIED BITUMINOUS SHEET AIR BARRIERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A. Surface preparation.
- B. Application of rolled, self-adhering air/vapor barrier system.
- C. Application of materials to provide bridge and seal air leakage pathways in:
  - 1. Wall and roof connections and penetrations
  - 2. Connections to foundation walls
  - 3. Walls, windows, curtain walls, storefronts, louvers, or doors
  - 4. Expansion and control joints
  - 5. All other penetrations through the wall assembly

**1.02 RELATED SECTIONS**

- A. Section 07 21 00 - Thermal Insulation.
- B. Section 07 62 00 - Flashing and Sheet Metal.
- C. Section 07 92 00 - Joint Sealants.
- D. Section 08 11 13 - Doors and Frames.

**1.03 REFERENCES**

- A. ASTM D412 - Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
- B. ASTM D570 - Standard Test Method for Water Absorption of Plastics.
- C. ASTM D882 - Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
- D. ASTM D903 - Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
- E. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- F. ASTM E96 (Method B) - Standard Test Methods for Water Vapor Transmission of Materials.
- G. ASTM E154 - Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
- H. ASTM E283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

- I. ASTM E783 - Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.
- J. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- K. ASTM E2178 - Standard Test Method for Air Permeance of Building Materials.
- L. ASTM E2357 - Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

**1.04 SUBMITTALS**

- A. Comply with Section 01 33 00 - Submittal Procedures.
- B. Submit manufacturer's product data and application instructions.

**1.05 QUALITY ASSURANCE**

- A. Installer Qualifications:
  - 1. Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the application of the air barrier.
    - a. Air-barrier Installer performing Work shall be approved by air barrier membrane manufacturer.
- B. Obtain air/vapor barrier materials from a single manufacturer regularly engaged in manufacturing the product.
- C. Provide products which comply with all state and local regulations controlling use of volatile organic compounds (VOCs).

**1.06 MOCK-UPS**

- A. Prior to installation of air/vapor barrier, apply air/vapor barrier as follows to verify details under shop drawing submittals and to demonstrate tie-ins with adjoining construction and other termination conditions, as well as qualities of materials and execution.
- B. Apply air barrier in field-constructed mock-ups of assemblies specified in Section 09 20 00 – Plaster and Gypsum Board.
- C. Construct typical exterior wall panel, 8' by 8' wide, incorporating back-up wall, cladding, window and doorframe and sill, insulation, flashing, building corner condition, junction with foundation wall and typical penetrations and gaps; illustrating materials interface and seals.
- D. Test mock-up in accordance with ASTM E783 and ASTM E1105 for air and water infiltration.
- F. Cooperate and coordinate with Owner's inspection and testing agency. Do not cover any installed air and vapor barrier membrane unless it has been inspected, tested, and approved.

## 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Store materials in a clean, dry area in accordance with manufacturer's instructions.
- C. Store adhesives and primers at temperatures of 40° F (5° C) and above to facilitate handling.
- D. Store membrane cartons on pallets.
- E. Do not store at temperatures above 90° F (32° C) for extended periods.
- F. Keep away from sparks and flames.
- G. Completely cover when stored outside. Protect from rain.
- H. Protect materials during handling and application to prevent damage or contamination.

## 1.08 ENVIRONMENTAL REQUIREMENTS

- A. Product not intended for uses subject to abuse or permanent exposure to the elements.
- B. Protect rolls from direct sunlight until ready for use
- C. Do not apply membrane when air or surface temperatures are below 40° F (4° C).
- D. Do not apply to frozen surfaces.

**PART 2 PRODUCTS**

## 2.01 MANUFACTURER

- A. W. R. MEADOWS, INC., PO Box 338, Hampshire, Illinois 60140-0338. (800) 342-5976. (847) 683-4500. Fax (847) 683-4544. Website: [www.wrmeadows.com](http://www.wrmeadows.com).
- B. or equal

## 2.02 MATERIALS

- A. Rolled, Self-Adhering Air/Vapor Barrier Membrane: Polymeric air/vapor barrier membrane protected by release paper on cross-laminated polyethylene carrier film with exposed polymeric membrane strips on both sides protected by pull-off release strips.
  - 1. Performance Based Specification: Air/Vapor barrier membrane shall have the following characteristics:
    - a. Air Leakage, ASTM E2357:  $\leq 0.04$  cfm / ft.<sup>2</sup> @ 75 Pa (1.57 lb./ft.<sup>2</sup>).
    - b. Air Permeability, ASTM E2178:  $\leq 0.004$  cfm / ft.<sup>2</sup> @ 75 Pa (1.57 lb./ft.<sup>2</sup>).
    - c. Water Vapor Permeance, ASTM E96 (Method B):  $\leq 0.035$  perms.
    - d. Elongation, ASTM D412: 400 %.
    - e. Tensile Strength, ASTM D412: 4000 psi (27.6 MPa).
    - j. Lap Peel Strength @ 39° F (3.9° C), ASTM D903, 180 Bend: 10 lbf/in. (1.75 N/mm).

**2.03 ACCESSORIES**

- A. Flashing and Transition Membrane: Self-adhesive polymeric sheet membrane having a thickness of 40 mils (1 mm).
- B. Liquid Flashing: Fluid applied, single component, flashing membrane for rough openings and detailing.
- C. Joint Tape: Self-adhesive polymeric membrane for joints of plywood and oriented strand board (OSB).
- D. Membrane Adhesive:
  - 1. Temperatures above 40° F (4° C): Water-Based Adhesive.
  - 2. Temperatures below 30° F (-1° C): Solvent-Based Primer.
- E. Pointing Mastic: mastic for sealing penetrations and terminations of membrane.
- F. Detailing Membrane: non-slump waterproofing material for joint detailing.
- G. Concrete Repair Materials: general purpose patching materials.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A. Examine surfaces to receive membrane. Notify Architect if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected.

**3.02 SURFACE PREPARATION**

- A. Protect adjacent surfaces not designated to receive air/vapor barrier system.
- B. Clean and prepare surfaces to receive air barrier in accordance with manufacturer's instructions.
- C. Do not apply air/vapor barrier to surfaces unacceptable to manufacturer.
- D. All surfaces must be clean, smooth, and dry and must be clean of oil, dust, and excess mortar.
- E. Strike masonry joints flush.
- F. Patch all holes and voids and smooth out any surface misalignments.
- G. Concrete surfaces must be cured for a minimum of 14 days.
- H. If curing compounds are used, they must be clear, resin based, without oil, wax, or pigments.

**3.03 APPLICATION OF AIR BARRIER SYSTEM**

**A. TRANSITION MEMBRANE**

1. Prime the area to be detailed using adhesive recommended by the membrane manufacturer according to the substrate.
2. Apply transition membrane with a minimum overlap of 3" (75 mm) onto primed surface at all joints, columns, and beams as indicated in drawings.
3. Tie in to window and door openings, roofing systems, floor intersections, and dissimilar materials.
4. Roll membrane firmly into place.
5. Ensure membrane is fully adhered and remove all wrinkles and fish mouths.
6. Overlap subsequent courses of membrane a minimum of 2" (50 mm) and ensure joints are fully adhered.
7. Seal top edge of transition membrane with pointing mastic.

**B. THROUGH WALL FLASHING**

1. Prime the area to be detailed using adhesive recommended by the membrane manufacturer according to the substrate.
2. Remove release paper prior to application.
3. Apply through wall flashing at based of masonry walls as indicated on drawings.
4. Recess through wall flashing 1/2" (13 mm) from the face of the masonry.
5. Apply a bead of pointing mastic if through wall flashing is not embedded into masonry.

**C. AIR BARRIER MEMBRANE**

1. Apply air barrier membrane system in accordance with manufacturer's instructions.
2. Ensure accessory materials are compatible with membrane and approved by membrane manufacturer.
3. Prime the area to be detailed using adhesive recommended by the membrane manufacturer according to the substrate. Re-apply adhesive to uncovered surfaces next day.
4. Apply membrane to primed surface by removing release paper and rolling membrane firmly into place.
5. Ensure membrane is fully adhered and remove all wrinkles and/or fish mouths.

6. Cut air barrier membrane to detail around protrusions and masonry reinforcing.
7. Overlap subsequent courses of membrane a minimum of 2" (50 mm) in a shingle fashion.
8. Inspect membrane before covering and repair as necessary. Cover tears and inadequate overlaps with membrane. Seal edges of patches with pointing mastic.
9. Seal all end laps and protrusions with pointing mastic.
10. Avoid use of products which contain tars, solvents, pitches, polysulfide polymers, or PVC materials that may come into contact with waterproofing membrane system.

**3.04 PROTECTION**

- A. Cover air barrier membrane as soon as possible, since it is not designed for permanent exposure.

**END OF SECTION**



**SECTION 07 54 00**

**THERMOPLASTIC MEMBRANE ROOFING**

**PART 1 - GENERAL**

**1.01 DESCRIPTION**

- A. Scope – Install a complete adhered Sika Sarnafil, or equal roofing system including membrane, flashings and other components.
- B. Related Work - The work includes but is not limited to the installation of:
  - 1. Substrate Preparation
  - 2. Vapor Barrier
  - 3. Wood Blocking
  - 4. Separation Layers
  - 5. Roof Membrane
  - 6. Fasteners
  - 7. Adhesive for Flashings
  - 8. Roof Membrane Flashings
  - 9. Walkways
  - 10. Metal Flashings
  - 11. Sealants
- C. Upon successful completion of work the following warranties must be submitted:
  - 1. Sika Sarnafil Warranty – 20 years
  - 2. Roofing Applicator Warranty – 20 years

**1.02 QUALITY ASSURANCE**

- A. This roofing system shall be applied only by a Roofing Applicator authorized by Sika Sarnafil prior to bid. Equal roofing systems and applicators shall be submitted and approved prior to bid.
- B. There shall be no deviation made from the Project Specification or the approved shop drawings without prior written approval by the Owner, the Owner's Representative and Sika Sarnafil, or equal.
- C. All work pertaining to the installation of roofing membrane and flashings shall only be completed by Applicator personnel trained and authorized by Sika Sarnafil, or equal in those procedures.

**1.03 SUBMITTALS**

- A. At the time of bidding, the Applicator shall submit to the Owner (or Representative) the following:
  - 1. Specific adherence to specification guideline.
  - 2. Samples of each primary component to be used in the roof system and the manufacturer's current literature for each component.
  - 3. Sample copy of manufacturer's warranty.

4. Sample copy of Applicator's warranty.
  5. Dimensioned shop drawings which shall include:
  6. Outline of roof with roof size and elevations shown.
  7. Details of flashing methods for every penetration and flashing condition.
- B. Certifications by manufacturers of roofing and insulating materials that all materials supplied comply with all requirements of the identified ASTM and other industry standards or practices.
- C. Certification from the Applicator that the system specified meets all identified code and insurance requirements as required by the Specification.
- D. Material Safety Data Sheets (MSDS)

**1.04 CODE REQUIREMENTS**

- A. The Applicator shall submit evidence that the proposed roof system meets the requirements of the local building code and has been tested and approved or listed by the following test organizations. These requirements are minimum standards and no roofing work shall commence without written documentation of the system's compliance, as required in the "Submittals" section of this specification.
- B. System shall be designed to meet a minimum wind design requirements of the most recent version of ASCE 7.
- C. Factory Mutual Research Corporation (FM) - Norwood, MA
1. Class 1-90 (for high wind exposure)
- D. Underwriters Laboratories, Inc. - Northbrook, IL
1. Class A assembly

**1.05 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. All products delivered to the job site shall be in the original unopened containers or wrappings bearing all seals and approvals.
- B. Handle all materials to prevent damage. Place all materials on pallets and fully protect from moisture.
- C. Membrane rolls shall be stored lying down on pallets and fully protected from the weather with clean canvas tarpaulins. Unvented polyethylene tarpaulins are not accepted due to the accumulation of moisture beneath the tarpaulin in certain weather conditions that may affect the ease of membrane weldability.
- D. As a general rule all adhesives shall be stored at temperatures between 40 degree F (5 degree C) and 80 degree F (27 degree C). Read instructions contained on adhesive canister for specific storage instructions.
- E. All flammable materials shall be stored in a cool, dry area away from sparks and open flames. Follow precautions outlined on containers or supplied by material manufacturer/supplier.

- F. All materials which are determined to be damaged by the Owner's Representative or Sika Sarnafil, or equal representative are to be removed from the job site and replaced at no cost to the Owner.

#### 1.06 JOB CONDITIONS

- A. Sarnafil, or equal, materials may be installed under certain adverse weather conditions but only after consultation with manufacturer as installation time and system integrity may be affected.
- B. Only as much of the new roofing as can be made weathertight each day, including all flashing and detail work, shall be installed. All seams shall be heat welded before leaving the job site that day.
- C. All work shall be scheduled and executed without exposing the interior building areas to the effects of inclement weather. The existing building and its contents shall be protected against all risks.
- D. All surfaces to receive new insulation, membrane or flashings shall be dry. Should surface moisture occur, the Applicator shall provide the necessary equipment to dry the surface prior to application.
- E. All new and temporary construction, including equipment and accessories, shall be secured in such a manner as to preclude wind blow-off and subsequent roof or equipment damage.
- F. Uninterrupted waterstops shall be installed at the end of each day's work and shall be completely removed before proceeding with the next day's work. Waterstops shall not emit dangerous or unsafe fumes and shall not remain in contact with the finished roof as the installation progresses. Contaminated membrane shall be replaced at no cost to the Owner.
- G. The Applicator is cautioned that certain Sarnafil membranes are incompatible with asphalt, coal tar, heavy oils, roofing cements, creosote and some preservative materials. Such materials shall not remain in contact with Sarnafil membranes. The Applicator shall consult Sika Sarnafil regarding compatibility, precautions and recommendations.
- H. Arrange work sequence to avoid use of newly constructed roofing as a walking surface or for equipment movement and storage. Where such access is absolutely required, the Applicator shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas. A substantial protection layer consisting of plywood over Sarnafelt or plywood over insulation board shall be provided for all new and existing roof areas that receive rooftop traffic during construction.
- I. Prior to and during application, all dirt, debris and dust shall be removed from surfaces either by vacuuming, sweeping, blowing with compressed air or similar methods.
- J. The Applicator shall follow all safety regulations as required by OSHA and any other applicable authority having jurisdiction.
- K. All roofing, insulation, flashings and metal work removed during construction shall be immediately taken off site to a legal dumping area authorized to receive such materials. Hazardous materials, such as materials containing asbestos, are to be removed and disposed of in strict accordance with applicable City, State and Federal requirements.

- L. All new roofing waste material (i.e., scrap roof membrane, empty cans of adhesive) shall be immediately removed from the site by the Applicator and properly transported to a legal dumping area authorized to receive such material.
- M. The Applicator shall take precautions that storage and application of materials and equipment does not overload the roof deck or building structure.
- N. Flammable adhesives and deck primers shall not be stored and not be used in the vicinity of open flames, sparks and excessive heat.
- O. The Applicator shall verify that all roof drain lines are functioning correctly (not clogged or blocked) before starting work. Applicator shall report any such blockages in writing to the Owner's Representative for corrective action prior to the installation of the roof system.
- P. Applicator shall immediately stop work if any unusual or concealed condition is discovered and shall immediately notify Owner of such condition in writing for correction.
- Q. Site cleanup, including both interior and exterior building areas that have been affected by construction, shall be completed to the Owner's satisfaction.
- R. All landscaped areas damaged by construction activities shall be repaired at no cost to the Owner.
- S. The Applicator shall conduct fastener pullout tests in accordance with the latest version of the SPRI/ANSI Fastener Pullout Standard to verify condition of the deck/substrate and to confirm expected pullout values.
- T. The Sarnafil membrane shall not be installed under the following conditions without consulting Sika Sarnafil's Technical Dept. for precautionary steps:
  - 1. The roof assembly permits interior air to pressurize the membrane underside.
  - 2. Any exterior wall has 10 percent or more of the surface area comprised of opening doors or windows.
  - 3. The wall/deck intersection permits air entry into the wall flashing area.
- U. Precautions shall be taken when using any adhesives at or near rooftop vents or air intakes. Adhesive odors could enter the building. Coordinate the operation of vents and air intakes in such a manner as to avoid the intake of adhesive odor while ventilating the building. Keep lids on unused cans at all times.
- V. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.
- W. Membranes are slippery when wet or covered with snow, frost, or ice. Working on surfaces under these conditions is hazardous. Appropriate safety measures must be implemented prior to working on such surfaces. Always follow OSHA and other relevant fall protection standards when working on roofs.

#### **1.07 BIDDING REQUIREMENTS**

**A. Pre-Bid Meeting:**

A pre-bid meeting shall be held with the Owner's Representative and involved trades to discuss all aspects of the project. The Applicator's field representative or roofing foreman

for the work shall be in attendance. Procedures to avoid rooftop damage by other trades shall be determined.

B. Site Visit:

Bidders shall visit the site and carefully examine the areas in question as to conditions that may affect proper execution of the work. All dimensions and quantities shall be determined or verified by the Applicator. No claims for extra costs will be allowed because of lack of full knowledge of the existing conditions unless agreed to in advance with the Owner or Owner's Representative.

1.08 WARRANTIES

- A. Manufacturer's Membrane Warranty – 20 years.
- B. Manufacturer's Standard System Warranty – all products installed shall be covered by a standard warranty of 20 years.
- C. Applicator/Roofing Contractor Warranty – Applicator's/Contractor's warranty shall be 20 years. Applicator/Contractor shall supply Owner with a separate workmanship warranty. In the event any work related to roofing, flashing, or metal is found to be within Applicator warranty term, defective or otherwise not in accordance with Contract Documents, the Applicator shall repair that defect at no cost to the Owner. Applicator's warranty obligation shall run directly to the Owner, and a copy shall be sent manufacturer.
- D. Owner Responsibility - Owner shall notify the contractor of any leaks, within one month, as they occur during the time period when both warranties are in effect.

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. Manufacturer: The components of the Sarnafil Adhered roof system, or equal, are to be products of Sika Sarnafil, or equal, as indicated on the Drawings and specified in the Contract Documents.
- B. Other acceptable manufacturers: Johns Manville, Carlisle or equal, upon submission of an acceptable pre-bid submittal.
- C. Roof assembly shall be Class A.

2.02 MEMBRANE

- A. Sarnafil G410 fiberglass reinforced membrane with a lacquer coating.
- B. Membrane shall conform to ASTM D4434 (latest version), "Standard for Polyvinyl Chloride Sheet Roofing". Classification: Type II, Grade I.
  - 1. Sarnafil 6G410-20, 80 mil (2.0 mm), thermoplastic membrane with fiberglass reinforcement.
- C. Certified Polymer Thickness
- D. Color of Membrane - EnergySmart White, initial solar reflectance of 0.83, emittance of 0.90, and solar reflective index (SRI) of 104 (ENERGY STAR listed).

E. Typical Physical Properties (1)

<u>Parameters</u>	<u>ASTM Test Method</u>	<u>ASTM D-4434 Spec. Requirement</u>	<u>Typical Physical Properties</u>
Reinforcing Material	-	-	Fiberglass
Overall Thickness(1), min., inches (mm)	D638	0.045 (1.14)	[0.0__inches]]
Thickness Above Scrim	-	-	0.023 (avg.)
Tensile Strength, min., psi (MPa)	D638	1500 (10.4)	1600 (11.1)
Elongation at Break, min. (machine / transverse)	D638	250% / 220%	250% / 220%
Seam strength(2), min. (% of tensile strength)	D638	75	80
Retention of Properties After Heat Aging	D3045	-	-
Tensile Strength, min., (% of original)	D638	90	95
Elongation, min., (% of original)	D638	90	90
Tearing Resistance, min., lbf (N)	D1004	10 (45.0)	14 (63.0)
Low Temperature Bend, -40° F (-40° C)	D2136	Pass	Pass
Accelerated Weathering Test (florescent light, uv exposure)	G154	5,000 Hours	10,000 Hours
Cracking (7x magnification)	-	None	None
Discoloration (by observation)	-	Negligible	Negligible
Crazing (7x magnification)	-	None	None
Linear Dimensional Change	D1204	0.10 % max.	0.02%
Weight Change After Immersion in Water	D570	± 3.0% max.	2.5%
Static Puncture Resistance, 33 lbf (15 kg)	D5602	Pass	Pass
Dynamic Puncture Resistance, 7.3 ft-lbf (10 J)	D5635	Pass	Pass
Initial Solar Reflectance	E903	-	0.83
Emissivity	E408, C1371, Other	-	0.90
Solar Reflective Index (SRI)	E1980	-	104
Recycled Content (5 & 10 ft. sheets only)	8 to 12% Pre-Consumer / Up to 1% Post Consumer.		

Notes

(1) Typical Physical Properties data is applicable for 0.048 in (1.2 mm) membrane thickness and greater.

(2) Failure occurs through membrane rupture not seam failure.

**2.03 FLASHING MATERIALS**

- A. Wall/Curb Flashing - Sarnaclad, or equal - A PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Sarnaclad is a 24 gauge, G90 galvanized metal sheet with a 20 mil unsupported Sarnafil membrane laminated on one side. The dimensions of Sarnaclad are 4 ft x 8 ft (1.2 m x 2.4 m) or 4 ft x 10 ft (1.2 m x 3.0 m)
- B. Perimeter Edge Flashing - Sarnaclad, or equal - A PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles for a high wind installation. Sarnaclad is a 24 gauge, G90 galvanized metal sheet with a 20 mil (0.5 mm) unsupported Sarnafil membrane laminated on one side. The dimensions of Sarnaclad are 4 ft x 8 ft (1.2 m x 2.4 m) or 4 ft x 10 ft (1.2 m x 3.0 m). Consult Product Data Sheet for additional information.
- C. Miscellaneous Flashing – all miscellaneous flashing are referenced in terms of Sarnafil. Equal products shall be submitted for review and approval by Architect.
  1. Sarnaflash - Prefabricated expansion joint cover made from Sarnafil membrane.

Sarnaflash is designed for securement to vertical or horizontal surfaces to span and accommodate the movement of new and existing expansion gaps from 1 inch to 4-1/2 inches (25 mm to 114 mm) across. Available in 40 foot (12 m) rolls.

2. Sarnareglet - Heavy-duty, extruded aluminum flashing termination reglet used at walls and large curbs. Sarnareglet is produced from 6063-T5, 0.10 inch to 0.12 inch (2.5 mm to 3.0 mm) thick extruded aluminum. Sarnareglet has a 2-1/4 inch (57 mm) deep profile, and is provided in 10 foot (3 m) lengths. Use prefabricated Sarnareglet mitered inside and outside corners where walls intersect.
3. Sarnastack - Prefabricated vent pipe flashing made from 0.048 inch (48 mil/1.2 mm) thick Sarnafil G410 membrane.
4. Sarnadrain-RAC - PVC-coated, heavy-duty aluminum roof drain insert that mechanically seals to the drainpipe interior. Sarnadrain-RAC is made of 0.080 inch (2 mm) thick 6063 aluminum with a urethane seal installed at the end of the drainpipe. The large 14 inch x 14 inch (0.36 m x 0.36 m) drain strainer is also made of 0.080 inch (2 mm) thick aluminum stock. The flange dimensions of Sarnadrain-RAC are 18 inches x 18 inches (0.46 m x 0.46 m).
5. Sarnacircle-"G" - Circular 0.048 inch (48 mil/1.2 mm) thick G410 membrane patch welded over T-joints formed by overlapping thick membranes.
6. Sarnacorners – Universal - Prefabricated outside and inside flashing corners made of 0.060 inch (60 mil/1.5 mm) thick membrane that are heat-welded to membrane or Sarnaclad base flashings.
7. Open Post Flashing - Prefabricated post flashing, 0.048 inch (48 mil/1.2 mm) thick, with an open seam used to flash obstructed rooftop conduits and pipes 1/2 to 1-1/4 inch (12.7-31.8 mm) in diameter. Available in 2 sizes; 1/2 to 3/4 inch (12.7-19 mm) and 3/4 to 1-1/4 inch (19-31.8 mm) diameter. Open Post Flashings are heat welded in place and terminated at the top of the penetration completing the pipe penetration detail.
8. Sikaflex-1a Sealant
9. Sarnafiller - A two-component urethane adhesive used for pitch pocket filler. Cures with excellent elasticity and adhesion to various surfaces.
10. Sarnacol 2170 Adhesive - Solvent-based reactivating adhesive used to attach membrane to flashing substrate.
11. Sarnacol 2170 VC Adhesive - Solvent-based, low VOC, reactivating adhesive used to attach membrane to flashing substrate.
12. Sarnafelt - A non-woven polyester or polypropylene mat cushion layer that is necessary behind G410 or G459 Flashing Membrane when the flashing substrates are rough or incompatible with the flashing membrane.

## 2.04 ATTACHMENT COMPONENTS

### A. Membrane Adhesive - Sarnacol, or equal, 2170 VC Adhesive:

A solvent-based, low VOC, reactivating adhesive used to attach the membrane to the substrate, either horizontally or vertically. Consult Product Data Sheets for additional information. Application rates are as follows:

SARNACOL 2170 VC APPLICATION RATES FOR BARE BACK MEMBRANE				
	Adhesive Rates – Gallons per 100 Square Feet (Liters per Meter <sup>2</sup> )			Approximate Sq. Ft./Pail (meter <sup>2</sup> )
	Substrate	Membrane	Total	
Isocyanurate Paper Facer	1.25 (0.51)	+ 0.50 (0.20)	= 1.75 (0.71)	285 (26.48)
Smooth Plywood	1.00 (0.41)	+ 0.50 (0.20)	= 1.50 (0.61)	333 (30.94)
Metal	0.75 (0.31)	+ 0.50 (0.20)	= 1.25 (0.51)	400 (37.16)
Concrete Wall	1.25 (0.51)	+ 0.50 (0.20)	= 1.75 (0.71)	285 (26.48)
GP DensDeck	1.25 (0.51)	+ 0.50 (0.20)	= 1.75 (0.71)	285 (26.48)
GP DensDeck Prime GP DensDeck DuraGuard	1.00 (0.41)	+ 0.50 (0.20)	= 1.50 (0.61)	333 (30.94)
USG Securock Gypsum-Fiber	0.75 (0.31)	+ 0.50 (0.20)	= 1.25 (0.51)	400 (37.16)

SARNACOL 2170 VC APPLICATION RATES FOR MEMBRANE FLASHINGS USING SARNAFELT				
	Adhesive Rates – Gallons per 100 Square Feet (Liters per Meter <sup>2</sup> )			Approximate Sq. Ft./Pail (meter <sup>2</sup> )
	Substrate (1 <sup>st</sup> coat)	Substrate (2 <sup>nd</sup> coat)	Membrane Total	
Smooth Plywood	1.00 (0.41)	+ 1.00 (0.41)	+ 0.50 (0.20) = 2.50 (1.02)	200 (18.58)
Concrete Wall	1.00 (0.41)	+ 1.00 (0.41)	+ 0.50 (0.20) = 2.50 (1.02)	200 (18.58)
Masonry Wall	1.00 (0.41)	+ 1.00 (0.41)	+ 0.50 (0.20) = 2.50 (1.02)	200 (18.58)
Granular Bitumen	1.00 (0.41)	+ 1.00 (0.41)	+ 0.50 (0.20) = 2.50 (1.02)	200 (18.58)
Smooth Aged Bitumen	1.00 (0.41)	+ 1.00 (0.41)	+ 0.50 (0.20) = 2.50 (1.02)	200 (18.58)

Notes:

- a) Due to an increase in viscosity when outdoor temperatures during installation are below 40 degree F (5 degree C), add 1/2 gallon per 100 square feet (0.2 l per m<sup>2</sup>) to rate for estimating purposes. Do not install when air temperature is within 5 degree F of dew point. Solvent evaporation time increases significantly when temperatures drop. Ensure first layer of Sarnacol 2170 is fully dry before second layer is applied to the back of the membrane for proper reactivation.
- b) Use a water-filled, foam-covered lawn roller to consistently and evenly press the membrane into the adhesive layer.

2.04 INSULATION/OVERLAYMENT/RECOVER BOARD

- A. DensDeck, or equal – ½” Siliconized gypsum, fire-tested hardboard with glass-mat facers.

2.05 DECK PRIMERS

- A. Sarnacol LR-2001 Deck Primer - Designed for use with Sarnacol LR-2001 adhesive to condition surfaces and promote adhesion between certain vapor barriers, acceptable deck substrates such as perlite, vermiculite and Zonolite with insulation board products. Consult Product Data Sheet for additional information.
- B. Sarnavap Self-Adhered Primer - A solvent-based primer designed for use with Sarnavap Self-Adhered vapor barrier to prime wood, concrete, lightweight concrete, gypsum boards and decks prior to application Sarnavap Self-Adhered vapor barrier. Consult Product Data Sheet for additional information.
- C. Sarnavap Self-Adhered Primer WB - A water-based primer designed for use with Sarnavap Self-Adhered vapor barrier to promote adhesion to most substrates.



Particularly recommended when use of solvent-based primer is not advised or permitted. Consult Product Data Sheet for additional information.

## 2.06 WALKWAY PROTECTION

- A. Sarnatred - A polyester reinforced, 0.096 inch (96 mil/2.4 mm), weldable membrane with surface embossment. Used as a protection layer from rooftop traffic. Sarnatred is supplied in rolls of 39.3 inches (1.0 m) wide and 32.8 feet (10 m) long. Consult Product Data Sheet for additional information.

## 2.07 VAPOR BARRIER

- A. Sarnavap-10 - A 10 mil (0.25 mm) thick polyethylene vapor barrier/air barrier. Sarnavap-10 is supplied in a folded panel that is rolled onto a core. The core width is 5 feet (1.5 m). When unrolled off the core and unfolded, the sheet dimensions are 20 feet (6.9 m) wide by 100 feet (33 m) long. Consult Product Data Sheet for additional information.

## 2.08 MISCELLANEOUS ACCESSORIES

- A. Aluminum Tape - A 2 inch (50 mm) wide pressure-sensitive aluminum tape used as a separation layer between small areas of asphalt contamination and the membrane and as a bond-breaker under the coverstrip at Sarnaclad joints.
- B. Sealing Tape Strip - Compressible foam with pressure-sensitive adhesive on one side. Used with metal flashings as a preventive measure against air and wind blown moisture entry.
- C. Multi-Purpose Tape - A high performance sealant tape used with metal flashings as a preventive measure against air and wind blown moisture entry.
- D. Sarnamatic 641mc or 661 - 220 volt, self-propelled, hot-air welding machine used to seal Sarnafil membrane seams.
- E. Sarnasolv - A high quality solvent cleaner used for the general cleaning of residual asphalt, scuff marks, etc., from the membrane surface. Sarnasolv is also used daily to clean seam areas prior to hot-air welding in tear off or dirty conditions or if the membrane is not welded the same day it is unrolled. Consult Product Data Sheet for additional information.
- F. Perimeter Warning Tape - Designed for use on PVC membranes as a reflective, highly visible pressure sensitive tape used to draw attention to roof perimeters and potential hazardous areas. Perimeter Warning Tape exceeds reflectivity 3 requirements and Federal spec. L-S-300, Class 1.

## 2.09 SEALANTS AND PITCH POCKET FILLERS

- A. Sarnafil Sikaflex-1a Sealant, or equal.
- B. Sarnafiller (two-component urethane adhesive for pitch pocket toppings).

Depending on substrates, the following sealants are options for temporary overnight tie-ins:

1. Type III hot asphalt conforming to ASTM D312 (latest version).
2. Sarnafiller.
3. Multiple layers of roofing cement and felt.

4. Spray-applied, water-resistant urethane foam.
5. Mechanical attachment with rigid bars and compressed sealant.

**2.10 MISCELLANEOUS FASTENERS AND ANCHORS**

- A. All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1-1/4 inch (32 mm) and shall be approved for such use by the fastener manufacturer. All miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 inch (25 mm) and shall be approved for such use by the fastener manufacturer.

**2.11 RELATED MATERIALS**

- A. Wood Nailer - Treated wood nailers shall be installed at the perimeter of the entire roof and around such other roof projections and penetrations as specified on Project Drawings. Thickness of nailers must match the insulation thickness to achieve a smooth transition. Wood nailers shall be treated for fire and rot resistance (wolmanized or osmose treated) and be #2 quality or better lumber. Creosote or asphalt-treated wood is not acceptable. Wood nailers shall conform to Factory Mutual Loss Prevention Data Sheet 1-49. All wood shall have a maximum moisture content of 19 percent by weight on a dry-weight basis.
- B. Plywood - When bonding directly to plywood, a minimum 1/2 inch (12 mm) CDX (C side out), smooth-surfaced exterior grade plywood with exterior grade glue shall be used. Rough-surfaced plywood or high fastener heads will require the use of Sarnafelt behind the flashing membrane. Plywood shall have a maximum moisture content of 19 percent by weight on a dry weight basis.

**2.12 ROOF NUMBERS**

- A. Provide roof numbers to all buildings. Roof numbers shall be a minimum of 6'-3" high and 14" to 16" wide. Numbers shall be cut from roof membrane and adhered using the system approved by the roofing manufacturer. All roof numbers shall be black. Submit roof numbers and obtain approval from Project Manager prior to application. See plans for exact building number. Use "Administration" for the administration building and numbers or letters, in accordance with the building numbering system for the school.

**PART 3 - EXECUTION**

**3.01 PRE-CONSTRUCTION CONFERENCE**

- A. The Applicator, Owner's Representative/Designer and Manufacturer(s) shall attend a pre-construction conference.

The meeting shall discuss all aspects of the project including but not limited to:

1. Safety
2. Set up
3. Construction schedule
4. Contract conditions
5. Coordination of the work

**3.02 SUBSTRATE CONDITION**

- A. Applicator shall be responsible for acceptance or provision of proper substrate to receive new roofing materials.

Applicator shall verify that the work done under related sections meets the following conditions:

1. Roof drains and scuppers have been reconditioned or replaced and installed properly.
2. Roof curbs, nailers, equipment supports, vents and other roof penetrations are properly secured and prepared to receive new roofing materials.
3. All surfaces are smooth and free of dirt, debris and incompatible materials.
4. All roof surfaces shall be free of water, ice and snow.

### 3.03 SUBSTRATE PREPARATION

- A. The roof deck and existing roof construction must be structurally sound to provide support for the new roof system. The Applicator shall load materials on the rooftop in such a manner as to eliminate risk of deck overload due to concentrated weight. The Owner's Representative shall ensure that the roof deck is secured to the structural framing according to local building code and in such a manner as to resist all anticipated wind loads in that location.

### 3.04 SUBSTRATE INSPECTION

- A. A dry, clean and smooth substrate shall be prepared to receive the Sarnafil Adhered roof system.
- B. The Applicator shall inspect the substrate for defects such as excessive surface roughness, contamination, structural inadequacy, or any other condition that will adversely affect the quality of work.
- C. The substrate shall be clean, smooth, dry, free of flaws, sharp edges, loose and foreign material, oil and grease. Roofing shall not start until all defects have been corrected.
- D. All roof surfaces shall be free of water, ice and snow.
- E. Sarnafil shall be applied over compatible and accepted substrates only.

### 3.05 VAPOR BARRIER/AIR BARRIER INSTALLATION

- A. Sarnavap Self-Adhered
1. Primer Application - The substrate must be clean, dry and free of dust, grease or other contaminants. Shake well before using. Apply to clean and dry surfaces with a paint brush, roller or sprayer. Application rates will vary depending on substrate. Sarnavap Self-Adhered vapor barrier must be installed on the same day as the primer application. Acceptable substrates for primer application include wood, concrete, lightweight concrete, gypsum boards and decks. Drying time is typically 30 minutes to 3 hours.

Spraying equipment recommendations - Spray tip size: between 20 and 25 mils

at 1300 psi continuous.

To Install:

- a. Apply primer to prepared substrate.
- b. Allow primer to dry completely.
- c. Install Sarnavap Self-Adhered vapor barrier.

Notes:

- a) Do not install when it is raining, snowing, or on wet/humid surfaces.
- b) Install Sarnavap Self-Adhered Primer at temperatures 32 degree F (0 degree C) and above. Average coverage rate is 0.25 to 1.22 gallons per square (0.1 to 0.5 L per m<sup>2</sup>).
- c) Install Sarnavap Self-Adhered Primer WB at temperatures 41 degree F (5 degree C) and above. Average coverage rate is 0.25 to 0.75 gallon per square (0.1 to 0.3 L per m<sup>2</sup>). KEEP FROM FREEZING.
- d) Do not use Sarnavap Self-Adhered Primer WB to seal Sarnavap Self-Adhered vapor barrier membrane joints.
- e) Sarnavap Self-Adhered Primer WB is not suitable for plastic surfaces.
- f) Do not use Sarnavap Self-Adhered Primer WB on asphaltic boards.

B. Membrane Application over Concrete Deck (Reroofing with Removal of Existing Roofing):

Install Sarnavap Self-Adhered over a clean and dry substrate. In concrete applications allow concrete to cure for at least 7 days. Do not install when it is raining, snowing, or on wet/humid surfaces. Install in temperatures 32 degree F (0 degree C) and above. The use of a primer is required on the following substrates: wood, concrete, lightweight concrete, gypsum boards and decks. On metal decks use a metal plate (6 x 42 inches - 15 x 106 cm) to support the membrane end lap between metal flutes ensuring a complete end lap seal.

- a. Begin application at the bottom of the slope. Unroll Sarnavap Self-Adhered onto the substrate without adhering for alignment. Overlap each preceding sheet by 3 inches (75 mm) lengthwise following the reference line and by 6 inches (150 mm) at each end. Stagger end laps by at least 12 inches (300 mm). Do not immediately remove the silicone release sheet.
- b. Once aligned, peel back a portion of the silicone release sheet and press the membrane onto the substrate for initial adherence. Hold Sarnavap Self-Adhered tight and peel back the release sheet by pulling diagonally.
- c. Use a 75 lb. (34 kg) roller to press Sarnavap Self-Adhered down into the substrate including the laps. Finish by aligning the edge of the roller with the lower end of the side laps and rolling up the membrane. Do not cut the membrane to remove air bubbles trapped under the laps. Squeeze out air bubbles by pushing the roller to the edge of the laps.

3.06 WOOD NAILER INSTALLATION

- A. Install continuous wood nailers at the perimeter of the entire roof and around roof

projections and penetrations as shown on the Detail Drawings.

Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons per lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches (0.3 m) on center or 16 inches (0.4 m) on center if necessary to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of each end. Two fasteners shall be installed at ends of nailer lengths. Nailer attachment shall also meet the requirements of the current Factory Mutual Loss Prevention Data Sheet 1-49.

- B. Thickness shall be as required to match substrate or insulation height to allow a smooth transition.
- C. Any existing nailer woodwork which is to remain shall be firmly anchored in place to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons per lineal meter) in any direction and shall be free of rot, excess moisture or deterioration. Only woodwork shown to be reused in Detail Drawings shall be left in place. All other nailer woodwork shall be removed.
- D. Stainless steel, corrosion resistant, fasteners are required when mechanically attaching any Sika Sarnafil product to wood nailers and wood products treated with ACQ (Alkaline copper Quaternary). When ACQ treated wood is used on steel roof decks or with metal edge detailing, a separation layer must be placed between the metal and ACQ treated wood.

### 3.07 INSTALLATION OF SARNAFIL MEMBRANE

The surface of the insulation or substrate shall be inspected prior to installation of the Sarnafil roof membrane. The substrate shall be clean, dry, free from debris and smooth with no surface roughness or contamination. Broken, delaminated, wet or damaged insulation boards shall be removed and replaced.

#### A. Sarnacol 2170 / 2170 VC Adhesive:

1. Over the properly installed and prepared substrate surface, adhesive shall be applied using solvent-resistant 3/4 inch (19 mm) nap paint rollers. The adhesive shall be applied to the substrate at a rate according to Sika Sarnafil requirements. The adhesive shall be applied in smooth, even coating with no gaps, globs, puddles or similar inconsistencies. Only an area which can be completely covered in the same day's operations shall be coated with adhesive. The first layer of adhesive shall be allowed to dry completely prior to installing the membrane.
2. When the adhesive on the substrate is dry, the Sarnafil roof membrane is unrolled. Adjacent sheets shall be overlapped 3 inches (75 mm). Once in place, one-half of the sheet's length shall be turned back and the underside shall be coated with adhesive at a rate of 1/2 gallon per 100 square feet (0.2 liters per m<sup>2</sup>). When the membrane adhesive has dried slightly to produce strings when touched with a dry finger, the coated membrane shall be rolled onto the previously-coated substrate being careful to avoid wrinkles. Do not allow adhesive on the underside of the Sarnafil membrane to dry completely. The amount of membrane that can be coated with adhesive before rolling into substrate will be determined by ambient temperature, humidity and crew. The bonded sheet shall be pressed firmly in place with a water-filled, foam-covered lawn roller by frequent rolling in two directions. The remaining un-bonded half of the sheet shall be folded back and the procedure repeated.

Notes: The Applicator shall count the amount of pails of adhesive used per area per day to verify conformance to the specified adhesive rate. No adhesive shall be applied in seam areas. All membrane shall be applied in the same manner.

**3.08 HOT-AIR WELDING OF SEAM OVERLAPS**

**A. General –**

1. All seams shall be hot-air welded. Seam overlaps should be 3 inches (76 mm) wide when automatic machine-welding and 4 inches (100 mm) wide when hand-welding, except for certain details.
2. Welding equipment shall be provided by or approved by Sika Sarnafil. All mechanics intending to use the equipment shall have successfully completed a training course provided by a Sika Sarnafil Technical Service Representative prior to welding.
3. All membrane to be welded shall be clean and dry.

**B. Hand-Welding**

Hand-welded seams shall be completed in two stages. Hot-air welding equipment shall be allowed to warm up for at least one minute prior to welding.

1. The back edge of the seam shall be welded with a narrow but continuous weld to prevent loss of hot air during the final welding.
2. The nozzle shall be inserted into the seam at a 45 degree angle to the edge of the membrane. Once the proper welding temperature has been reached and the membrane begins to "flow", the hand roller is positioned perpendicular to the nozzle and rolled lightly. For straight seams, the 1-1/2 inch (40 mm) wide nozzle is recommended for use. For corners and compound connections, the 3/4 inch (20 mm) wide nozzle shall be used.

**C. Machine Welding**

1. Machine welded seams are achieved by the use of Sika Sarnafil's automatic welding equipment. When using this equipment, Sika Sarnafil's instructions shall be followed and local codes for electric supply, grounding and over current protection observed. Dedicated circuit house power or a dedicated portable generator is recommended. No other equipment shall be operated simultaneously off the generator.
2. Metal tracks may be used over the deck membrane and under the machine welder to minimize or eliminate wrinkles.

**D. Quality Control of Welded Seams**

1. The Applicator shall check all welded seams for continuity using a rounded screwdriver. Visible evidence that welding is proceeding correctly is smoke during the welding operation, shiny membrane surfaces, and an uninterrupted flow of dark gray material from the underside of the top membrane. On-site evaluation of welded seams shall be made daily by the Applicator at locations as directed by the Owner's Representative or Sika Sarnafil's representative. One inch (25 mm) wide cross-section samples of welded seams shall be taken at

least three times a day. Correct welds display failure from shearing of the membrane prior to separation of the weld. Each test cut shall be patched by the Applicator at no extra cost to the Owner.

### 3.09 MEMBRANE FLASHINGS

All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and Sika Sarnafil. Approval shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing, the affected area shall be removed and replaced at the Applicator's expense. Flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces. Use caution to ensure adhesive fumes are not drawn into the building.

#### A. Sarnacol Adhesive for Membrane Flashings

1. Over the properly installed and prepared flashing substrate, Sarnacol adhesive shall be applied according to instructions found on the Product Data Sheet. The Sarnacol adhesive shall be applied in smooth, even coats with no gaps, globs or similar inconsistencies. Only an area which can be completely covered in the same day's operations shall be flashed. The bonded sheet shall be pressed firmly in place with a hand roller.
2. No adhesive shall be applied in seam areas that are to be welded. All panels of membrane shall be applied in the same manner, overlapping the edges of the panels as required by welding techniques.
3. Install Sarnastop/Sarnabar/Sarnacord according to the Detail Drawings with approved fasteners into the structural deck at the base of parapets, walls and curbs. Sarnastop is required by Sika Sarnafil at the base of all tapered edge strips and at transitions, peaks, and valleys according to Sika Sarnafil's details.
4. Sika Sarnafil's requirements and recommendations and the specifications shall be followed. All material submittals shall have been accepted by Sika Sarnafil prior to installation.
5. All flashings shall extend a minimum of 8 inches (0.2 m) above roofing level unless otherwise accepted in writing by the Owner's Representative and Sika Sarnafil Technical Department.
6. All flashing membranes shall be consistently adhered to substrates. All interior and exterior corners and miters shall be cut and hot-air welded into place. No bitumen shall be in contact with the flashing membrane.
7. All flashing membranes shall be mechanically fastened along the counter-flashed top edge with Sarnastop at 6 to 8 inches (0.15 to 0.20 m) on center.
8. Sarnafil flashings shall be terminated according to Sika Sarnafil recommended details.
9. All flashings that exceed 30 inches (0.75 m) in height shall receive additional securement. Consult Sika Sarnafil Technical Department for securement methods.

### 3.10 METAL FLASHINGS

- A. Metal details, fabrication practices and installation methods shall conform to the applicable requirements of the following:
1. Factory Mutual Loss Prevention Data Sheet 1-49 (latest issue).
  2. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - latest issue.
  3. Metal, other than that provided by Sika Sarnafil, is not covered under the Sika Sarnafil warranty.
  4. Complete all metal work in conjunction with roofing and flashings so that a watertight condition exists daily.
  5. Metal shall be installed to provide adequate resistance to bending to allow for normal thermal expansion and contraction.
  6. Metal joints shall be watertight.
  7. Metal flashings shall be securely fastened into solid wood blocking. Fasteners shall penetrate the wood nailer a minimum of 1 inch (25 mm).
  8. Airtight and continuous metal hook strips are required behind metal fascias. Hook strips are to be fastened 12 inches (0.3 m) on center into the wood nailer or masonry wall.
  9. Counter flashings shall overlap base flashings at least 4 inches (100 mm).
  10. Hook strips shall extend past wood nailers over wall surfaces by 1-1/2 inch (38 mm) minimum and shall be securely sealed from air entry.

**3.11 SARNACLAD METAL BASE FLASHINGS/EDGE METAL**

All flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and Sika Sarnafil. Acceptance shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Applicator's expense.

- A. Sarnaclad metal flashings shall be formed and installed per the Detail Drawings.
1. All metal flashings shall be fastened into solid wood nailers with two rows of post galvanized flat head annular ring nails, 4 inches (100 mm) on center staggered. Fasteners shall penetrate the nailer a minimum of 1 inch (25 mm).
  2. Metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.
  3. Adjacent sheets of Sarnaclad shall be spaced 1/4 inch (6 mm) apart. The joint shall be covered with 2 inch (50 mm) wide aluminum tape. A 4 inch minimum (100 mm) wide strip of Sarnafil flashing membrane shall be hot-air welded over the joint. Exercise caution at perimeter of roof.

**3.12 EDGE METAL**

All flashings shall be installed concurrently with the roof membrane as the job progresses. No



temporary flashings shall be allowed without the prior written approval of the Owner's Representative and Sika Sarnafil. Acceptance shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Applicator's expense.

A. Edge Grip Extruded

1. Position the roof membrane over edge of roof and down outside face of wall covering wood nailer(s) completely. Allow 1/2 inch (13 mm) of excess membrane to extend down past the wood nailer. Hot-air weld all seams making sure there are no voids in welds.
2. Apply a 3/8 inch (10 mm) continuous bead of Sikaflex – 1a sealant to the clean bottom of heavy-duty extruded retainer. Install extruded retainer from right to left as seen from rooftop. Field cut sections as necessary.
3. Install retainer splice under intersecting sections of extruded retainer.
4. Fasten extruded retainer into side of nailer 12 inches (0.3 m) on center. Use fasteners provided with Edge Grip Extruded system; 1-1/2 inch (38 mm) hex head stainless steel fasteners with neoprene washers. Allow 1/8 inch (3 mm) gap between extruded retainer sections for thermal expansion [1/4 inch (6 mm) if temperature is below 40 degrees F (4 C)].
5. Fasteners shall provide a minimum 240 lbs. (109 kg) pull-out resistance; suitable for the substrates to which being installed.
6. Install concealed joint splice plates at intersecting sections of snap-on fascia cover joints.
7. Position snap-on fascia cover so that it's top engages the extruded retainer top. Rotate downward engaging bottoms of snap-on fascia cover and extruded retainer base plate. Allow 1/4 inch (6 mm) gap between snap-on fascia sections for thermal expansion. Field cut where necessary.

3.13 WALKWAY INSTALLATION

- A. Sarnatred Walkway - Roofing membrane to receive Sarnatred Walkway shall be clean and dry. Place chalk lines on deck sheet to indicate location of Walkway. Apply a continuous coat of Sarnacol 2170 or 2170 VC adhesive to the deck sheet and the back of Walkway in accordance with Sika Sarnafil's technical requirements and press Walkway into place with a water-filled, foam-covered lawn roller. Clean the deck membrane in areas to be welded. Hot-air weld the entire perimeter of the Walkway to the Sarnafil deck sheet. Check all welds with a rounded screwdriver. Re-weld any inconsistencies. Important: Check all existing deck membrane seams that are to be covered by Walkway with rounded screwdriver and reweld any inconsistencies before Walkway installation. Do not run Walkway over Sarnabars.

3.14 PERIMETER WARNING TAPE

Areas of membrane where tape is to be applied must be cleaned to a "like new" condition. Failure to properly clean the membrane will result in less than satisfactory adhesion. The membrane should be cleaned as follows:

- A. New membrane: Remove loose dirt and dust by wiping clean with water. For areas where dirt is embedded, scrub the application area with a commercial cleaner such as

Simple Green, 409 or other similar all purpose cleaner using a Scotch Brite scrubbing pad or similar product. Wash away residual cleaning material with clean water.

- B. Weathered membrane: For older membranes or areas where there is excessive dirt buildup, use the above cleaning procedure followed by cleaning with a natural fiber rag wet with MEK, and wipe away all residual cleaning solution and remaining dirt until membrane has a "like new" appearance.
- C. After surface is clean and dry, apply tape to surface taking care to avoid trapping air and creating blisters as tape is smoothed over with hand pressure. If a chalk line is used be sure to keep chalk dust clear of application area.
- D. Do not apply Perimeter Warning Tape to surfaces where the temperature is below 40 degrees Fahrenheit.
- E. Perimeter Warning Tape may be slippery when wet.

**3.15 TEMPORARY CUT-OFF**

- A. All flashings shall be installed concurrently with the roof membrane in order to maintain a watertight condition as the work progresses. All temporary waterstops shall be constructed to provide a 100 percent watertight seal. The stagger of the insulation joints shall be made even by installing partial panels of insulation. The new membrane shall be carried into the waterstop. Waterstop shall be sealed to the deck or substrate so that water will not be allowed to travel under the new or existing roofing. The edge of the membrane shall be sealed in a continuous heavy application of sealant as described in Section 2.10. When work resumes, the contaminated membrane shall be cut out. All sealant, contaminated membrane, insulation fillers, etc. shall be removed from the work area and properly disposed of off site. None of these materials shall be used in the new work.
- B. If inclement weather occurs while a temporary waterstop is in place, the Applicator shall provide the labor necessary to monitor the situation to maintain a watertight condition.
- C. If any water is allowed to enter under the newly-completed roofing, the affected area shall be removed and replaced at the Applicator's expense.

**3.16 COMPLETION**

- A. Prior to demobilization from the site, the work shall be reviewed by the Owner's Representative and the Applicator. All defects noted and non-compliances with the Specifications or the recommendations of Sika Sarnafil shall be itemized in a punch list. These items must be corrected immediately by the Applicator to the satisfaction of the Owner's Representative and Sika Sarnafil prior to demobilization.
- B. All Warranties referenced in this Specification shall have been submitted and have been accepted at time of contract award.

**END OF SECTION**

**SECTION 07 62 00**

**SHEET METAL FLASHING AND TRIM**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: Flashings, counter flashings, seismic joint covers, vents, and copings as indicated on the Drawings and specified herein.
- B. Related Sections:
  - 1. Refer to Division 7 for Roofing Sections
  - 2. Joint Sealants; refer to Section 07 92 00.
  - 3. Painting and Coating; refer to Section 09 90 00.
  - 4. Mechanical Equipment

**1.02 REFERENCE STANDARDS**

- A. Preform sheet metal work, including fabrications, in strict accordance with Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) Architectural Sheet Metal Manual, and the Aluminum Association.

**1.03 SUBMITTALS**

- A. Submit copies of standard details covering all sheet metal conditions and fabrications to be necessary on the project. Where standard details do not exist, prepare and deliver such details to Architect.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Fabricate sheet metal items from sheet steel in accordance with ASTM A653, galvanized in accordance with ASTM A653, G90. Galvanizing on exposed surfaces not receiving paint shall receive an appearance grade finish.
- B. Unless shown otherwise on Drawings, provide steel sheet metal of at least 22 gauge steel.
- C. Where sheet aluminum is shown on Drawings, provide 0.032-inch thickness (20 gauge) and in accordance with ASTM B209, for 3003-H14, in color finish as selected by Architect.
- D. Extruded Aluminum: Manufacturer's standard extrusions of sizes and profiles indicated, and in accordance with ASTM B221 for 6063-T52 alloy and temper, AA-C22A41 clear anodized finish; 0.080-inch minimum thickness for primary legs of extrusions that are anodized.

- E. Stainless Steel: AISI Type 302/304, complying with ASTM A167, with No. 2D soft annealed finish, except where harder temper required for forming or performance; 0.0187-inch (.05 mm) thick, except as otherwise indicated.

**2.02 ACCESSORIES**

- A. Fasteners and Clips: Provide as required and appropriate for the materials being fastened. Where fasteners or clips may be exposed to outside weather conditions, provide stainless steel type.
  - 1. Provide fasteners such as bolts, screws and nails hot-dip galvanized as specified in accordance with ASTM A153.
- B. Where rivets will be used, provide malleable iron type with rust-inhibitive coating.
- C. If drive pins are incorporated into work, provide cadmium plated with neoprene facing, at least one-inch long, with neoprene washers.
- D. Solder: For use with steel or copper, provide 50 - 50 tin/lead solder (ASTM B32) with rosin flux.
- E. Solder: For use with stainless steel, provide 60 - 40 tin/lead solder (ASTM B32) with acid-chloride type flux, except use rosin flux over tinned surfaces.
- F. Bituminous Coating: Solvent-type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.
- G. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.
- H. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07 92 00 Joint Sealants.
- I. Epoxy Seam Sealer: Two part noncorrosive metal seam cementing compound, recommended by metal manufacturer for exterior/interior non-moving joints including riveted joints.
- J. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-resistant seaming and adhesive application of flashing sheet metal.
- K. Paper Slip Sheet: 5 lbs. rosin-sized building paper.
- L. Polyethylene Underlayment: Minimum 6-mil carbonated polyethylene film resistant to decay when tested in accordance with ASTM E154.
- M. Reglets: Metal or plastic units of type and profile indicated, compatible with flashing indicated, noncorrosive.
- N. Conductor-Head Guards: 20 gage bronze or nonmagnetic stainless steel mesh or fabricated units, with selvedge edges and noncorrosive fasteners. Select materials for compatibility with gutters and downspouts.
- O. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed-cell material recommended by elastic flashing manufacturer as filler under flashing loops to ensure movement with minimum stress on flashing sheet.

## 2.03 FABRICATION

- A. General Metal Fabrication: Shop fabricate work to greatest extent possible. Comply with details shown and with applicable requirements of SMACNA "Architectural Sheet Metal Manual" and other recognized industry practices. Fabricate for waterproof and weather-resistant performance with expansion provisions for running work, sufficient to permanently prevent leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material manufacturer instructions and recommendations for forming material. Form exposed sheet metal work without excessive oil-canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.
- B. Seams: Fabricate non-moving seams in sheet metal with flat-lock seams. For metal other than aluminum, in edges to be seamed, form seams and solder. Form aluminum seams with epoxy seam sealer; rivet joints for additional strength where required.
- C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be used or would not be sufficiently weather/waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
- D. Sealant Joints: Where movable, non-expansion type joints are indicated or required for proper performance of work, form metal to provide for proper installation of elastomeric sealant, in compliance with SMACNA standards.
- E. Separations: Provide for separation of metal from incompatible metal or corrosive substrates by coating concealed surfaces at locations of contact, with bituminous coating or other permanent separation as recommended by manufacturer/fabricator.
- F. Aluminum Extrusion Units: Fabricate extruded aluminum running units with formed for extruded aluminum joint covers. Fabricate mitered and welded corner units.

## 2.04 PREFABRICATED COPINGS AND FLASHINGS

- A. Provide factory prefabricated 0.050" aluminum continuous snap-on type copings with concealed mounting plate at joints. Copings shall be maximum 10' lengths. Mounting plate shall be extended 5 inches minimum beyond space between coping lengths. Secure cover plate according to manufacturers' recommendations. Provide copings manufactured by W.P. Hickman, or others, as approved by Architect. Provide flashing manufactured by Fry Reglet or other as approved by Architect.
  - 1. Pre-finish coping in Kynar 500 coating of custom color as selected by Architect.
  - 2. Copings shall be Factory Mutual Class I-90 certified. Provide certification to Architect.
  - 3. Arched copings shall be factory pre-fabricated true-arch copings, CNC machine cut heli-arc welded and finish ground prior to Kynar 500 finish. Segmented copings shall not be accepted. Arched coping sections shall be fabricated from 0.063" aluminum and not exceed 5' in length."

## PART 3 – EXECUTION

**3.01 PREPARATION**

- A. Inspect substrate conditions prior to installation of sheet metal items. Conditions which could be detrimental to correct and proper installation of sheet metal assemblies are to be called to the attention of the Owner for their disposition prior to sheet metal work being installed.
- B. Coordinate fabrication and installation of sheet metal items with work of others such as roofing, curtainwall and windows, sealants, mechanical and electrical.

**3.02 INSTALLATION**

- A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations and with SMACNA "Architectural Sheet Metal Manual." Anchor units of work securely in place by methods indicated, providing for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weatherproof.
- B. Underlayment: Where stainless steel or aluminum is to be installed directly on cementitious or wood substrates, install a slip sheet of red rosin paper and a course of polyethylene underlayment.
- C. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof performance.
- D. Install reglets to receive counterflashing in manner and by methods indicated. Where shown in concrete, furnish reglets to trades of concrete work for installation as work of Division 3 sections. Where shown in masonry, furnish reglets to trades of masonry work, for installation as work of Division 4 sections.
- E. Install counterflashings in reglets, either by snap-in seal arrangement or by welding in-place for anchorage and filling reglet with mastic or elastomeric sealant, as indicated in depending on degree of sealant exposure.
- F. Install elastic flashing in accordance with manufacture's recommendations. Where required, provide for movement at joints by forming loops or bellows in width of flashing. Locate cover or filler strips at joints to facilitate complete drainage of water for flashing. Seam adjacent flashing sheets with adhesive, seal and anchor edges in accordance with manufacturer's recommendations.
- G. Nail flanges of expansion joint units to curb nailers, at maximum spacing of 6 inches o.c. Fabricate seams at joints between units with minimum 3 inch overlap, to form a continuous, waterproof system.
- H. Conductor Head Guards: Install "bee-hive type" strainer-guard at conductor heads, removable for cleaning downspouts.
- I. Flash around exterior openings in the building where other waterproofing methods are insufficient.

**3.03 JOINTS**

- A. Typically, provide flat locked joints with sealant between metal surfaces, unless shown otherwise. Where standing seams are required, provide with folded corners.

- B. Provide minimum of 1 inch laps.
- C. Where concealed joints are possible, provide flat locked joints with 3 inch reinforcing behind, set in full bed of sealant
- D. Do not leave sheet metal joint unsealed. See sealant section of these specifications.

**3.04 INSPECTION**

- A. Immediately following installation of sheet metal work, touch-up areas where primer has been removed during installation operations and where soldering has occurred.
- B. Where architectural coatings are provided, touch-up marred or abraded finishes with compatible coating which can be expected to provide the same serviceability as factory applied coatings.

**3.05 CLEANING**

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.

**3.06 PROTECTION**

- A. Advise Contractor of required procedures for surveillance and protection of flashings and sheet metal work during construction to ensure that work will be without damage or deterioration other than natural weathering at time of Substantial Completion.

**END OF SECTION**

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SECTION 07 92 00

**JOINT SEALANTS**

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section includes: Sealants and backing, primers, and bond-breakers as indicated on the Drawings and specified herein. Work will include, but is not limited to the following locations:

1. Joints between metal and cementitious building elements
2. Joints between cementitious elements
3. Expansion and control joints
4. Cross joints in copings and projecting work
5. Sills, jambs and heads of windows, doors, louvers and similar openings where they abut dissimilar materials.
6. Horizontal joints
7. Hidden joints expected to undergo minimal movement.
8. Sealing of penetrations thru fire rated assemblies.

- B. Related Work:

1. Glass and glazing and appurtenant sealant systems
2. Hollow metal door and window frames
3. Concrete flatwork
4. Roofing and sheet metal

1.02 REFERENCE STANDARDS

- A. Provide an installation in strict compliance with Title 24 requirements.

1.03 SUBMITTALS

- A. Submit manufacturer's printed literature and installation instructions on specified materials for review.
- B. Submit manufacturer's standard colors of materials for selection.
- C. Submit standard size sample of back-up material, primer and bond-breaker proposed for each system.

1.04 QUALITY ASSURANCE

- A. Proper caulking and proper installation of sealants requires that installers be thoroughly trained and experienced in the necessary skills and thoroughly familiar with the specified requirements.
- B. For caulking and installation of sealants throughout project, use only personnel who have been specifically trained in such procedures and who are completely familiar with the joint details shown or required, and the installation requirements called for in these specifications.
- C. Coordinate this work with work of other sections to ensure proper installations.
- D. Provide written certification that materials in contact with the sealants and appurtenant

components, such as gaskets, spacers, setting blocks, concrete curing compounds, aluminum finishes, etc., are compatible with the sealants after 21-days exposure to ultra violet 2000 - 4000 (micro-watt radiation).

- E. Provide adhesion test data to production samples of metal and glass/spandrels, tested in accordance with ASTM C794.

**1.05 GUARANTEES AND WARRANTIES**

- A. Provide two year guarantee against defects in materials and workmanship of materials and installation. Include replacement or repairs as may be required by Owner.

**PART 2 - PRODUCTS**

**2.01 SEALANTS**

- A. Horizontal Non-Traffic-Bearing Surfaces: Provide acrylic or terpolymer acrylic base, chemical curing, self-leveling type sealants, non-sagging, uniform, homogeneous and free from lumps, capable of being continuously immersed in water, withstand movement up to 12.5 percent of joint width, and satisfactorily gunnable at 70 degrees F., non-staining and non-bleeding, in colors to be selected by Architect.
  - 1. Preferred product is Mono 555 manufactured by Tremco, and one part Acrylic Sealant manufactured by DAP.
- B. Horizontal Traffic-Bearing Joints: Provide multi-component, self-leveling polyurethane joint sealant meeting ASTM C920, capable of movement to plus or minus 25 percent.
  - 1. Preferred product is THC-900 as manufactured by Tremco, and Vulkem 245 as manufactured by Tremco.
- C. Non-moving Interior or Exterior Joints: Provide two-part noncorrosive epoxy metal seam cementing compound, recommended by metal manufacturer, at 2 feet each side of seam.
- D. Vertical Surfaces: Provide three-part epoxidized polyurethane terpolymer sealant, non-sagging, gun grade, meeting ASTM C920, Type M, Grade NS, Class 25, use NT, M, A and O.
  - 1. Preferred product is Dymeric as manufactured by Tremco, and Vulkem 227 as manufactured by Tremco.
- E. Hidden, Paintable, or Low Movement Interior Joints: Provide materials in compliance with Federal Specifications A-A-272, Type I, Butyl type, able to withstand joint movement to maximum five percent.
  - 1. Preferred product is Butyl as manufactured by Tremco.
- F. Acoustical Sealants: Where required, provide acoustical sealants manufactured by Tremco or other approved; highly resilient, permanently flexible, and shrink and stain resistant.
- G. Fire Rated Sealants: Where scheduled and as required to maintain fire ratings of penetrations through fire rated assemblies. Provide UL listed products, passing ASTM E84 and E814. Provide "Fyre-Shield" by Tremco; "Semco PR-855" by PRC-DeSoto International a PPG Industries Co., or equal.

## H. Acceptable Product Manufacturer's:

1. TREMCO
2. GE Silicones
3. Dow Corning
4. BASF

## 2.02 ACCESSORIES

- A. Primers: Where necessary, provide primers compatible with not only sealant, but substrate and finish on which to be applied. Primers are to be non-staining type and must have been specifically tested for durability on the surfaces to be sealed, and are specifically recommended for this installation by their manufacturer.
- B. Back-up Materials: Provide one of the following, as recommended for the particular joint construction and sealant type:
1. Close-cell resilient urethane or polyvinyl-chloride foam
  2. Close-cell polyethylene foam
  3. Closed-cell sponge of vinyl or rubber
  4. Polychloroprene tubes or beads
  5. Polyisobutylene extrusions
  6. Oil-less dry jute
  7. Preformed support strips for tile control joints and expansion joints, polyisobutylene or poly- chloroprene rubber.
- C. Bond Breaker: Use only one of the following as best suited for the specific application and as recommended by the manufacturer of the sealant to be used.
1. Polyethylene tape, pressure-sensitive adhesive, with the adhesive required only to hold tape to the construction materials shown.
  2. Aluminum foil conforming to Federal Specifications QQ-A-1876.
  3. Wax paper.
- D. Masking Tape: For masking around joints, provide masking tape conforming to ASTM D6123.

**PART 3 - EXECUTION**

## 3.01 PREPARATION

- A. Joints and surfaces which are to be caulked or sealed shall be clean, dry and free of dust, loose mortar and other foreign materials.
- B. Clean ferrous metals of rust, mill scale and coatings by wire brush, grinding or sandblasting. Remove oil, grease and/or temporary protective coatings with high performance cleaners, as approved by sealant manufacturer.
- C. Joint dimensions for sealant should be reviewed and installed in accordance with sealant manufacturer's printed instructions. In no case should the sealant application be less than 1/4-inch wide, and 1/4-inch deep, except in specific metal-to metal curtain wall applications, and then as recommended by the sealant manufacturer.
- D. Concrete or masonry joint surfaces shall be wire brushed, then air-blown clean. The joint

interface must be free of form release agents of chemical retarders which may interfere with sealant adhesion and performance.

- E. Sealants shall not be applied to masonry joints where a water repellent or masonry preservative has been applied prior to caulking. When called for, waterproofing treatments should be applied after caulking.
- F. Do not caulk joints until they are in compliance with requirements of the approved manufacturer of the materials, the details as shown on the Drawings, and the specific requirements of other sections of the specification.

### **3.02 INSTALLATION**

- A. Apply and install sealant where shown on drawings, or if not shown on Drawings, apply and install sealant materials and products which could lead to infiltration of moisture, water, light, or air blown particles into building; and within building where changes of materials in same or different planes could allow moisture, water, air, or light to penetrate.
- B. Provide acoustical sealants on, around and between building construction members such as framing, panel boxes, cutouts for penetrations of other materials or equipment, etc., where walls and floors are designated to be sound attenuated or acoustically treated.
- C. Install joint backing with a blunt instrument so as not puncture the surface skin. Size of joint backing should be determined by taking the joint width and adding 25 percent to assure proper compression of backer rod.
- D. Apply sealant with a caulking gun, using proper nozzles. Use sufficient pressure to properly fill the joints with sealant to the back-up materials.
- E. After joints have been completely filled, they shall be neatly tooled to eliminate air pockets or voids, and to provide a smooth, neat appearing finish in intimate contact with interfaces. After tooling, surface of sealant shall be free of ridges, wrinkles, sags, air pockets and embedded impurities.
- F. It is recommended that a 40-degree F., minimum application temperature be maintained for joint sealant installations. When it is necessary, that applications be made at lower temperatures, take precautions to assure that joints have clean, dry, and frost-free surfaces. Submit a letter by sealant manufacturer's representative, verifying that surfaces are acceptable.

### **END OF SECTION**

SECTION 08 11 13

HOLLOW METAL DOORS AND FRAMES

PART 1 – GENERAL

1.01 SUMMARY

- A. Section includes: Standard steel door frames and other light frames shown on Drawings, with fastening devices.
- B. Related Sections:
  - 1. Section 06 10 00 – Rough Framing.
  - 2. Section 07 92 00 – Joint Sealants.
  - 3. Section 08 71 00 – Door Hardware.
  - 4. Section 09 90 00 – Painting and Coating.

1.02 REFERENCE STANDARDS

- A. Follow Hollow Metal Manufactures Association (HMMA) and Steel Door Institute (SDI) recommendations for materials, construction and installation procedures.
- B. Comply with 2019 California Building Code, Title 24, Part 2, Section 703.
- C. Comply with NFPA #80

1.03 SUBMITTALS

- A. Shop drawings shall be submitted for approval in accordance with section 01 33 00 – Submittal Procedures, covering each type of door frame condition.
- B. Schedule: Submit a schedule of frames using same reference numbers for details and openings as those on the Contract Drawings.
- C. Templates will be furnished by hardware supplier for preparing shop drawings and for preparing and reinforcing hollow metal work to receive hardware.
- D. Submit initial shop drawings, indicating attachment and fastening devices, reinforcement, gauges, paint type and certification that frames meet or exceed quality standards of SDI. Final submittal shall be made no later than 60 days after initial submittal.

1.04 QUALITY ASSURANCE

- A. Provide doors frames and accessories manufactured by a certified SDI member company. Company must be a certified member in good standing of these organizations as of the past 5 years.
- B. Steel Frame Standard: Comply with SDI 100, unless more stringent requirements are indicated.
- C. Mock-Up: Provide one fully painted, fully glazed combination window and door opening (all door hardware need not be installed) as soon as practicable after delivery of frames to the site. Approved opening will serve as a standard of quality for the balance of the hollow metal frames on the project.

**D. Testing:**

1. Contractor shall allow in his bid for replacement of four doors, which will be selected at random by the Architect for dismantling and inspection of internal construction. Contractor shall provide labor and tools to cut open and dismantle doors under Architect's direction. Owner reserves the right to dismantle additional doors, at Owner's expense, as deemed necessary by Owner.
2. Owner's testing lab will test gauges of selected door frame parts, interior and exterior welding, galvanizing, and shop priming, for conformance with SDI recommended specifications and additional requirements of this Section. Retesting, if necessary, shall be done in accordance with requirements of Division 01 – General Requirements of these specifications.

**E. Replacement of Product and Manufacturer:**

1. Failure of any hollow metal frame to meet specified standards shall be grounds to reject entire shipment of hollow metal frames, including those already installed. Items shall be replaced at Contractor's expense, including four additional doors for dismantling.
2. Failure of any hollow metal frame to meet specified standards shall be grounds to reject the manufacturer of the frames. Upon rejection of manufacturer, Contractor shall propose an alternate manufacturer acceptable to the Owner and Architect. No extensions of time or additions to the contract will be allowed due to an Owner mandated substitution of hollow metal manufacturer.

**1.05 DELIVERY, STORAGE AND HANDLING**

- A. Provide packaging, containers, separators, banding, spreaders, paper wrapping, etc., as required to completely protect units during transportation and storage.
- B. Inspect door frames on delivery for damage, and notify shipper and supplier if damage is found. Minor damages may be repaired, provided refinished items match new work and are acceptable to Architect. Remove and replace damaged items that cannot be repaired as directed.
- C. Protection: Store frames at building site under cover. Place units on minimum 4 inch (100 mm) high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. Available Manufacturers: Subject to compliance with requirements, manufactures offering products that may be incorporated into the Work included, but are not limited to the following for Steel Door Frames:
  1. Door Components, Inc.
  2. Ceco Door Products, a United Dominion Company
  3. Republic Doors and Frames
  4. Steelcraft, a Division of Ingersoll-Rand.

**2.02 MATERIALS**

- A. Hot-Rolled Steel Sheets: ASTM A1011, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
- B. Cold-Rolled Steel Sheets: ASTM A1008, Commercial Steel (CS), or ASTM A1008, Drawing Steel (DS), Type B; stretcher-leveled standard of flatness.
- C. Hot-Dipped Zinc-Coated Steel Sheets: ASTM A653, Commercial Steel (CS), Type B; with an A40 (ZF120) zinc-iron-alloy (galvannealed) coating, stretcher-leveled standard of flatness.
- D. Electrolytic Zinc-Coated Steel Sheets: ASTM A879, Commercial Steel (CS), Class B coating; mill phosphatized; suitable for unexposed applications; stretcher-leveled standard of flatness where used for face sheets.

### 2.03 FRAMES

- A. Provide fully welded frames for doors, 16 gauge, prime painted steel, designed for butted, wrap-around, and keyed-in construction conditions, fire-rated where required. Frames for exterior locations shall be galvanized with A60 (absolute) coating.
  - 1. All door frames shall have head section continuous welded to jamb section at the hinge side of the frame.
  - 2. Exterior frames shall have all horizontal sections including mullions continuously welded to vertical sections on the exterior (from the room side of the fixed stop outward) portion of the frame. Intent is to seal driven water out of joints. Caulking will not be considered at these locations.
  - 3. Maximum allowable gap at stop miters shall be 1/16-inch.
  - 4. All welds shall be ground smooth, and "Bondo" applied and sanded as necessary for a smooth, flush, quality appearance of the frame faces.
  - 5. All frames shall be sized to provide for a minimum tolerance of 1/4-inch larger than wall or partition assembly unit is to be installed in.
  - 6. Provide minimum three (3) wall anchors on jambs and two (2) on head.
- B. Provide knock-down frames only where specifically noted, or where absolutely required for renovation / modernization work at existing wood stud openings.
  - 1. Weld pipe spacers or other type of spacers, per manufacturer's standard design in back of frame to fit tightly against wood studs.
  - 2. Face weld, grind smooth and re-prime with rust-inhibitive primer in field all exposed frame face joints.
  - 3. Exposed joints at stucco and drywall to be sealed with caulk.

### 2.04 ACCESSORIES

- A. Include minimum three (3) 16 gauge jamb anchors for each side of frames, and as otherwise required by the Drawings.
- B. Provide minimum two (2) 14 gauge steel floor anchors per door frame, and as otherwise

required by the Drawings.

- C. Prepare and reinforce door frames for hardware as follows: 12 gauge for surface applied closers, 3/16-inch for hinges, 12 gauge for hold-open arms, 9 gauge for floor checking hinges, and 14 gauge for other reinforcement.
- D. Hardware Preparation: Prepare, reinforce, mortise, drill, and tap frames according to templates supplied by hardware supplier, reinforcing as standard with door and frame manufacturer except 3/16-inch steel behind butts and 12 gauge steel for mortised or surface-applied hardware. Conform to ANSI A115 Series as applicable to the hardware specified.
- E. Finish: Thoroughly clean metal surfaces and chemically treat for paint adhesion. Paint inaccessible surfaces before assembling. Sand exposed surfaces of hollow metal and accessories and make smooth with mineral filler as required. Apply a baked-on coat of manufacturer's standard rust-inhibitive primer, including concealed surfaces of door frames and anchors. (Note: painter will be required to apply a "satin" finish final paint coat.)

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. In general install door frames in accordance with SDI 100 Series.
- B. Install frames for doors plumb, rigid and in true alignment, and fastened so as to retain their position and clearance during construction of partitions and walls. Frames and doors shall be installed so the appropriate door undercut is maintained (plus or minus 1/8") for thresholds, door shoes, and sweeps.
- C. Ensure dimensional tolerance and stability of frames for proper installation and operation of hardware and doors.
- D. Coordinate frame and drip flashing installation where shown on Drawings.
- E. Touch up shop applied primer on frames following installation and just prior to finish painting.
- F. Following installation, provide protection of frames until frames are to be finish painted.

#### **3.02 HOLLOW METAL FRAME GROUTING**

- A. At all exterior hollow metal jambs, drypack/grout the bottom 6-inch space between the hollow metal and 6-inch concrete curb at the wall. The intent is to fill solid the void between the frame and concrete curb. Install drypack/grout before any finishes are applied to the studs.

**END OF SECTION**



**SECTION 08 31 13**

**ACCESS DOORS AND FRAMES**

**PART 1 - GENERAL**

**1.01 SECTION INCLUDES**

- A. Access door and frame units, fire-rated, in wall, and ceiling locations.
- B. Reference drawings for extent, location and size of each type of access door required.

**1.02 RELATED SECTIONS**

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to work of this section.
- B. Section 03 30 00 – Cast-In-Place Concrete: Openings in concrete.
- C. Division 9 – Finishes: Gypsum Board Ceilings.
- D. Section 09 90 00 – Paints and Coatings: Field paint finish.
- E. Division 22 – Plumbing: Plumbing components requiring access.
- F. Division 23 – Heating, Ventilating and Air Conditioning: Mechanical components requiring access.
- G. Division 26 – Electrical: Electrical components requiring access.

**1.03 REFERENCES**

- A. ITS (DIR) - Directory of Listed Products; Intertek Testing Services NA, Inc.; current edition.
- B. UL (FRD) - Fire Resistance Directory; Underwriters Laboratories Inc.; current edition.

**1.04 REGULATORY REQUIREMENTS**

- A. Comply with 2019 California Building Code

**1.05 SUBMITTALS**

- A. See Section 01 33 00 – Submittal Procedures, for administrative requirements.
- B. Product Data: Provide sizes, types, finishes, hardware, scheduled locations, and details of adjoining work.
- C. Shop Drawings: Indicate exact position of all access door units. Obtain specific locations and sizes for required access doors from trades requiring access to concealed equipment and indicate on submittal schedule. Submit shop drawings for fabrication and installation of customized access doors and frames, including details of each frame type, elevations of door design types, anchorage and accessory items.
- D. Samples: Submit two access units, 3x5 inch minimum size illustrating frame

configuration, anchors, panel face material, and factory primer color.

- E. Manufacturer's Installation Instructions: Indicate installation requirements and rough-in dimensions. Submit manufacturer's technical data and installation instructions for each type of access door assembly, including setting drawings, templates, instructions and directions for installation of anchorage devices. Including complete schedule, including types, general locations, sizes, wall and ceiling construction details, finishes, latching or locking provisions, and other data pertinent to installation.
- F. Size Variations: Obtain Architect's acceptance of manufacturer's standard size units which may vary slightly from sizes indicated.
- G. Project Record Documents: Record actual locations of all access units.

#### **1.06 REGULATORY REQUIREMENTS**

- A. Conform to applicable code for fire rated access doors.
  - 1. Provide access doors of fire rating equivalent to the fire rated assembly in which they are to be installed. Provide access door assembly with panel door, frame, hinge, and latch from manufacturer listed in UnderWriters Laboratories, Inc., "Building Materials Directory" for rating shown.
- B. Provide products listed and labeled by UL and/or ITS (Warnock Hersey) as suitable for the purpose specified and indicated. Provide UL label on each fire-rated access door.
- C. Provide certificate of compliance from authority having jurisdiction indicating approval of fire rated doors.

#### **1.07 PROJECT CONDITIONS**

- A. Coordinate the work with other work requiring access doors. Coordinate locations with other work, furnish inserts and anchoring devices which must be built into other work for installation of access doors. Coordinate delivery with other work to avoid delays.

### **PART 2 - PRODUCTS**

#### **2.01 MANUFACTURERS**

- A. Access Doors and Frames:
  - 1. Karp Associates, Inc.
  - 2. Milcor Inc: [www.milcorinc.com](http://www.milcorinc.com).
  - 3. J.L. Industries.

#### **2.02 ACCESS DOORS AND PANELS**

- A. All Units: Factory fabricated, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.

#### **2.03 FABRICATION AND MATERIALS**

- A. General: Furnish each access door assembly manufactured as an integral unit, complete with all parts and ready for installation.

- B. Steel Access Doors and Frames: Fabricate units of continuous welded steel construction, unless otherwise indicated. Grind welds smooth and flush adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of support shown.
- C. Frames: Fabricate from 16-gage steel.
  - 1. Fabricate frame with exposed flange nominal 1" wide around perimeter of frame for units installed in the following construction:
    - a. Exposed masonry.
    - b. Exposed concrete.
    - c. Drywall finish.
  - 2. For gypsum drywall or gypsum plaster, furnish perforated frames with drywall bead.
  - 3. For installation in masonry construction, furnish frames with adjustable metal masonry anchors.
  - 4. For full-bed plaster applications, furnish frames with galvanized expanded metal lath and exposed casing bead, welded to perimeter of frame.
- D. Flush Panel Doors: Fabricate from not less than 14-gage sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees. Finish with manufacturer's factory-applied prime paint.
  - 1. For fire-rated units, provide manufacturer's standard insulated flush panel/doors, with continuous piano hinge and self-closing mechanism.
- E. Recessed Panel Doors: Fabricate from not less than 18-gage sheet steel with face of panel formed to provide recess below surface of applied finish. Reinforce panel as required to prevent buckling. Finish with manufacturer's factory-applied prime paint.
  - 1. Furnish recessed panels for concealed installation in acoustic tile ceiling systems.
  - 2. Furnish recessed panels and frames with expanded metal lath for concealed installation in plaster.
- F. Locking Devices: Furnish flush, screwdriver-operated cam locks of number required to hold door in flush, smooth plane when closed.
  - 1. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

**PART 3 - EXECUTION****3.01 EXAMINATION**

- A. Verify that rough openings are correctly sized and located.

**3.02 INSTALLATION**

- A. Install units in accordance with manufacturer's instructions.
- B. Install frames plumb and level in openings. Secure rigidly in place.
- C. Position units to provide convenient access to the concealed work requiring access.
- D. Adjust hardware and panels after installation for proper operation.
- E. Remove and replace panels or frames which are warped, bowed or otherwise damaged.
- F. Paint to match adjacent finishes, unless otherwise noted in plans.

**END OF SECTION**

**SECTION 08 33 23  
OVERHEAD COILING DOORS**

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. Section Includes: Manual overhead rolling doors.
- B. Related Sections:
  - 1. 06 10 00 Rough Carpentry. Door opening jamb and head members
  - 2. 08 31 13 Access Doors and Frames. Access doors
  - 3. 09 90 00 Painting and Coating. Field painting

**1.2 SYSTEM DESCRIPTION**

- A. Design Requirements:
  - 1. Cycle Life: Standard construction for normal use of up to 20 cycles per day maximum, and an overall maximum of 50,000 operating cycles for the life of the door
  - 2. Safety: Chain operated doors shall be designed so that the door immediately stops upward or downward travel and is maintained in a stationary position when the hand chain is released by user.

**1.3 SUBMITTALS**

- A. Reference Section 01 33 00 Submittal Procedures; submit the following items:
  - 1. Product Data
  - 2. Shop Drawings
  - 3. Quality Assurance/Control Submittals:
    - a. Provide proof of manufacturer ISO 9001:2008 registration
    - b. Provide proof of manufacturer and installer qualifications - see 1.4 below
    - c. Provide manufacturer's installation instructions
  - 4. Closeout Submittals:
    - a. Operation and Maintenance Manual
    - b. Certificate stating that installed materials comply with this specification

**1.4 QUALITY ASSURANCE**

- A. Qualifications:
  - 1. Manufacturer Qualifications: ISO 9001:2008 registered and a minimum of five years' experience in producing doors of the type specified
  - 2. Installer Qualifications: Manufacturer's approval

**1.5 DELIVERY STORAGE AND HANDLING**

- A. Follow manufacturer's instructions

**1.6 WARRANTY**

- A. Standard Warranty: Two years from date of shipment against defects in material and workmanship.
- B. Maintenance: Submit for owner's consideration and acceptance of a maintenance service agreement for installed products.

**PART 2 PRODUCTS**

**2.1 MANUFACTURER**

- A. Manufacturer:
  - 1. Cookson, Model ESD10: 1901 South Litchfield Road, Goodyear, AZ 85338. Telephone: (800) 294-4358.
  - 2. Cornell
  - 3. Clopay Building Products

Substitutions: Not permitted

**2.2 MATERIALS**

- A. Curtain:
  - 1. Configuration: Standard curtain configuration
  - 2. Slats: Galvanized Steel: No. 5F, 20 gauge Grade 40 steel, ASTM A 653 galvanized steel zinc coating with Bottom Bar: Two 2x2x1/8 inch (50x50x3.2 mm) structural angles
  - 3. Finish: SpectraShield® Coating System (Color Selected by Architect):
    - a. ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, gray baked-on base coat and gray baked-on polyester finish coat
    - b. Zirconium pre-treatment followed by baked-on polyester powder coat, with color as selected by Architect from manufacturer's standard color range; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better
- B. Endlocks: Alternate slats each secured with two 1/4" (6.35 mm) rivets. Fabricate interlocking sections with high strength nylon. Provide windlocks as required to meet specified wind load.
  - 1. Nylon: Required up to 21'-5" width (DBG - Distance Between Guides)

## C. Bottom Bar

1. Configuration: Heavy Duty Bottom Bar: 6" x 2" x 3/8" aluminum tubular extrusion configured to withstand 350% more impact than standard bottom bar. (Doors up to 12' wide.)
2. Finish: Powder Coat (Color Selected by Architect): Zirconium pre-treatment followed by baked-on polyester powder coat, color as selected by Architect from manufacturer's standard color range; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363 pencil hardness: H or better

## D. Guides:

1. Fabrication: Minimum 3/16 inch (4.76 mm) structural steel angles. Provide windlock bars of same material when windlocks are required to meet specified wind load. Top of inner and outer guide angles to be flared outwards to form bellmouth for smooth entry of curtain into guides. Provide removable guide stoppers to prevent over travel of curtain and bottom bar.  
Top 16 1/2" (419.10 mm) of coil side guide angles to be removable for ease of curtain installation and as needed for future curtain service.
2. Configuration: Standard guide configuration
3. Finish: Corrosion Inhibitive: Zirconium treatment followed by a corrosion inhibitive baked-on zinc enriched gray polyester powder coat; minimum 2.5 mils (0.065 mm) cured film thickness

## E. Counterbalance Shaft Assembly:

1. Barrel: Steel pipe capable of supporting curtain load with maximum deflection of 0.03 inches per foot (2.5 mm per meter) of width
2. Spring Balance: Oil-tempered, heat-treated steel helical torsion spring assembly designed for proper balance of door to ensure that maximum effort to operate will not exceed 25 lbs (110 N). Provide wheel for applying and adjusting spring torque

## F. Brackets: Fabricate from minimum 3/16 inch (5 mm) steel plate with permanently lubricated ball or roller bearings at rotating support points to support counterbalance shaft assembly and form end closures

1. Finish: Corrosion Inhibitive: Zirconium treatment followed by a corrosion inhibitive baked-on zinc enriched gray polyester powder coat; minimum 2.5 mils (0.065mm) cured film thickness

## G. Hood: Minimum 24 gauge galvanized steel with reinforced top and bottom edges. Provide minimum 1/4 inch (6.35 mm) steel intermediate support brackets.

1. Finish: SpectraShield® Coating System (Color Selected by Architect):
  - a. ASTM A 653 galvanized base coating treated with dual process rinsing agents in preparation for chemical bonding, gray baked-on base coat and gray baked-on polyester finish coat
  - b. Zirconium pre-treatment followed by baked-on polyester powder coat, with color as selected by Architect from manufacturer's standard color

range; minimum 2.5 mils (0.065 mm) cured film thickness; ASTM D-3363  
pencil hardness: H or better

H. Weatherstripping:

1. Bottom Bar:
  - a. Manually Operated Doors: Replaceable, bulb-style, compressible EDPM gasket extending into guides
  - b. Motor Operated Doors: Sensing/weather edge within neoprene astragal extending full width of door bottom bar
2. Guides: Vinyl strip sealing against fascia side of curtain
3. Hood: Neoprene/rayon baffle to impede air flow above coil
4. Lintel Seal: Nylon brush seal fitted at door header to impede air flow

**2.3 OPERATION**

- A. Manual ControlGard Chain Hoist: Provide chain hoist operator with endless steel chain, chain pocket wheel and guard, geared reduction unit, and chain keeper secured to guide. Chain hoist to include integral brake mechanism that will immediately stop upward or downward travel and maintain the door in a stationary position when the hand chain is released by the user.

**2.4 ACCESSORIES**

- A. Locking: Padlockable slide bolt on coil side of bottom bar at each jamb extending into slots in guides.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Examine substrates upon which work will be installed and verify conditions are in accordance with approved shop drawings
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory substrates
- C. Commencement of work by installer is acceptance of substrate

**3.2 INSTALLATION**

- A. Install door and operating equipment with necessary hardware, anchors, inserts, hangers and supports
- B. Follow manufacturer's installation instructions

**3.3 ADJUSTING**

- A. Following completion of installation, including related work by others, lubricate, test, and adjust doors for ease of operation, free from warp, twist, or distortion

**3.4 CLEANING**

- A. Clean surfaces soiled by work as recommended by manufacturer



- B. Remove surplus materials and debris from the site

**3.5 DEMONSTRATION**

- A. Demonstrate proper operation to Owner's Representative
- B. Instruct Owner's Representative in maintenance procedures

**END OF SECTION**

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**SECTION 08 71 00**

**DOOR HARDWARE**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
  - 1. Door Hardware.
  - 2. Gate Hardware.
- B. Related Sections:
  - 1. Section 07 92 00 – Joint Sealants: Exterior thresholds
  - 2. Section 08 11 13 – Hollow Metal Doors and Frames.
- C. Specific Omissions: Hardware for the following is specified or indicated elsewhere.
  - 1. Windows.
  - 2. Cabinets, including open wall shelving and locks.
  - 3. Signs, except where scheduled.
  - 4. Toilet accessories, including grab bars.
  - 5. Installation.
  - 6. Rough hardware.
  - 7. Conduit, junction boxes & wiring.

1.03 REFERENCES:

Use date of standard in effect as of Bid date.

- A. American National Standards Institute – ANSI/BHMA 156.18 – Materials and Finishes.
- B. ADA – Americans with Disabilities Act of 1990 as amended by the ADA Amendments Act of 2010.
- C. BHMA – Builders Hardware Manufacturers Association
- D. DHI – Door and Hardware Institute
- E. NFPA – National Fire Protection Association
  - 1. NFPA 80 – Fire Doors and Other Opening Protectives
  - 2. NFPA 105 – Smoke Door Assemblies and Other Opening Protectives
  - 3. NFPA 252 – Fire Tests of Door Assemblies
- F. UL – Underwriters Laboratories
  - 1. UL10C – Positive Pressure Fire Tests of Door Assemblies.
  - 2. UL 305 – Panic Hardware

- G. WH – Warnock Hersey
- H. 2019 California Building Code
- I. SDI – Steel Door Institute
- J. WI – Woodwork Institute
- K. AWI – Architectural Woodwork Institute
- L. NAAMM – National Association of Architectural Metal Manufacturers

1.04 REGULATORY REQUIREMENTS

**Door and gate hardware: (all requirements below shall apply to gates as well)**

- A. Reference **2019 California Building Code (CBC)**
- B. Doors/doorways as part of an accessible route shall comply with **CBC Sections 11B-404.**
- C. The clear opening width for a door shall be 32" minimum. For a swinging door it shall be measured between the face of the door and the stop, with the door open 90 degrees. There shall be no projections into it below 34" and 4" maximum projections into it between 34" and 80" above the finish floor or ground. Door closers and stops shall be permitted to be 78" minimum above the finish floor or ground. **CBC Section 11B-404.2.3**
- D. Handles, pulls, latches, locks, and other operable parts on accessible doors shall comply with **CBC Section 11B-309.4** and shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist. Operable parts of such hardware shall be 34" minimum and 44" maximum above finish floor or ground. Where sliding doors are in the fully open position, operating hardware shall be exposed and usable from both sides.  
**CBC Section 11B-404.2.7**
- E. The force for pushing or pulling open a door shall be as follows: **CBC Section 11B-404.2.9.**
  - 1. Interior hinged doors, sliding or folding doors, and exterior hinged doors: **5 pounds (22.2 N)** maximum. Required fire doors: the minimum opening force allowable by the DSA authority, not to exceed **15 pounds (66.7N)**. These forces do not apply to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
  - 2. The force required for activating any operable parts, such as lever hardware, or disengaging other devices shall be **5 pounds (22.2N)** maximum to comply with **CBC Section 11B-309.4.**
- F. Door closing speed shall be as follows: **CBC Section 11B-404.2.8**
  - 1. Closer shall be adjusted so that the required time to move a door from an open position of 90 degrees to a position of 12 degrees from the latch is **5** seconds minimum.
  - 2. Spring hinges shall be adjusted so that the required time to move a door from an open position of 70 degrees to the closed position is **1.5** seconds minimum.

- G. Thresholds shall comply with **CBC Section 11B-404.2.5**.
- H. Floor stops shall not be located in the path of travel potentially creating a tripping hazard and shall be placed a maximum of 4" from walls.  
**DSA Policy 99-08.**
- I. Hardware (including panic hardware) shall not be provided with "Night Latch" (NL) function for any accessible doors or gates unless the following conditions are met per **DSA Interpretation 10-08 DSA /AC (External), revised 4/28/09**. Such conditions must be clearly demonstrated and indicated in the specifications:
1. Such hardware has a 'dogging' feature.
  2. It is dogged during the time the facility is open.
  3. Such 'dogging' operation is performed only by employees as their job function (non-public use).
- J. Pair of doors: limit swing of one leaf to 90 degrees so that a clear floor space is provided beyond the arc of the swing for the wall-mounted tactile sign. **CBC Section 11B-703.4.2.1**

#### 1.05 SUBMITTALS & SUBSTITUTIONS

- A. SUBMITTALS: Submit six copies of schedule per Section 01 33 00. Only submittals printed one sided will be accepted and reviewed. Organize vertically formatted schedule into "Hardware Sets" with index of doors and headings, indicating complete designations of every item required for each door or opening. Include following information:
1. Type, style, function, size, quantity and finish of hardware items.
  2. Use BHMA Finish codes per ANSI/BHMA A156.18.
  3. Name, part number and manufacturer of each item.
  4. Fastenings and other pertinent information.
  5. Location of hardware set coordinated with floor plans and door schedule.
  6. Explanation of abbreviations, symbols, and codes contained in schedule.
  7. Mounting locations for hardware.
  8. Door and frame sizes, materials and degrees of swing.
  9. List of manufacturers used and their nearest representative with address and phone number.
  10. Catalog cuts.
  11. Wiring and Riser Diagrams.
  12. Manufacturer's technical data and installation instructions for electric hardware.
  13. Date of jobsite visit for renovation projects.
- B. Bid and submit manufacturer's updated/improved item if scheduled item is discontinued.
- C. Deviations: Highlight, encircle or otherwise identify deviations from "Schedule of Finish Hardware" on submittal with notations clearly designating those portions as deviating from this section.
- D. If discrepancy between drawings and scheduled material in this section, bid the more expensive of the two choices, note the discrepancy in the submittal and request direction from Architect for resolution.
- E. Substitutions per Division 1 – General Requirements, Specification Sections. Include product data and indicate benefit to the Project. Furnish operating samples on request.

- F. Items listed with no substitute manufacturers have been requested by Owner to meet existing standard.
- G. Furnish as-built/as-installed schedule with closeout documents, including keying schedule, wiring diagrams, manufacturers' installation, adjustment and maintenance information, and supplier's final inspection report.

**1.06 QUALITY ASSURANCE:**

- A. Qualifications:
  - 1. Hardware supplier: direct factory contract supplier who employs a certified architectural hardware consultant (AHC), available at reasonable times during course of work for project hardware consultation to Owner, Architect and Contractor.
    - a) Responsible for detailing, scheduling and ordering of finish hardware. Detailing implies that the submitted schedule of hardware is correct and complete for the intended function and performance of the openings.
- B. Hardware: Free of defects, blemishes and excessive play. Obtain each kind of hardware (latch and locksets, exit devices, hinges and closers) from one manufacturer.
- C. Exit Doors: Operable from inside with single motion without the use of a key or special knowledge or effort.
- D. Exterior Classroom Exit Doors: Use classroom security function locksets with holdback feature.
- E. Fire-Rated Openings: NFPA 80 compliant. Hardware UL10C / California State Fire Marshal Standard 12-7-4 (positive pressure) compliant for given type/size opening and degree of label. Provide proper latching hardware, non-flaming door closers, approved-bearing hinges, and resilient seals. Coordinate with wood door section for required intumescent seals. Furnish openings complete.
- F. Note: scheduled resilient seals may exceed selected door manufacturer's requirements.
- G. See 2.6.H for added information regarding resilient and intumescent seals.
- H. Furnish hardware items required to complete the work in accordance with specified performance level and design intent, complying with manufacturers' instructions.
- I. Pre-Installation Meetings: Initiate and conduct with supplier, installer and related trades, coordinate materials and techniques, and sequence complex hardware items and systems installation. Include manufacturers' representatives of locks, panic hardware and door closers in the meetings. Convene prior to commencement of related work.

**1.07 DELIVERY, STORAGE AND HANDLING:**

- A. Delivery: coordinate delivery to appropriate locations (shop or field).
  - 1. Permanent keys and cores: secured delivery direct to District locksmith.
- B. Acceptance at Site: Items individually packaged in manufacturers' original containers, complete with proper fasteners and related pieces. Clearly mark packages to indicate contents, locations in hardware schedule and door numbers.

- C. Storage: Provide securely locked storage area for hardware, protect from moisture, sunlight, paint, chemicals, dust, excessive heat and cold, etc.

1.08 PROJECT CONDITIONS AND COORDINATION:

- A. Where exact types of hardware specified are not adaptable to finished shape or size of members requiring hardware, provide suitable types having as nearly as practical the same operation and quality as type specified, subject to Architect's approval.
- B. Coordination: Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents. Furnish related trades with the following information:
1. Location of embedded and attached items to concrete.
  2. Location of wall-mounted hardware, including wall stops.
  3. Location of finish floor materials and floor-mounted hardware.
  4. Locations for conduit and raceways as needed for electrical hardware items. Fire/life-safety system interfacing. Point-to-point wiring diagrams plus riser diagrams to related trades.
  5. Manufacturer templates to door and frame fabricators.
- C. Check Shop Drawings for doors and entrances to confirm that adequate provisions will be made for proper hardware installation.
- D. Prior to submittal, carefully inspect existing conditions to verify finish hardware required to complete Work, including sizes, quantities, existing hardware scheduled for re-use, and sill condition material. If conflict between the specified/scheduled hardware and existing conditions, submit request for direction from Architect. Include date of jobsite visit in the submittal.
1. For renovation projects, submittals prepared without thorough jobsite visit by qualified hardware expert will be rejected as non-compliant.

1.09 WARRANTY:

- A. Part of respective manufacturers' regular terms of sale. Provide manufacturers' written warranties:
- |                       |                          |
|-----------------------|--------------------------|
| 1. Locksets:          | Five years               |
| 2. Exit Devices:      | Three years mechanical   |
|                       | Two years electrical     |
| 3. Closers:           | Ten years mechanical     |
|                       | Two years electrical     |
| 4. Hinges:            | Life of the Installation |
| 5. Continuous Hinges: | Life of the Installation |
| 6. Other Hardware:    | Two years                |

1.10 COMMISSIONING:

- A. Conduct these tests prior to request for certificate of substantial completion:
1. With installer present, test door hardware operation with climate control system and stairwell pressurization system both at rest and while in full operation.

2. With installer, access control contractor and electrical contractor present, test electrical hardware systems for satisfactory operation.
3. With installer and electrical contractor present, test hardware interfaced with fire/life-safety system for proper operation and release.

**1.11 REGULATORY REQUIREMENTS:**

- A. Comply with the California Building Code (CBC) 2019
- B. All hardware for accessible doors shall meet the requirements of CBC Sections 1010.1.7, 1010.1.9, 11B-404, 11B-309.4 and 1010.1.8.
- C. Hand-activated door opening hardware, handles, pulls, latches, locks, and other operating devices on accessible doors shall have a shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist to operate. CBC Section 11B-309.4. Hardware shall be centered between 34" and 44" above the floor. CBC Section 11B-404.2.7.
- D. Adjust doors to open with not more than 5.0 lbs pressure to open at exterior doors and 5.0 lbs at interior doors. As allowed per California Building Code, Section 11B-404.2.9 and 1010.1.3, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15 lbs.
- E. Door closers and gate closers shall be adjusted so that from an open position of 90 degrees, the time required to move the door to a position of 12 degrees from the latch is 5 seconds minimum, per California Building Code Section 11B-404.2.8.1.
- F. Smooth surfaces at bottom 10" of push sides of doors, facilitating push-open with wheelchair footrests, per California Building Code Section 11B-404.2.10.
- G. Door opening clear width no less than 32", measured from face of frame stop, or edge of inactive leaf of pair of doors, to door face with door opened to 90 degrees. Hardware projection not a factor in clear width if located above 34" and the hardware projects no more than 4". California Building Code Section 11B-404.2.3 and 1010.1.1.
  1. Exception: doors not requiring full passage through the opening, that is, to spaces less than 24" in depth, may have the clear opening width reduced to 20". Example: shallow closets.
- H. Door opening clear height no less than 80" measured from top of sill to bottom of frame header stop. Projections into clear opening height not to exceed 4". California Building Code Sections 11B-404.2.3 and 1010.1.1.
- I. Thresholds: floor or landing no more than 1/2" below the top of the threshold of the doorway. Change in level between 1/4" and 1/2": beveled to slope no greater than 1:2 (50 percent slope). California Building Code Sections 11B-404.2.5 and 1010.1.7.
- J. Floor stops: Do not locate in path of travel. Locate no more than 4" from walls, per CBC 2019 Section 11B-204 and 11B-307.
- K. Pairs of doors: limit swing of one leaf to 90 degrees to protect persons reading wall-mounted tactile signage.
- L. Meet California Building Code Sections 11B-404.2.7, 11B-404.2.9, 1010.1.8 and 1010.1.9.



## M. Exit Devices:

1. Panic hardware shall comply with CBC Section 1010.1.10 Panic hardware shall be so mounted (centered between 36" and 44" above finished floor as recommended) that the clear width of the exitway is not less than 32" measured between the face of the door and the opposite stop. CBC Section 11B-404.2.3 and Figure 11B-404.2.3.
2. The unlatching force of panic hardware shall not exceed 5 lbs (22.2N), applied in the direction of travel. CBC Section 11B-309.4.
3. Panic hardware shall not be provided with "Night Latch" (NL) function for any accessible doors or gates unless the following conditions are met:
  - a. Such hardware has a dogging feature
  - b. It is dogged during the time the facility is open
  - c. Such dogging operation is performed only by employees as their job function (non-public use)

**PART 2 – PRODUCTS**

**NOTE: ABSOLUTELY NO CONCEALED HARDWARE TO BE USED AT ANYTIME OR UNDER ANY CIRCUMSTANCES**

## 2.01 MANUFACTURERS:

- A. Listed acceptable alternate manufacturers: submit for review products with equivalent function and features of scheduled products

ITEM:	MANUFACTURER:	ACCEPTABLE SUB:
Hinges	(IVE) Ives 3CB1	Bommer
Continuous Hinges	(IVE) Ives Aluminum Geared Series	Pemko
Pivots	DO NOT USE	
Floor Closers	DO NOT USE	
Key System	(SCH) Schlage Primus I/C	District Standard
Locks	(SCH) Schlage L9000, LV9000	District Standard
Exit Devices	(VON) Von Duprin 99	District Standard
Key-Removable Mullion	(VON) Von Duprin KR1954, KR9954	District Standard
Closers	(LCN) LCN 4041, 4041XP	District Standard
Auto Flush Bolts	(IVE) Ives FB30,FB40,FB50,FB60	DCI
Coordinators	(IVE) Ives COR Series	DCI
Silencers	(IVE) Ives	Rockwood
Push & Pull Plates	(IVE) Ives	Rockwood
Kickplates	(IVE) Ives	Rockwood
Stops & Holders	(IVE) Ives	Rockwood
Overhead Stops	(GLY) Glynn-Johnson 80 & 100 series	None Available
Thresholds	(NGP) NGP	Zero
Seals & Bottoms	(NGP) NGP	Zero

## 2.02 HINGING METHODS:

- A. Drawings typically depict doors at 90 degrees, doors will actually swing to maximum allowable. Use wide-throw conventional or continuous hinges as needed up to 8 inches in width to allow door to stand parallel to wall for true 180-degree opening. Advise architect if 8-inch width is insufficient.

- B. Conform to manufacturer's published hinge selection standard for door dimensions, weight and frequency, and to hinge selection as scheduled. Where manufacturer's standard exceeds the scheduled product, furnish the heavier of the two choices, notify Architect of deviation from scheduled hardware.
- C. Conventional Hinges: Steel or stainless steel pins and concealed bearings. Hinge open widths minimum, but of sufficient throw to permit maximum door swing. Use heavy-weight hinges at doors with panic hardware and high-use door openings.
- D. Continuous Hinges: Use at outswing exterior doors
  - 1. Geared-type aluminum.
    - a) Use wide-throw units where needed for maximum degree of swing, advise architect if commonly available hinges are insufficient.
  - 2. At masonry construction, coordinate with the anchoring and hollow metal supplier prior to frame installation, by placing a strip of insulation on the back of the hollow metal frame behind the rabbet section. When the frame is grouted in place, the backing will allow drilling and tapping without dulling or breaking the installer's bits.

**2.03 LOCKSETS, LATCHSETS: MATCH EXISTING LEVER STYLE**

- A. Mortise Locksets and Latchsets: Shall be Schlage L9000 Series as scheduled.
  - 1. Chassis: cold-rolled steel, handing field-changeable without disassembly.
  - 2. Latchbolts: 3/4 inch throw stainless steel anti-friction type.
  - 3. Lever Trim: through-bolted, accessible design, cast lever or solid extruded bar type levers as scheduled. Filled hollow tube design unacceptable.
    - a) Spindles: security design independent breakaway. Breakage of outside lever does not allow access to inside lever's hubworks to gain wrongful entry.
    - b) Inside lever applied by screwless shank mounting – no exposed trim mount screws
    - c) Outside and inside trim thru-bolted together and through the door
  - 4. Spring-loaded fusible link provides fail secure mode in case of fire.
  - 5. Universal lock case – 10 functions in one case.
  - 6. Floating mounting tabs automatically adjusts to fit a beveled door edge.
  - 7. Field reversible handing without opening lock case.
  - 8. External spring cages allow for simple trim retrofit.
  - 9. Lever rotation in both directions (up & down) for ease of use.
  - 10. At Vandlgard locks, locked lever freely rotates down while remaining securely locked. This feature prevents damage to internal lock components when subjected to excessive force. Use at exterior doors when fixed Vandal-Resistant trim (Ives VR900 Series) is not used.
  - 11. Furnish inside indicator at exterior classroom doors with "locked" display.
  - 12. Independent lever rotation.
  - 13. Furnish solid cylinder collars with wave springs. Wall of collar to cover rim of mortise cylinder.
  - 14. Thumbturns: accessible design not requiring pinching or twisting motions to operate.
  - 15. Strikes: 16 gage curved steel, bronze or brass with 1 inch deep box construction, lips of sufficient length to clear trim and protect clothing.

16. Scheduled Lock Series and Design: Schlage L and LV series, OMEGA design.
17. Certifications:
  - a) ANSI/BHMA A156.18, Grade 1 Operational, Grade 1 Security.
  - b) ASTM F1450.
18. Accepted substitutions: none

#### 2.04 EXIT DEVICES / PANIC HARDWARE MATCH EXISTING LEVER STYLE

##### A. General features: Shall be Von Duprin 99-2 Series as scheduled.

1. Independent lab-tested 1,000,000 cycles.
2. Use 98 Series with stainless-steel finish at gates. All other openings use 99-2 Series.
3. Push-through push-pad design. No exposed push-pad fasteners, no exposed cavities when operated. Return stroke fluid dampeners and rubber bottoming dampeners, plus anti-rattle devices.
4. 0.75-inch throw deadlocking latchbolts.
5. End caps: impact-resistant, flush-mounted. No raised edges or lips to catch carts or other equipment.
6. Mount all panic devices with through-bolt fasteners. Absolutely no concealed hardware to be used, under any circumstances.
7. No exposed screws to show through glass doors.
8. Non-handed basic device design with center case interchangeable with all functions, no extra parts required to effect change of function.
9. Releasable in normal operation with 15-lb. maximum operating force, and with 32 lb. maximum pressure under 250-lb. load to the door.
10. Flush end cap design as opposed to typical "bottle-cap" design end cap.
11. Exterior doors use XP-series devices: Static load force resistance of at least 2000 pounds.
12. Where devices span over door lite frame and the face of the selected lite manufacturer's frame is raised from the face of the door, furnish panic hardware manufacturer's fitted shims or glass-bead kits at no additional cost to the project.
13. Comply with CBC Section 1010.1.8.

##### B. Specific features:

1. Non-Fire Rated Devices: cylinder dogging.
2. Lever Trim: breakaway type, forged brass or bronze escutcheon min .130" thickness, compression spring drive, match lockset lever design.
3. Vandal-Resistant Trim: Use Ives VR900 Series at exterior doors whenever possible.
4. Fire-Labeled Devices: UL label indicating "Fire Exit Hardware".
5. At Paired Openings: Use key-removable mullion with 2 rim panic devices, DO NOT use concealed vertical rod devices or surface vertical rod devices.
6. DO NOT use mortise panic (9975) devices.
7. Electrically Operated Devices: Single manufacturer source for electric latch retraction devices, electrically controlled trim, power transfers, power supplies, monitoring switches and controls.
8. Removable Mullions: Removable with single turn of building key. Securely reinstalled without need for key. Furnish storage brackets for securely stowing the mullion away from the door when removed.
9. Accepted substitutions: none

2.05 CLOSERS

- A. Surface Closers: Shall be LCN 4041 and 4040XP Series.
1. Full rack-and-pinion type cylinder with removable non-ferrous cover and cast iron body. Double heat-treated pinion shaft, single piece forged piston, chrome-silicon steel spring.
  2. Use 4041XP closers at all exterior and high-use door openings.
  3. ISO 2000 certified. Units stamped with date-of-manufacture code.
  4. Independent lab-tested 10,000,000 cycles.
  5. Non-sized, non-handed, and adjustable. Place closer inside building, stairs, and rooms.
  6. Plates, brackets and special templating when needed for interface with particular header, door and wall conditions and neighboring hardware.
  7. At 6' 8" high door openings, modify closer mounting so that closer body does not interfere with 80" opening height.
  8. Adjustable to open with not more than 5.0lbs pressure to open at exterior doors and 5.0lbs at interior doors. As allowed per California Building Code, Section 11B-309.4 and 11B-404.2.9, local authority may increase the allowable pressure for fire doors to achieve positive latching, but not to exceed 15lbs.
  9. When provided, the sweep period of the closer shall be adjusted so that from an open position of 90 degrees, the door will take at least 5 seconds to move to a point 12 degrees from the latch, measured to the landing side of the door.
  10. Separate adjusting valves for closing speed, latching speed and backcheck, fourth valve for delayed action where scheduled.
  11. Extra-duty arms (EDA and CUSH) at exterior and interior doors scheduled with parallel arm units.
  12. Generally, closers need to swing to maximum allowable degree of opening (180 degrees if possible).
  13. Generally, do not use closers with hold-open feature unless specifically approved by Facilities Engineering and Maintenance.
  14. Use through-bolt fasteners at all closers.
  15. Exterior door closers: tested to 100 hours of ASTM B117 salt spray test, furnish data on request.
  16. Exterior doors: seasonal adjustments not required for temperatures from 120 degrees F to -30 degrees F, furnish checking fluid data on request.
  17. Non-flaming fluid, will not fuel door or floor covering fires.
  18. Pressure Relief Valves (PRV) not permitted.
  19. Supply Special Rust Inhibitor (SRI) at corrosive environments. This special corrosion resistant pretreatment, when added to the powder coat finish, gives the closer a tremendous advantage over a potentially corrosive environment.
  20. Accepted substitutions: none
- B. Low-Energy Door Operators: Shall be LCN 4600 Series. Comply with ANSI/BHMA A156.19 Electric power-open, hydraulically checked spring power closing. Modular construction. Finished metal cover. Field-adjustable opening force, opening speed, time-open, closing and latching speeds. Door reopens and timing cycle restores if system reactuated during closing cycle. Breakaway clutch protection from forced closing. Door, frame, motor and drive train protected by attenuated initiation of opening cycle.
1. Self-contained low-voltage power supply, terminal strip and sequencing for incorporation of hardwired electric hardware with system operation.
  2. Provide concealed on/off system switch at closer body mechanism.

## 2.06 OTHER HARDWARE

- A. Automatic Flush Bolts: Low operating force design.
- B. Overhead Stops: Glynn-Johnson 80 and 100 Series. Non-plastic mechanisms and finished metal end caps. Field-changeable stop-only functions. Use only where floor or wall stops are inadvisable. When used, use heavy-weight hinges or continuous hinges.
- C. Kick Plates: Rounded and relieved edges, .050 inches minimum thickness, height and width as scheduled. Sheet-metal screws of bronze or stainless steel to match other hardware.
- D. Vandal-Resistant Trim: Use IVES VR900 Series at all exterior doors whenever possible.
- E. Lockguards: Use at exterior outswing single doors with lockset to protect gap between door and frame at strike when Vandal-Resistant trim is not used.
- F. Viewers: Provide 190 degree viewer at all exterior doors without visionlites. Install at wheel chair use eye level.
- G. Door Stops: Provide stops to protect walls, casework or other hardware.
  - 1. Unless otherwise noted in Hardware Sets, provide wall type with appropriate fasteners. Where wall type cannot be used, provide floor type. If neither can be used, provide overhead type.
  - 2. Locate overhead stops for maximum possible opening. Consult with Owner for furniture locations. Minimum: 90 deg stop / 95 deg deadstop. Note degree of opening in submittal.
- H. Seals: Finished to match adjacent frame color. Resilient seal material: polyurethane, polypropylene, nylon brush, silicone rubber or solid high-grade neoprene as scheduled. Do not furnish vinyl seal material. UL label applied to seals on rated doors. Substitute products: certify that the products equal or exceed specified material's thickness and durability.
  - 1. Proposed substitutions: submit for approval.
  - 2. Solid neoprene: MIL Spec. R6855-CL III, Grade 40.
  - 3. Non-corroding fasteners at in-swinging exterior doors.
  - 4. Fire-rated Doors, Resilient Seals: UL 263 / CBC Section 703 compliant. Coordinate with selected door manufacturers' and selected frame manufacturers' requirements. Where rigid housed resilient seals are scheduled in this section and the selected door manufacturer only requires an adhesive-mounted resilient seal, furnish rigid housed seal. Adhesive applied seals are not allowed.
  - 5. Fire-rated Doors, Intumescent Seals: Furnished by selected door manufacturer. Furnish fire-labeled opening assembly complete and in full compliance with UL 263 / CBC Section 703. Where required, intumescent seals vary in requirement by door type and door manufacture -- careful coordination required
- I. Thresholds: As scheduled and per details. Comply with CBC Section 11B-404.2.5. Substitute products: certify that the products equal or exceed specified material's thickness. Proposed substitutions: submit for approval.

1. Exteriors: Seal perimeter to exclude water and vermin. Use sealant complying with requirements in Division 07 "Thermal and Moisture Protection". Non-ferrous 1/4inch fasteners and lead expansion shield anchors, or Red-Head #SFS-1420 (or approved equivalent) Flat Head Sleeve Anchors (SS/FHSL).
  2. Fire-rated openings, 90min or less duration: use thresholds to interrupt floor covering material under the door where that material has a critical radiant flux value less than 0.22 watts per square centimeter, per NFPA 253. Use threshold unit as scheduled. If none scheduled, request direction from Architect.
  3. Plastic plugs with wood or sheet metal screws are not an acceptable substitute for specified fastening methods.
  4. Fasteners: Generally, exposed screws to be Phillips or Robertson drive. Pinned TORX drive at high security areas. Flat head sleeve anchors (FHSL) may be slotted drive. Sheet metal and wood screws: full-thread. Sleeve nuts: full length to prevent door compression.
- J. Exposed Through-Bolts: Use for fastening all closers and panic hardware. Coordinate with wood doors; ensure provision of proper blocking to ensure through-bolts will not crush or deform door for mounting panic hardware and door closers. Coordinate with metal doors and frames; ensure provision of proper reinforcement to ensure through-bolts will not crush or deform door for mounting panic hardware and door closers.
- K. Silencers: Interior hollow metal frames, 3 for single doors, 2 for pairs of doors. Omit where adhesive mounted seal occurs. Leave no unfilled/uncovered pre-punched silencer holes.
- L. Wall- & Floor-mounted electromagnetic door holders: LCN's SEM series or approved equivalent. Incorporate into U.L. listed fire & life-safety system, doors release to allow closure and latching when door's zone is in alarm state. Use minimum projection required to allow door to open as widely as allowed by wall conditions and projection of door hardware.

**2.07 FINISH:**

- A. Generally, BHMA 626 Satin Chromium OR BHMA 630 Satin Stainless Steel. Generally, use stainless steel finish only at gate openings.
1. Areas using BHMA 626 to have push-plates, pulls and protection plates of BHMA 630, Satin Stainless Steel, unless otherwise noted.
- B. Door closers: factory powder coated to match other hardware, unless otherwise noted.
- C. Aluminum items: match predominant adjacent material. Seals to coordinate with frame color.

**2.08 KEYING REQUIREMENTS:**

- A. Key System: Schlage Everest Primus high-security utility-patented keyway, interchangeable core throughout. Utility patent protection to extend at least until 2014. Key blanks available only from factory-direct sources, not available from after-market keyblank manufacturers. For estimate use factory GMK charge. Initiate and conduct meeting(s) with Owner and I-R Security & Safety Consultants representatives to determine system keyway(s), keybow styles, structure, degree of physical security and degree of geographic exclusivity. Furnish Owner's written approval of the system. Contractor will order and supply permanent cylinders (cores) and Owner will install cylinders (cores).

1. Existing factory-registered master key system.
  2. Primus Level 9G (verify)
  3. Construction keying: furnish temporary keyed-alike brass cores. Remove at substantial completion and install permanent cylinders/cores in Owner's presence. Demonstrate that construction key no longer operates.
  4. Temporary cylinders/cores remain supplier's property.
  5. Furnish 10 construction keys.
  6. Furnish 2 construction control keys.
  7. Furnish 200 keyblanks and 10 control keyblanks.
  8. Key Cylinders: furnish 6-pin solid brass construction.
  9. Furnish 20 extra "0" bitted cores.
- B. Cylinders/cores: keyed at by Owner, O bitted from factory of lock manufacturer where permanent records are maintained. Locksets and cylinders same manufacturer.
- C. Permanent keys: use secured shipment direct from point of origination to District locksmith.
1. 4 keys per cylinder, 3 control keyblanks, 200 additional keyblanks.
- D. Bitting List: use secured shipment direct from point of origination to District locksmith at completion.
- E. Approved Finish Hardware Submittal: furnish 2 copies to District locksmith at completion.

**PART 3 - EXECUTION****3.01 ACCEPTABLE INSTALLERS:**

- A. Can read and understand manufacturers' templates, suppliers' hardware schedules and printed installation instructions. Can readily distinguish drywall screws from manufacturers' furnished fasteners. Available to meet with manufacturers' representatives and related trades to discuss installation of hardware.

**3.02 PREPARATION:**

- A. Ensure that walls and frames are square and plumb before hardware installation. Make corrections before commencing hardware installation.
- B. Locate hardware per SDI-100 and applicable building, fire, life-safety, accessibility, and security codes.
1. Notify Architect of code conflicts before ordering material.
  2. Locate levers, key cylinders, t-turn pieces, touchbars and other operable portions of latching hardware between 34 inches to 44 inches above the finished floor, per CBC Sections 11B-404.2.7 and 11B-309.4.
  3. Where new hardware is to be installed near existing doors/hardware scheduled to remain, match locations of existing hardware.
- C. Overhead stops: before installing, determine proposed locations of furniture items, fixtures, and other items to be protected by the overhead stop's action.

**3.03 INSTALLATION**

- A. Install hardware per manufacturer's instructions and recommendations. Do not install surface-mounted items until finishes have been completed on substrate. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate for proper installation and operation. Remove and reinstall or replace work deemed defective by Architect.
  - 1. Gaskets: install jamb-applied gaskets before closers, overhead stops, rim strikes, etc; fasten hardware over and through these seals. Install sweeps across bottoms of doors before astragals, cope sweeps around bottom pivots, trim astragals to tops of sweeps.
  - 2. When hardware is to be attached to existing metal surface and insufficient reinforcement exists, use RivNuts, NutSerts or similar anchoring device for screws.
  - 3. Use manufacturers' fasteners furnished with hardware items, or submit Request for Substitution with Architect.
  - 4. Replace fasteners damaged by power-driven tools.
- B. Locate floor stops no more than 4 inches from walls and not within paths of travel. See paragraph 2.02 regarding hinge widths, door should be well clear of point of wall reveal. Point of door contact no closer to the hinge edge than half the door width. Where situation is questionable or difficult, contact Architect for direction.
- C. Core concrete for exterior door stop anchors. Set anchors in approved non-shrink grout.
- D. Locate overhead stops for minimum 90 degrees and maximum allowable degree of swing.
- E. Drill pilot holes for fasteners in wood doors and/or frames.
- F. Lubricate and adjust existing hardware scheduled to remain. Carefully remove and give to Owner items not scheduled for reuse.

**3.04 ADJUSTING**

- A. Adjust and check for proper operation and function. Replace units, which cannot be adjusted to operate freely and smoothly.
  - 1. Hardware damaged by improper installation or adjustment methods: repair or replace to Owner's satisfaction.
  - 2. Adjust doors to fully latch with no more than 1 pound of pressure.
  - 3. Adjust delayed-action closers on fire-rated doors to fully close from fully-opened position in no more than 10 seconds.
  - 4. Adjust door closers per 1.09 this section.
- B. Inspection: Use hardware supplier's consultant or consultant's agent. Include supplier's report with closeout documents.
- C. Final inspection: Installer to provide letter to Owner that upon completion installer has visited the Project and has accomplished the following:
  - 1. Re-adjust hardware.
  - 2. Evaluate maintenance procedures and recommend changes or additions, and instruct Owner's personnel.
  - 3. Identify items that have deteriorated or failed.
  - 4. Submit written report identifying problems



## 3.06 DEMONSTRATION:

- A. Demonstrate mechanical hardware and electrical hardware systems, including adjustment and maintenance procedures.

## 3.07 PROTECTION/CLEANING:

- A. Cover installed hardware, protect from paint, cleaning agents, weathering, carts/barrows, etc. Remove covering materials and clean hardware just prior to substantial completion.
- B. Clean adjacent wall, frame and door surfaces soiled from installation/reinstallation process.

## 3.08 SCHEDULE OF FINISH HARDWARE

- A. See door schedule in drawings for hardware set assignments.
- B. Manufacturers and their abbreviations used in this schedule

GLY	Glynn-Johnson
IVE	H.B. Ives
LCN	LCN Closers
NGP	National Guard Products
SCH	Schlage Lock Company
VON	Von Duprin

- C. Spextra 377944 Hardware Sets

**HARDWARE GROUPS**

## Hardware Group 01 - STORAGE ROOM (EXT)

Door(s):

102	103	104
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Qty		Description	Catalog Number	Finish	Mfr
6	EA	HW HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	SET	AUTO FLUSH BOLT	FB31P	630	IVE
1	EA	DUST PROOF STRIKE	DP1	626	IVE
1	EA	CLASSROOM SEC HOLDBK	L9077T LLL 17A L283-150	630	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	PERMANENT CORE	MATCH CAMPUS STANDARD	626	TBD
1	EA	DOOR PULL	VR900 LLP	630	IVE
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4040XP HEDA MC TBSRT	689	LCN
2	EA	ARMOR PLATE	8400 34" X 2" LDW B-CS	630	IVE
2	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	ASTRAGAL	43SP	SP	ZER
1	EA	THRESHOLD	103A-226 (OR AS DETAILED)	A	ZER
1	EA	RAIN DRIP	142A	A	ZER

**GROSSMONT UNION HIGH SCHOOL DISTRICT  
HELIX C.H.S. NEW RESTROOM AND STORAGE BUILDINGS**

**FEBRUARY 11, 2020**

Hardware Group 02 – STORAGE ROOMS (EXT, OS)

Door(s):

101-1

Qty		Description	Catalog Number	Finish	Mfr
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	630	IVE
1	EA	CLASSROOM SEC HOLDBK	L9077T LLL 17A L283-150	630	SCH
2	EA	PRIMUS CORE	20-740	626	SCH
2	EA	PERMANENT CORE	MATCH CAMPUS STANDARD	626	TBD
1	EA	DOOR PULL	VR900	630	IVE
1	EA	SURFACE CLOSER	4040XP SHCUSH MC TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	103A-226 (OR AS DETAILED)	A	ZER
1	EA	RAIN DRIP	142A	A	ZER

Hardware Group 03 - UNISEX TOILET ROOMS (EXT)

Door(s):

105

106

Qty		Description	Catalog Number	Finish	Mfr
1	EA	CONT. HINGE	224HD	628	IVE
1	EA	PRIVACY LOCK	L9040 17A L583-363 L283-722	630	SCH
2	EA	PRIMUS CORE	20-740	626	SCH
1	EA	PERMANENT CORE	MATCH CAMPUS STANDARD	626	TBD
1	EA	DOOR PULL	VR900 LLP	630	IVE
1	EA	SURFACE CLOSER	4040XP H MC TBSRT	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	FLOOR STOP	FS18S	BLK	IVE
1	EA	GASKETING	188S-BK	S-Bk	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	THRESHOLD	103A-226 (OR AS DETAILED)	A	ZER

**END OF SECTION**

## Designs and finishes

### The Standard Collection

The Standard Collection levers can be paired with exit devices and locks from our trusted Schlage and Von Duprin brands. And, they are built to the same exacting standards. Our Standard Collection levers offer a more traditional style that is appropriate for use in a number of commercial applications.

01



02



03



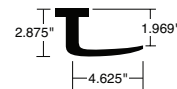
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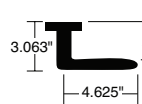
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07



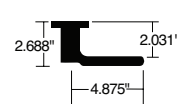
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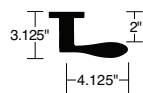
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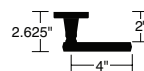
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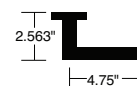
Accent



Asti



Latitude



Note: Levers shown with Schlage L Series mortise "A" rose. Knobs shown with rose that is unavailable in the L Series. Additional rose and escutcheon designs available.

## Trim and special accessories

### Thumbturns and indicators

Choose from these variations of thumbturn locks that help you meet the demands of specialized projects.

#### Thumbturns



**Standard turn**  
**09-509**



**ADA turn**  
**09-509 x L583-363**  
Available with all thumbturn-function L Series locks except L9463 and L463



**Coin turn**  
**L283-124**  
For lock functions L9044 and L9444 with rose trim.



**Emergency button**  
**K510-330**  
For lock functions L9040 and L9440



**Ligature resistant turn**  
**09-029**



**Cylinder turn**  
**09-90x**  
For L463 and L9463 classroom function deadlocks

#### Indicators

The 180 degree visibility indicator offers unparalleled visibility and flexibility. The unique features of the indicator make it ideally suited for classroom security applications as well as traditional occupied/vacant applications.

- 2" x 1 1/2" display for easy viewing at a distance
- 180° window for visibility at any angle
- High-mount placement for quick assessment
- High contrast colors for ease of reading
- Available for over 30 functions, inside or outside of door (see Functions section for availability)
- Retrofit kit allows indicator upgrades to already installed L Series mortise locks
- Indicator text available in English or French

#### N escutcheon indicators



Cylinder



Thumbturn



Cointurn



Emergency key

#### Sectional indicators



Cylinder



Thumbturn



Cointurn



Emergency key

	LOCKED	OCCUPIED	DO NOT DISTURB	
	UNLOCKED	VACANT		
Inside trim	L283-711	L283-712	L283-713	L283-714
Outside trim	L283-721	L283-722	L283-723	L283-724

#### Legacy indicator












**Hotel occupancy indicator**  
**09-611**

For lock function L9486P, used with A or B roses on section trim. Three available messages: "OCCUPIED", "DO NOT DISTURB" or "LOCKED".








## L Series mechanical lock functions

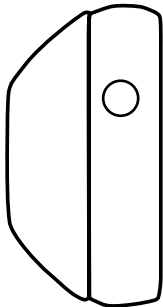
## Non-keyed functions

<p>Schlage <b>L9010</b></p> <p>ANSI <b>F01</b></p> <p><b>Passage latch</b></p> <ul style="list-style-type: none"> <li>• Latchbolt retracted by lever/knob from either side at all times</li> <li>• Inside lever always free for immediate egress</li> </ul> 	<p>Schlage <b>L9025</b></p> <p>ANSI <b>F31</b></p> <p><b>Exit lock</b></p> <ul style="list-style-type: none"> <li>• No outside trim</li> <li>• Inside lever always free for immediate egress</li> </ul> 	<p>Schlage <b>L9040</b> <b>LV9040</b></p> <p>ANSI <b>F22</b></p> <p><b>Bath/bedroom privacy lock</b></p> <ul style="list-style-type: none"> <li>• Latchbolt retracted by lever/knob from either side unless outside lever is locked by inside thumbturn</li> <li>• Actuating inside lever or closing door unlocks outside lever</li> <li>• To unlock from outside remove emergency button, insert emergency thumbturn in access hole and rotate</li> <li>• Inside lever always free for immediate egress</li> </ul>  	<p>Schlage <b>L9044</b> <b>LV9044</b></p> <p>ANSI <b>—</b></p> <p><b>Privacy with coin turn outside</b></p> <ul style="list-style-type: none"> <li>• Latchbolt retracted by lever/knob from either side unless outside lever is locked by inside thumbturn or outside coin turn</li> <li>• Actuating inside lever, closing door, or rotating outside coin turn unlocks outside lever</li> </ul>  
<p>Schlage <b>L9440</b> <b>LV9440</b></p> <p>ANSI <b>F19</b></p> <p><b>Privacy with deadbolt</b></p> <ul style="list-style-type: none"> <li>• Latchbolt retracted by lever/knob from either side</li> <li>• Deadbolt actuated by inside thumbturn</li> <li>• Throwing deadbolt locks outside knob/lever</li> <li>• Inside lever retracts both deadbolt and latchbolt and unlocks outside lever</li> <li>• To unlock from outside remove emergency button, insert emergency thumbturn in access hole and rotate</li> <li>• Inside lever always free for immediate egress</li> </ul>  	<p>Schlage <b>L9444</b> <b>LV9444</b></p> <p>ANSI <b>—</b></p> <p><b>Privacy with deadbolt and coin turn outside</b></p> <ul style="list-style-type: none"> <li>• Latchbolt retracted by lever/knob from either side</li> <li>• Deadbolt actuated by inside thumbturn or outside coin turn</li> <li>• Throwing deadbolt locks outside knob/lever</li> <li>• Inside lever retracts both deadbolt and latchbolt and unlocks outside lever</li> <li>• Rotating coin turn retracts deadbolt and unlocks outside lever</li> <li>• Inside lever always free for immediate egress</li> </ul>  		

## L Series mechanical lock functions

## Single cylinder non-deadbolt functions

<p>Schlage</p> <p><b>L9026</b></p> <p><b>Exit lock with cylinder</b></p> <ul style="list-style-type: none"> <li>• No outside trim</li> <li>• Outside cylinder retracts latchbolt</li> <li>• Inside lever always free for immediate egress</li> <li>• Auxiliary latch deadlocks latchbolt when door is locked</li> </ul> 	ANSI	<p>Schlage</p> <p><b>L9050</b> <b>LV9050</b></p> <p><b>Office and inner entry lock</b></p> <ul style="list-style-type: none"> <li>• Latchbolt retracted by lever/knob from either side unless outside lever is locked by key or thumbturn</li> <li>• With outside locked, latchbolt retracted by key or inside lever</li> <li>• Outside lever locked until unlocked by thumbturn or key</li> <li>• Auxiliary latch deadlocks latchbolt when door is closed</li> <li>• Inside lever always free for immediate egress</li> </ul> 	ANSI	<p>Schlage</p> <p><b>L9056</b> <b>LV9056</b></p> <p><b>L9050 with automatic unlocking</b></p> <ul style="list-style-type: none"> <li>• Latchbolt retracted by lever/knob from either side unless outside lever is locked by key or thumbturn</li> <li>• With outside locked, latchbolt retracted by key or inside lever</li> <li>• Outside lever locked until unlocked by thumbturn or key</li> <li>• Auxiliary latch deadlocks latchbolt when door is closed</li> <li>• Inside lever always free for immediate egress</li> </ul> 	ANSI	<p>Schlage</p> <p><b>L9070</b> <b>LV9070</b></p> <p><b>Classroom lock</b></p> <ul style="list-style-type: none"> <li>• Latchbolt retracted by lever/knob from either side unless outside lever is locked by key</li> <li>• Unlocked from outside by key</li> <li>• Auxiliary latch deadlocks latchbolt when door is closed</li> <li>• Inside lever always free for immediate egress</li> </ul> 	ANSI
<p>Schlage</p> <p><b>L9076</b> <b>LV9076</b></p> <p><b>Classroom holdback lock</b></p> <ul style="list-style-type: none"> <li>• Latchbolt retracted by lever/knob from either side unless outside lever is locked by key</li> <li>• When locked, latchbolt retracted by key or inside lever</li> <li>• Auxiliary latch deadlocks latchbolt when door is closed</li> <li>• Holdback feature activated by turning inside lever/knob and rotating key 360°</li> <li>• Inside lever always free for immediate egress</li> </ul> 	ANSI	<p>Schlage</p> <p><b>L9080</b> <b>LV9080</b></p> <p><b>Storeroom lock</b></p> <ul style="list-style-type: none"> <li>• Latchbolt retracted by lever/knob inside or key outside</li> <li>• Outside lever/knob is always inoperable</li> <li>• Auxiliary latch deadlocks latchbolt when door is closed</li> <li>• Inside lever always free for immediate egress</li> </ul> 	ANSI	<p>Single cylinder deadbolt functions</p>		<p>Schlage</p> <p><b>L9453</b> <b>LV9453</b></p> <p><b>Entrance lock</b></p> <ul style="list-style-type: none"> <li>• Latchbolt retracted by lever/knob from either side unless outside locked by 20° thumbturn rotation</li> <li>• Deadbolt actuation through 90° thumbturn rotation</li> <li>• When locked, outside key or inside lever/knob retracts both deadbolt and latchbolt</li> <li>• Outside lever/knob locked until thumbturn is restored to vertical position</li> <li>• Throwing deadbolt locks outside lever/knob</li> <li>• Auxiliary latch deadlocks latchbolt when door is closed</li> <li>• Inside lever always free for immediate egress</li> </ul> 	ANSI



VR900LLP RH with black grip  
VR900LLP LH with black grip  
VR904LLP RH without black grip  
VR904LLP LH without black grip

- For use with most mortise locks on outswinging doors including Schlage L9000 Series with interior L or N escutcheon, and rose trim
- Handed design allows trim to be positioned to coordinate with the centerline of inside hardware

**Size**

- 11 Gauge(0.120" thick)

**Mounting**

- For door thickness 1-3/4-2-1/4". 1/4-20 X 1-1/4" and 1/4-20 X 1-3/4" mounting screws with countersunk washers

Width	Height	Thru-bolt pattern (4 holes)	Clearance grip to door	Projection
5-1/4"	11"	1-3/4" wide x 10" high	1-1/2"	1-7/8"

**Finishes**

- Available in Stainless Steel US32D
- 304 Series Stainless Steel standard, exceeding industry standards for corrosion resistance. Recommended for external applications
- Models are available with or without attractive black plastisol edge grip
- Custom finishes are available as engineering special, consult customer service

**Additional information**

- 1-1/2" cylinder hole cut-out, located 2-7/32 above Horizontal center line and 1/4" offset from vertical center line towards the hinge side of the door
- Designed for use with 1-1/4" cylinders. Other cylinders may require additional blocking rings, not supplied.
- Protective cylinder collar spins to reduce damage from pipe wrench or other tool
- Comes with cylinder cup
- Additional cut-outs and locations are available as engineering special, consult customer service

A  
Hinges & pivots

B52  
Pulls & plates

C  
Flush bolts & coordinators

D  
Latches, catches & bolts

E  
Stops

F  
Exterior hardware

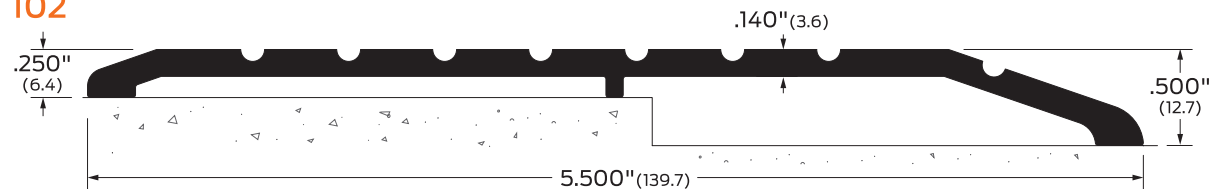
G  
Miscellaneous hardware

## Thresholds

## Offset thresholds



## 102



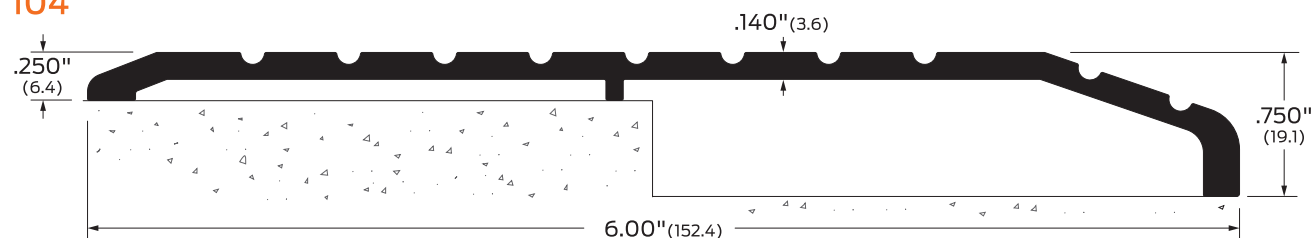
Finishes: A, BK, D, G Options: E, EL



ANSI/BHMA: 102A, 102D, 102G, 102BK J32180  
102A-E, 102D-E, 102G-E, 102BK-E J32280

Handicap offset. Supplied without mounting holes.

## 104



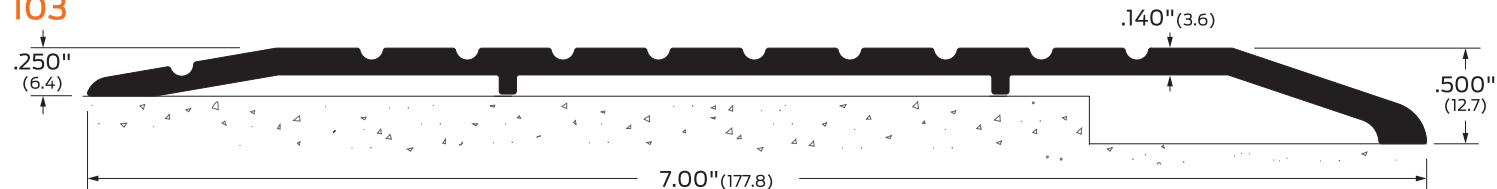
Finishes: A, BK, D, G Options: E, EL



ANSI/BHMA: 104A, 104D, 104G, 104BK J32180  
104A-E, 104D-E, 104G-E, 104BK-E J32280

Supplied without mounting holes.

## 103



Finishes: A, BK, D, G Options: E, EL



ANSI/BHMA: 103A, 103D, 103G, 103BK J32180  
103A-E, 103D-E, 103G-E, 103BK-E J32280

Handicap offset. Supplied without mounting holes.

See Thresholds Accessories & options page for details.

## Finishes:

**A** Aluminum mill finish  
**BK** Aluminum black anodized  
**D** Aluminum dark bronze anodized  
**G** Aluminum gold anodized  
**B** Bronze, architectural mill finish  
**B-ORB** Oil-rubbed bronze

## Options:

**E** Epoxy abrasive tread  
**EL** Photoluminescent and abrasive epoxy tread  
**V3** Full body strength fill  
**EV3** Epoxy and full body strength fill  
**ELV3** Photoluminescent and abrasive epoxy tread, full body strength fill

## Note:

Special anchors available for mounting most thresholds on concrete surfaces.



SECTION 09 24 00

CEMENT PLASTERING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes: Lath and cement plaster for soffits, exterior walls, interior walls and ceilings where indicated, and base coats for ceramic wall tile installation.
  - 1. All exterior walls shall be provided with lath and cement plaster a minimum of 8 feet from ground level.
- B. Related Work:
  - 1. Substrates such as concrete masonry and cast-in-place concrete.
  - 2. Wood framing.
  - 3. Section 09 90 00 – Painting and Coating.

1.02 REFERENCE STANDARDS

- A. Comply with applicable provisions of Chapter 25, Part 2, Title 24, California Building Code, 2019. Where required for fire protection, shall also conform to the provisions of Chapter 7.
- B. Install plaster work in accordance with the Plaster and Lathing Systems Manual issued by the Southern California Plastering Institute, Inc..Acceptable practice per Technical Services Information Bureau, Technical Bulletins, [www.tsib.org](http://www.tsib.org), Phone (714) 221-5530.

1.03 SUBMITTALS

- A. Samples:
  - 1. Submit in accordance with Section 01 33 00 – Submittal Procedures, and the General Conditions, samples of color and texture for Architect's review.
  - 2. Provide samples of aluminum channel screeds and trim, three (3) of each color indicated.
  - 3. Provide a 4 foot by 8 foot sample panel of each plaster system required on project, at a field location selected by Architect. Once sample installation has been approved, that sample becomes the standard of quality expected for that system throughout the project.

1.04 QUALITY ASSURANCE

Provide protection of materials and assemblies in place from plastering operations. Drawings are not necessarily intended to assign construction sequence or method, therefore, protection of in place materials and assemblies may be required in excess of that which can be construed from drawings. Furnish, install, then remove all that protection and scaffolding or staging at no additional cost.

**PART 2 - PRODUCTS**

**2.01 PLASTER MATERIALS**

- A. Cement: ASTM C150, Type I or II, Portland, 50 percent (50%) plastic cement by TXI Riverside Cement.
- B. Lime: ASTM C206, dry hydrated type. Lime putty, if proposed, shall weigh more than 83 pounds per cubic foot.
- C. Sand: ASTM C144, clean and well graded from coarse to fine.
- D. Water: Clean and free from injurious amounts of acid, alkali, and organic matter.
- E. Fiber Reinforcing: Provide chopped alkali-resistant glass fibers or 15 denier polypropylene fibers for use in scratch and brown coats.
- F. Color: Provide integral color stucco coat, colors as selected by Architect (3 minimum), manufactured by Expo Stucco, La Habra Stucco, Omega Products International, or equal. Integral coloring is to be used regardless of the fact that field painting is also required.
- G. High-Strength Gypsum Plaster: Structo-Base by U.S. Gypsum Co., or approved equal with average dry compressive strength of 2,800 psi per ASTM C472 for mix of 100 pounds of plaster with two cubic feet of sand.
- H. Gypsum Finish Coat: Red Top Keene's Cement by U. S. Gypsum Co., or approved equal meeting ASTM C61.

**2.02 LATH AND ACCESSORIES**

- A. Lath:
  - 1. At vertical surfaces without rigid back-up (between framing members) provide 3.4 pound, expanded metal wire (diamond mesh), galvanized, ASTM C847, paper backed at exterior locations, manufactured by Clarkwestern Dietrich Building Systems, LLC, ClarkDietrich Metal Lath and Accessories, or other approved. Provide with paper meeting FS QQ-L-101C, Type I, Grade D, at soffits and walls in wet areas.
  - 2. At vertical surfaces with rigid back-up (plywood) at exterior, over one layer of Grade D paper and one layer of leather back plaster felt, 1-1/2" x 17 gage woven wire galvanized stucco netting (self furring lath with staple attachment over plywood substrate is unacceptable), and at interior locations 1-inch x 20 gage woven wire stucco netting, ASTM C1032 as manufactured by Clarkwestern Dietrich Building Systems, LLC, ClarkDietrich Metal Lath and Accessories, or equal. Lath shall be held a minimum of 1/4-inch away from rigid back-up by the use of furring nails. Self furring lath with staple attachment over plywood substrate is unacceptable.
  - 3. At Exterior Soffits: Provide 3/8-inch rib, expanded diamond mesh weighing 3.4 pounds per square yard, fabricated from galvanized steel sheets, ASTM C847.
- B. Accessories: Provide galvanized trim such as Dietrich Cornerite TM, beads, screeds, and prefabricated joints for control and expansion/contraction, unless otherwise noted on Drawings.

1. Wire Staples: 16 gage by 1-3/8 inches long by 3/4- inches wide, or barbed roof nails 1-1/2 inches long with 7/16-inch head. At horizontal soffits provide 5/8-inch wide, 1-1/2 inches long, No. 9 W&M gauge ring shank hook staples.
  2. Hanger Wires: 8 gage
  3. Tie Wires: 16 gage or 18 gage. See Drawings.
  4. Sheet Metal Items: 26 gage corner beads, base screeds, runners, and expansion screeds.
  5. Expansion joint with expansion flange, including prefabricated joints for control and expansion/ contraction.
  6. Hot-Rolled Carrying Channels: 1-1/2 inches deep, weighing 1.12 pounds per lineal foot with wire hangers spaced 36 inches on centers.
  7. Cold-Rolled Furring Channels: 7/8-inch deep x 22 gage hat section, spaced at 16 inches on centers.
  8. Drip screeds as indicated on Drawings, or vented casing style bead.
  9. Vent Screeds: Fry channel screed aluminum extruded alloy 6063 TS, PCS-75-V 300 factory baked on custom color to match exterior plaster at soffit. Install where indicated on Drawings.
  10. Plaster Screeds and Moldings: Provide aluminum extruded alloy 6063 TS channel screeds and moldings by Fry Reglet Corp., as shown on the Drawings. Provide factory baked on custom color as selected by Architect.
  11. Furring Nails: Corrosion resistant with cardboard furring spacers.
- C. Galvanize metal fastening devices such as staples, nails, screws, and wire ties.
- D. Bonding Agent: Provide Plaster-Weld, or other approved, to allow proper bond of plaster to substrate.

## 2.03 ELASTOMERIC COATING

- A. Where indicated on the drawings, provide 100% acrylic elastomeric exterior finish coating, including prime coats for adhesion or base coat as required for to level finish on existing walls or soffits. Architect to select from manufacturer's standard finishes. Color shall be a custom color selected by the Architect.
- B. Acceptable Manufacturers and Products:
1. Weatherlastic by Dryvit (Basis of Design)
  2. Thorolastic by Thoro / BASF Chemical Co.

## PART 3 - EXECUTION

### 3.01 PREPARATION

- A. Properly prepare surfaces, substrates, and previously installed assemblies to receive of plaster finish.
- B. Ensure that existing surfaces are clean and free of loose and foreign material. Apply necessary surface treatments such as bonding agents when required or recommended.
- C. Lightly sandblast or acid wash existing surfaces where such treatment is recommended by the Plastering Institute, and where such treatment will not harm other surfaces or assemblies.
- D. Inspect framing systems in place to see that they are rigidly and permanently fastened; ready to receive lath, and provide written acceptance of substrate.

**3.02 FIELD QUALITY CONTROL**

- A. Comply with the requirements of California Building Code Chapter 25 for support of lath:  
"2507.3 Lath attachment to horizontal wood supports. [DSA-SS, DSA-SS/CC and OSHPD 1 & 4]

Where interior or exterior lath is attached to horizontal wood supports, either of the following attachments shall be used in addition to the methods of attachment described in referenced standards listed in Table 2507.2.

- 1. Secure lath to alternate supports with ties consisting of a double strand of No. 18 W & M gage galvanized annealed wire at one edge of each sheet of lath. Wire ties shall be installed not less than 3 inches (76 mm) back from the edge of each sheet and shall be looped around stripping, or attached to an 8d common wire nail driven into each side of the joist 2 inches (51 mm) above the bottom of the joist or to each end of a 16d common wire nail driven horizontally through the joist 2 inches (51 mm) above the bottom of the joist and the ends of the wire secured together with three twists of the wire.
- 2. Secure lath to each support with 1/2-inch-wide (12.7 mm), 1 1/2-inch-long (38 mm) No. 9 W & M gage, ring shank, hook staple placed around a 10d common nail laid flat under the surface of the lath not more than 3 inches (76 mm) from edge of each sheet. Such staples may be placed over ribs of 3/8-inch (9.5 mm) rib lath or over back wire of welded wire fabric or other approved lath, omitting the 10d nails."

END OF COMMENT

- 1. Interiors: Application of Metal Plaster Bases shall comply with the requirements of CBC section 2507.
- 2. Vertical and Horizontal Assemblies shall comply with CBC section 2507.

**3.03 INSTALLATION**

- A. Install lath with long dimension at right angles to supports. Lath over solid backing shall have at least 1/4-inch clearance from backing.
- B. Stagger ends of lath to avoid continuous joints. Lap joints at least 2 inches. Butt lath into internal corners and reinforce angles with Cornerite reinforcement, secured along edges at no more than 10 inch intervals.

- C. Attach lath to supports and side laps at 6 inches on centers maximum.
- D. Fasteners for lath and metal accessories (reveals, expansion joints, screeds, etc.) must be into wood framing members (on plywood only), and lengths need to consider plywood thickness (verify minimum penetration into wood studs, blocking, plates)
- E. Install control joints at maximum 10 foot intervals in each direction. Ensure a waterproof joint. Where recommended by the Plastering Institute or required by Code, install weep screeds.
- F. Attach plastering accessories to supports using blocking, provide true grounds for plaster. Wire-tie, nail or staple to supporting substrates. When solid flange moldings are installed the stucco netting shall be cut and wire placed over the flange before the molding is fastened to the substrate. Place additional building paper over the upper flange of horizontal moldings.
- G. If wood grounds are not shown, install preformed corner beads.
- H. As work progresses, build-in expansion/contraction joints as shown on drawings. If not detailed, place as recommended by Lath and Plastering Manual but gain written approval from Architect on their exact location prior to installation.

#### 3.04 NUMBER OF COATS AND THICKNESS

- A. Interior Base Coats for Ceramic Tile: Provide scratch approximately 1/2-inch thick, to receive brown coat by tile installer. Refer to tile section 09 30 00, for additional information.
- B. Exterior Veneer Stucco Over C.M.U.: Brown coat and two finish coats approximately 5/8-inch total thickness to cover substrate and provide medium dash finish coat with light knockdown.
- C. Exterior Stucco Over Lath and Framing: Scratch, brown and two finish coats approximately 7/8-inch thick. Provide medium dash finish coat, with light knock down.
- D. High-Strength Gypsum Plaster Over Metal Lath: Scratch, brown and Keene Cement Finish coats; smooth troweled.

#### 3.05 APPLICATION

- A. Scratch and Brown Coats: Apply with sufficient material to completely cover lath and scratch across supports. Patch cracks in brown coat prior to application of finish.
- B. Exterior Finish Coats: Apply in two coats with an approved type of plastering machine, each coat covering surface uniformly. Apply first coat to form medium dash coat texture pattern, followed by second coat resulting in uniform color and texture throughout project. All plaster will have an integral color in the finish coat. Smooth finishes will be unacceptable.
  - 1. Apply first coat by making several passes with nozzle to completely cover surface.
  - 2. Apply second coat by doubling back the same day, when first coat is sufficiently dry.
- C. Refer to Title 24, Section 2504, Part 2, California Building Code 2019, for horizontal

assemblies required for plaster ceilings.

**3.06 CURING**

- A. Moist cure the scratch coat for 48 hours prior to application of brown coat. Cure brown coat 7 days prior to application of finish coat (48 hours moist curing, 5 days additional curing.) For moist cure, keep plaster surface continuously wet by water fog spray, or cover surface with absorptive cover kept continuously wet.

**3.07 CUTTING AND PATCHING**

- A. Cut, patch, point up, and repair plaster as necessary to accommodate other work and to restore cracks, dents, and imperfections. Repair or replace work to eliminate blisters, buckles, excessive crazing and check cracking, dry outs, efflorescence, sweat outs, and similar defects and where bond to the substrate has failed.
- B. Sand smooth-troweled finishes lightly to remove trowel marks and arises.

**3.08 CLEANING AND PROTECTION**

- A. Remove temporary protection and enclosure of other work. Promptly remove plaster from door frames, windows, and other surfaces that are not to be plastered. Repair floors, walls, and other surfaces that have been stained, marred, or otherwise damaged during the plastering work. When plastering work is completed, remove unused materials, containers, and equipment and clean floors of plaster debris.
- B. Provide final protection and maintain conditions, in a manner suitable to ensure that plaster will remain intact without damage or deterioration at time of Substantial Completion.
- C. Plaster from beads, screeds, base, and trim. Leave work clean and ready for painting.

**END OF SECTION**

SECTION 09 29 00

**GYPSUM BOARD**

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section includes: Framing required for gypsum board ceilings, blocking and furring channels, as required, gypsum board walls and ceilings and taped and sanded joint treatment where required, including adhesives and texturizing as indicated on the Drawings and specified herein.
- B. Related Sections:
  - 1. Section 06 10 00 – Rough Framing.
  - 2. Section 09 90 00 – Painting and Coating.
  - 3. Division 10 – Specialties.

1.02 REFERENCE STANDARDS

- A. Work to conform to California Building Code, 2019, Chapter Title 24, Part 2.
- B. Perform gypsum board systems work in strict accordance with recommendations of the following reference standards, unless otherwise specified in this section or required by local code. Keep a copy of applicable reference standards in field office for duration of project.
  - 1. ASTM C1396 – Standard Specification for Gypsum Board.
  - 2. ASTM C1177 – Standard Specification for Glass Mat Gypsum Substrate for use as Sheathing.
  - 3. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
  - 4. ASTM C514 – Standard Specification for Nails for the Application of Gypsum Board.
  - 5. ASTM C557 – Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
  - 6. ASTM C1002 – Standard Specification for steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
  - 7. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
  - 8. ASTM E413 – Classification for Rating Sound Insulation.
  - 9. ASTM C840 – Standard Specification for Application and Finishing of Gypsum Board.
  - 10. ASTM D3273 – Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
  - 11. Gypsum Association - GA-216 – Recommended Specifications for the Application and Finishing of Gypsum Panel Products.
  - 12. Gypsum Association - GA-254 – Recommended Specifications for the Fire-Resistant Gypsum Sheathing.
  - 13. Underwriters Laboratories, Inc. (UL) - Building Materials Directory.
  - 14. Underwriters Laboratories, Inc. (UL) - Fire Resistance Index.

1.03 SUBMITTALS

- A. Submit copies of manufacturer's product information and installation instructions for each item and accessories.

**1.04 DELIVERY, STORAGE AND HANDLING**

- A. Deliver materials in manufacturer's unopened containers, packages or bundles identified with manufacturer's name, brand, type, and grade clearly marked.
- B. Store in dry areas and protect from dampness and deterioration.
- C. Protect ready-mixed products from freezing.
- D. Protect metal products from rusting.
- E. Deliver fire-rated materials bearing testing agency label and required fire classification number.

**1.05 PROJECT CONDITIONS**

- A. Do not install board products unless installation areas comply with minimum temperature and ventilation requirements recommended by manufacturer. As a minimum, provide temperatures above 50 degrees F. during and after installation.
- B. Under slow drying conditions, allow additional drying time between coats of joint treatment.
- C. Protect installed materials from drafts during hot, dry weather.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURERS**

- A. Provide gypsum board materials manufactured by one of the following:

United States Gypsum (USG)  
Pabco Gypsum  
Georgia Pacific  
National Gypsum Company

**2.02 GYPSUM BOARD:**

- A. Standard: ASTM C1396 Type I; 5/8-inch thick, Type X with U.L. designation as required by U.L. listing, tapered edges, ends square cut, maximum permissible lengths
- B. GEORGIA-PACIFIC DENSSHIELD® brand:
  - 1. Water-Resistant treated core covered front and back with acrylic coated high-density fiberglass mats.
  - 2. Panels to comply with ASTM D3273, E96; Thickness: 5/8 inch, unless otherwise indicated.
- C. Impact Resistant Gypsum Board: Interior Sheathing
  - 1. Georgia-Pacific – ToughRock®
  - 2. National Gypsum – Hi-Abuse XP®



## 3. USG – Fiberock® Abuse-Resistant Panels

## 2.03 GYPSUM BOARD ACCESSORIES

- A. Provide gypsum board accessories in accordance with GA-216, and as shown on drawings and specified.
- B. Trims: Provide accessories such as corner beads and edge trim as metal fabrications. Plastic materials will not be acceptable.
  - 1. Cornerbead: Use SHEETROCK paper faced metal outside corner, B1 XW EL.
  - 2. L-Trim: Use SHEETROCK paper faced metal "L" trim, B4.
  - 3. J-Trim: Use SHEETROCK paper faced metal "J" trim, B9.
  - 4. Control Joint: Use No. 93, Amico
  - 5. Bullnose Cornerbead: Use SHEETROCK paper faced metal 3/4-inch, or 1-1/2 inch (as selected by Architect). Bullnose outside corner.
- C. Fasteners: Corrosion resistant conforming to ASTM C1002.
  - 1. Wood Studs: Minimum 1-1/4 inch, Type W, bugle head.
  - 2. Metal Studs: Minimum Type S, bugle head.
  - 3. Ceiling Furring: S-12, bugle head at 12 inches at all edges and supports.
- D. Adhesive: Provide type manufactured by US Gypsum or other approved, appropriate for attaching board to dissimilar substrate materials shown on Drawings.
  - 1. Gypsum board to gypsum board- Durabond or Easy Sand.
  - 2. Gypsum board to coreboard, or sound deadening board- Durabond or Easy Sand.
  - 3. Gypsum board to cementitious substrates- Durabond 90.
- E. Joint Treatment:
  - 1. Paper tape conforming to ASTM C475, or USG Heavy Duty.
  - 2. Compound-powdered or ready-mixed conforming to ASTM C475. Taping and topping joint compound or all-purpose joint compound may be used.
- F. Texturing:
  - 1. Wall Texturing: Provide materials manufactured by one of the following:
    - a. Hamilton Drywall Products
    - b. USG
    - c. National Gypsum Co.
  - 2. Ceiling Texturing: Provide materials manufactured by one of the following:
    - a. Hamilton Drywall Products
    - b. USG
    - c. National Gypsum Co.
- G. Shims: Provide for between studs and gypsum board for level and true wall plane.
- H. Drywall Channel Screeds: Provide channel screeds and moldings by Fry Reglet Corp., as shown on the Drawings. Provide custom colors as selected by the Architect.

- I. Acoustical Sealant: USG SHEETROCK Acoustical Sealant.
- J. Drywall Primer: USG SHEETROCK 1<sup>st</sup> Coat.
- K. Setting Compound: DURABOND or Easy Sand.

**2.04 ACCESS DOORS**

- A. In partitions and ceilings installed in accordance with this Section, provide doors where shown on the Drawings and where required for access to mechanical installations and electrical installations. Verify quantity, type and location with mechanical and electrical trades.
- B. Types:
  - 1. Refer to Specification Divisions 22, 23 & 26 for types of access doors. Contractor shall provide appropriate access doors for all plumbing, electrical and mechanical devices which need access for future maintenance purposes.
  - 2. For piercing fire-rated surfaces, provide access doors having the same fire rating as the surface being pierced.
  - 3. For tile surfaces and toilet rooms, provide stainless steel access doors and frames, with satin finish.
  - 4. For other installations, provide prime-coated steel access doors and frames for finish painting to be performed at the job listed under Section 09 90 00 of these Specifications.

**2.05 DRYWALL REVEAL MOLDINGS**

- A. Drywall Channel Screeds: Provide channel screeds and moldings by Fry Reglet Corp., as shown on the Drawings. Provide custom colors as selected Architect.
  - 1. 3/4-inch Model No. DRM-625-75 by Fry Reglet Corp.

**2.06 OTHER MATERIALS**

- A. Provide other materials, not specifically described but required for a complete and proper installation, as selected by the Contractor subject to the acceptance of the Architect.
- B. Metal Trim: The Drawings do not show all locations and requirements for metal trim. Carefully study the Drawings and the installation and provide all metal trim normally recommended by the manufacturer of the gypsum wall board accepted for use in this Work.

**PART 3 - EXECUTION**

**3.01 PREPARATION**

- A. Examine the areas and conditions under which Work of this Section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

**3.02 INSTALLATION**

- A. Install gypsum board in accordance with the Drawings and with the separate boards in moderate contact but not forced into place.

- B. At internal and external corners, conceal the cut edges of the boards by the overlapping covered edges of the abutting boards.
- C. Stagger the boards so that corners of any four boards will not meet at a common point except in vertical corners.
- D. Joints between wall and floor shall not exceed 1/8-inch. Where sound-rated drywall construction is indicated, seal construction at perimeters, control and expansion joints, openings and penetrations with a continuous bead of acoustical sealant including a bead at both faces of partitions. Comply with ASTM C919 and manufacturer's recommendation for location of edge trim and close off sound-flanking paths around or through construction, including sealing of partitions above acoustical ceilings.
- E. Ceilings: Install the gypsum wallboard to ceilings with the long dimension of the wallboard at right angles to the supporting members.
  - 1. Wall board may be installed with the long dimension parallel to supporting members that are spaced 16 inches on centers when attachment members are provided at end joints.
- F. Walls: Install the gypsum wallboard to studs at right angles to the furring or framing members.
  - 1. Make end joints, where required, over framing or furring members.
  - 2. Install gypsum wallboard over full height of all stud walls.
- G. Attaching:
  - 1. Drive the specified screws with clutch-controlled power screwdrivers, spacing the screws 12 inches on centers at ceilings and 16" on center at walls.
  - 2. Where framing members are spaced 24 inches apart on walls, space screws 12" on centers.
  - 3. Attach double layers in accordance with the pertinent codes and the manufacturer's recommendations as accepted by the Architect.
  - 4. Attach to wood as required by governmental agencies having jurisdiction.
- H. Access Doors:
  - 1. By careful coordination with the Drawings and with the trades involved, install the specified access doors (Section 10 00 00 and specifications in Division 23, Mechanical) where required.
  - 2. Anchor firmly into position and align properly to achieve an installation flush with the finished surface.

### 3.03 JOINT TREATMENT

- A. Inspect areas to be joint treated, verifying that the gypsum wall board fits snugly against supporting framework.
- B. In areas where joint treatment and compound finishing will be performed, maintain a temperature of not less than 55 degrees for 24 hours prior to commencing the treatment, and maintain temperature until joint finishing compounds have dried.
- C. Apply the joint treatment and finishing compound by machine or hand tool.

- D. Provide a minimum drying time of 24 hours between coats, with additional drying time in poorly ventilated areas.
- E. Embedding Compounds:
  - 1. Apply to gypsum wallboard and fastener heads in a thin uniform layer.
  - 2. Spread the compound not less than 3 inches wide at joints, center the reinforcing tape in the joint, and embed the tape in the compound. Then spread a thin layer of compound over the tape.
  - 3. After this treatment has dried, apply a second coat of embedding compound to joints and fastener heads, spreading in a thin uniform coat to not less than 6 inches wide at joints, and feather edged.
  - 4. Sandpaper between coats as required.
  - 5. When thoroughly dry, sandpaper to eliminate ridges and high points.
- F. Finishing Compounds:
  - 1. After embedding compound is thoroughly dry and has been completely sanded, apply a coat of finishing compound to joints and fastener heads.
  - 2. Feather the finishing compound to not less than 12 inches wide.
  - 3. When thoroughly dry, sandpaper to obtain a uniformly smooth surface, taking care not to scuff the paper surface of the wallboard.
  - 4. Texture finish walls and ceilings to be painted. Submit a sample to the Architect for acceptance.

#### **3.04 CORNER TREATMENT**

- A. Internal Corners: Treat as specified for joints, except fold the reinforcing tape lengthwise through the middle and fit neatly into the corner.
- B. External Corners:
  - 1. Install the specified corner bead, fitting neatly over the corner and securing with the same type fasteners used for installing the wallboard.
  - 2. Space the fasteners approximately 6 inches on centers, and drive through the wallboard into the framing or furring member.
  - 3. After the corner bead has been secured into position, treat the corner with joint compound and reinforcing tape as specified for joints, feathering the joint compound out from 8 inches to 10 inches on each side of the corner.

#### **3.05 CLEANUP**

- A. In addition to other requirements for cleaning, use necessary care to prevent scattering gypsum wallboard scraps and dust, and to prevent tracking gypsum and joint finishing compound onto floor surfaces.
- B. At completion of each segment of installation in a room or space, promptly pick-up and remove from the working area all scrap, debris, and surplus material of this Section.

**END OF SECTION**

## SECTION 09 90 00

## PAINTING AND COATING

## PART 1 - GENERAL

## 1.01 SUMMARY

- A. Section includes: Provide materials, labor and equipment necessary for the completion of a completely painted project, including preparation of painted surfaces. Provide finishes based on materials and products scheduled in these specifications and on the drawings. If not otherwise specified, provide prime coat and two finish coats on all exposed to view or weather surfaces. This shall include painting all pigmented exterior plaster (integral color stucco) in not less than three colors. The following miscellaneous items shall also be painted:
1. Areas shown to be painted on the Room Finish Schedule or Exterior and Interior Elevations. Items called out to be painted in Divisions 23 and Division 26. All hollow metal.
  2. Exposed site plumbing items, such as PIV's, backflow preventors, exposed pipes and standpipes, fire hydrants, irrigation air relief valve covers, exposed valves, exposed roof drain pipes, etc.
  3. Exposed interior piping and electrical conduits (except in electrical rooms and closets), wall and ceiling access covers, hatches, panel covers, and plates, and exposed cable tray and supports.
  4. Roof hatches (interior and exterior), exterior galvanized ladders, sheet metal parapet copings on both sides and top. Exposed metal components that arrive on job with only prime finish. Sign posts. Decorative metal fence and gates. Metal railings and bollards. Exposed steel connectors, bolts, and plates.
  5. Stain and seal exposed wood components.
- B. Specific items NOT to be painted or finished: Factory finished items (as opposed to factory primed), chain link fence, volleyball and basketball posts, football goals, chin-up bars, concrete benches, wood casework finished by casework fabricator.
- C. Related Work:
1. Section 07 92 00 – Joint Sealants.
  2. Section 09 29 00 – Gypsum Board.
  3. Mechanical, Division 23.
  4. Electrical, Division 26.

## 1.02 REFERENCE STANDARDS

- A. Conform to California Air Resources Board (CARB) Rules, especially 1113, Architectural Coatings.
- B. 2019, Title 19, California Code of Regulations (CCR), Public Safety, State Fire Marshal Regulations

## 1.03 SUBMITTALS

- A. Prepare eight, 8-1/2-inch by 11-inch samples of finishes, to be provided to District's Maintenance and Operations Department. When possible, apply finishes on identical type materials to which they will be applied on job.
- B. Identify each sample as to finish formula, color name, reflectance number and sheen name and gloss units.
- C. Colors will be selected by Owner and Architect prior to commencement of work, from manufacturer's full range of standard and custom colors.
- D. State Fire Marshal, Fire and Life Safety Approval: Flame retardant coatings shall be listed by the California State Fire Marshal's office. A copy of this listing and a material specification sheet shall accompany the submittal.
- E. Submittal to be reviewed and signed by District's Maintenance and Operations Department prior to Architects approval.

**1.04 QUALITY ASSURANCE**

- A. Mock-up: Before proceeding with paint application, finish one complete surface of each color scheme required, clearly indicating selected colors, finish texture, materials and workmanship. If approved, sample area will serve as a minimum standard for work throughout.

**1.05 MAINTENANCE MATERIALS**

- A. Leave on premises where directed, not less than one full gallon of each color, of each type of paint, in new unopened containers. Label each container for identification.

**1.06 DELIVERY, STORAGE AND HANDLING**

- A. Deliver paint materials in sealed original labeled containers bearing manufacturer's name, type of paint, brand name, solids content, color designation and instructions for mixing and/or reducing.
- B. Provide adequate storage facilities. Store paint materials at a minimum ambient temperatures of 65 degrees F., in well ventilated area.
- C. Take precautionary measures to prevent fire hazards and spontaneous combustion.

**1.07 PROJECT CONDITIONS**

- A. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture contents of surfaces are below following minimums: gypsum board - 12 percent; cementitious materials - 12 percent.
- B. Ensure surface temperatures and surrounding temperatures are above 50 degrees F., before applying finishes.
- C. Provide adequate continuous ventilation and sufficient heating facilities to maintain temperatures above 50 degrees F., for 24 hours before, during, and 48 hours after application of finishes.
- D. During painting, provide minimum of 25 foot candles of lighting on surfaces to be painted.

**PART 2 - PRODUCTS****2.01 MANUFACTURERS**

- A. Provide paints and coatings manufactured by one of the following companies noted in Section 2.02, D and refer to cross-reference guide for acceptable alternates.

**2.02 PAINT MATERIALS**

- A. Accessories: Provide linseed oil, turpentine and other materials not specifically specified but required to achieve finishes.
- B. Paints and Coatings: Provide ready-mixed type except field catalyzed coatings; pigments fully ground maintaining soft paste consistency, capable of being readily and uniformly dispersed to complete homogeneous mixtures.
- C. Provide paints and coatings with good flowing and brushing properties and capable of drying or curing free of streaks and sags.
- D. **Painting**  
Provide equivalent paint types according to the following schedule.

**Interior****New Drywall (Semi Gloss Finish)**

1 <sup>st</sup> coat	S-W ProMar 200 Zero VOC Primer
2 <sup>nd</sup> coat	S-W ProMar 200 Zero VOC Semi-Gloss
3rd coat (to cover*)	S-W ProMar 200 Zero VOC Semi-Gloss

**New Drywall (Low Sheen Finish)**

1 <sup>st</sup> coat	S-W ProMar 200 Zero VOC Primer
2 <sup>nd</sup> coat	S-W ProMar 200 Zero VOC Low-Sheen Eg-shel
3rd coat (to cover*)	S-W ProMar 200 Zero VOC Low-Sheen Eg-shel

**New Drywall (Eggshell Finish)**

1 <sup>st</sup> coat	S-W ProMar 200 Zero VOC Primer
2 <sup>nd</sup> coat	S-W ProMar 200 Zero VOC Eg-shel
3rd coat (to cover*)	S-W ProMar 200 Zero VOC Eg-shel

**New Wood Painted Surfaces (Semi Gloss Finish)**

1 <sup>st</sup> coat	S-W Preprite ProBlock Primer
2 <sup>nd</sup> coat	S-W ProIndustrial WB Alkyd Urethane Semi-Gloss
3rd coat (to cover*)	S-W ProIndustrial WB Alkyd Urethane Semi-Gloss

**New Steel Door / Door and Window Frames**

1 <sup>st</sup> step	GLL Clean n Etch
1 <sup>st</sup> coat	S-W ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	S-W ProIndustrial WB Alkyd Urethane Semi-Gloss
3rd coat (to cover*)	S-W ProIndustrial WB Alkyd Urethane Semi-Gloss

**New Ferrous Metal (including steel doors and hollow metal frames)**

Pretreatment	GLL Clean n Etch
1 <sup>st</sup> coat	S-W ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	S-W ProIndustrial WB Alkyd Urethane Semi-Gloss
3rd coat (to cover*)	S-W ProIndustrial WB Alkyd Urethane Semi-Gloss

New Galvanized Metal

Pretreatment	GLL Clean n Etch
1 <sup>st</sup> coat	S-W ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	S-W ProIndustrial WB Alkyd Urethane Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	S-W ProIndustrial WB Alkyd Urethane Semi-Gloss

Ceilings

1 <sup>st</sup> coat	S-W Quick Dry Stain Blocking Primer
2 <sup>nd</sup> coat (to cover*)	S-W ProIndustrial WB Acrylic Dry Fall Flat

Exterior

New Painted Stucco-Plaster-Concrete (Low Sheen Finish)

1 <sup>st</sup> coat	S-W Loxon Masonry Primer
2 <sup>nd</sup> coat	S-W A100 Satin
3 <sup>rd</sup> coat (to cover*)	S-W A100 Satin

New Painted Wood (Gloss Finish)

1 <sup>st</sup> coat	S-W Preprite ProBlock Primer
2 <sup>nd</sup> coat	S-W ProIndustrial WB Alkyd Urethane Gloss
3 <sup>rd</sup> coat (to cover*)	S-W ProIndustrial WB Alkyd Urethane Gloss

New Painted Wood (Semi-Gloss Finish)

1 <sup>st</sup> coat	S-W Preprite ProBlock Primer
2 <sup>nd</sup> coat	S-W ProIndustrial WB Alkyd Urethane Semi-Gloss
3 <sup>rd</sup> coat (to cover*)	S-W ProIndustrial WB Alkyd Urethane Semi-Gloss

New Painted Wood (Low Sheen Finish)

1 <sup>st</sup> coat	S-W Preprite ProBlock Primer
2 <sup>nd</sup> coat	S-W A100 Satin
3 <sup>rd</sup> coat (to cover*)	S-W A100 Satin

New Steel Doors / Door and Window Frames

1 <sup>ST</sup> step	GLL Clean n Etch
1 <sup>st</sup> coat	S-W ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	S-W ProIndustrial WB Alkyd Urethane Gloss
3 <sup>rd</sup> coat (to cover*)	S-W ProIndustrial WB Alkyd Urethane Gloss

New Ferrous Metal

1 <sup>ST</sup> step	GLL Clean n Etch
1 <sup>st</sup> coat	S-W ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	S-W ProIndustrial WB Alkyd Urethane Gloss
3 <sup>rd</sup> coat (to cover*)	S-W ProIndustrial WB Alkyd Urethane Gloss

New Galvanized Metal

Pretreatment	GLL Clean n Etch
1 <sup>st</sup> coat	S-W ProCryl Acrylic Metal Primer
2 <sup>nd</sup> coat	S-W ProIndustrial WB Alkyd Urethane Gloss
3 <sup>rd</sup> coat (to cover*)	S-W ProIndustrial WB Alkyd Urethane Gloss

- E. **SPECIAL COATINGS (HIGH PERFORMANCE) –** Exterior metal stairs (including handrails, railings and guard rails), roof sheet metal flashing, roof equipment, metal wall louvers and other metal surfaces requiring High Performance Coatings.

Unprimed or shop primed ferrous metal

1 <sup>st</sup> coat	S-W Macropoxy 646
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2 <sup>nd</sup> coat	S-W High Solids Polyurethane
3 <sup>rd</sup> coat (to cover*)	S-W High Solids Polyurethane

Galvanized or Aluminum

1 <sup>st</sup> coat	S-W Macropoxy 646
2 <sup>nd</sup> coat	S-W High Solids Polyurethane
3 <sup>rd</sup> coat (to cover*)	S-W High Solids Polyurethane

- F. **Other** – Wood, metal and concrete steps and ramps attached to buildings indicated will be painted as follows:

Concrete Steps/Ramps

1 <sup>st</sup> coat	S-W Macropoxy 646
2 <sup>nd</sup> coat	S-W High Solids Polyurethane
3 <sup>rd</sup> coat (to cover*)	Include yellow safety stripes

Metal Steps/Ramps

1 <sup>st</sup> coat	S-W Macropoxy 646
2 <sup>nd</sup> coat	S-W High Solids Polyurethane
3 <sup>rd</sup> coat (to cover*)	S-W High Solids Polyurethane w/ sand
4 <sup>th</sup> coat	Include yellow stripes

\*"to cover" is defined – coverage must meet district's approval

\*\*"spot prime" is defined as priming all bare metal areas

H. **Anti-Graffiti Coating**

1. Preferred Product: Graffiti Barrier VOC: by Surtec, Inc., Surface Technology, 1880 N. MacArthur Drive, Tracy, CA 95376, Phone: (209) 820-3700.
2. Approved Alternate: Monochem Permashield Premium: by Monopole Inc., 4661 Alger Street, Los Angeles, CA. 90039, Phone: 818-500-8585

I. **Paint Guide**

SURFACES	SHERWIN WILLIAMS
Interior	ProIndustrial WB Alkyd Urethane S/G
Interior	ProIndustrial WB Alkyd Urethane L/S
Exterior	A100 Satin
Exterior	ProIndustrial WB Alkyd Urethane Gloss

J. **Primer Guide**

SURFACES	SHERWIN WILLIAMS
Interior – New Gypsum Board	ProMar 200 Zero VOC Primer
Interior – New Wood	Preprite ProBlock Primer
Interior – New Metal Surfaces	GLL Clean n Etch
Exterior – New Painted Wood	Preprite ProBlock Primer
Exterior – New Painted Stucco, Concrete, and Plaster	Loxon Masonry Primer
Exterior – New Painted Metal	GLL Clean n Etch

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Thoroughly examine surfaces scheduled to be painted prior to commencement of work. Report in writing of conditions potentially detrimental to proper application. Do not commence until satisfied that defects and deficiencies in surfaces have been rectified.

**3.02 PROTECTION**

- A. Adequately protect other surfaces from paint and damages. Repair damages as a result of inadequate or unsuitable protection.
- B. Furnish sufficient drop cloths, shields and protective equipment to prevent spray or droppings from fouling surfaces not being painted and in particular, surfaces within storage and preparation areas.
- C. Place cotton waste cloths and materials which may constitute a fire hazard in closed metal containers and remove daily from site.
- D. Remove or cause to have removed, electrical plates, fittings, fastenings, escutcheons, and hardware prior to painting operations. These items are to be carefully stored, cleaned and replaced on completion of work in each area. Do not use solvents or other harsh cleansers on surfaces which could be damaged by such use of materials.

**3.03 PREPARATION OF SURFACES**

- A. Thoroughly clean surfaces to be painted with hydro-cleaning process to remove chalk, dirt and other deleterious materials where such cleaning methods are practical. Spot prime before application of finish coats.
- B. Remove dirt, grease and oil from canvas and cotton covered insulated materials such as pipes and ducts.
- C. On surfaces to be cleaned which cannot be hydro-cleaned, where possible, wash with solution of TSP and thoroughly rinse.
- D. Patch and prime cementitious materials.
- E. Remove contamination from gypsum board surfaces and prime to conceal defects. Paint after defects have been remedied.
- F. Remove surface contamination and oils from zinc coated/galvanized surfaces, wash with solvent, apply etching primer or as recommended by paint manufacturer and confirmed with metal manufacturer.
- G. Remove dirt, loose scale, powder, mortar and other foreign matter from cementitious surfaces which are to be painted or to receive sealer. Remove oil and grease with TSP solution, rinse well and allow to thoroughly dry.
- H. Remove stains from cementitious surfaces caused by weathering of corroding materials with a solution of sodium metasilicate after being thoroughly wetted with water. Allow to thoroughly dry.
- I. Fill hairline cracks, small holes and imperfections. Smooth off to match adjacent

surfaces. Smooth off to match adjacent surfaces. Wash and neutralize high alkali where they occur.

- J. Remove grease, rust, scale, dirt and dust from steel and iron surfaces. Where heavy coatings of scale are evident, remove by wire brushing, sandblasting or other method necessary, practical and in accordance with Steel Structures Painting Council.
- K. Clean non-primed steel surfaces by washing with solvent. Apply a treatment of phosphoric acid solution, ensuring welded joints, bolts and nuts are similarly cleaned. Prime surfaces to indicate defects. Paint after defects have been remedied.
- L. Sand and scrape shop primed steel surfaces to remove loose primer, and rust. Feather out edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare surfaces.
- M. Wipe off sanding dust and grit from miscellaneous wood and carpentry items prior to priming. Spot coat knots, pitch steaks and sappy sections with sealer. Fill nail holes and cracks after primer has dried and sand between coats. Back prime interior and exterior woodwork.
- N. Doors:
  - 1. Painting Contractor shall not remove or reinstall any door hardware.
  - 2. Except for door hinges, painting of doors must be completed prior to installation of hardware.

### 3.04 APPLICATIONS

- A. Apply each coat at proper consistency.
- B. Each coat of paint is to be slightly darker than preceding coat unless otherwise directed, or finish is clear.
- C. Sand lightly between coats to achieve required finish.
- D. Do not apply finishes on surfaces that are not sufficiently dry.
- E. Allow each coat to dry before following coats are applied.
- F. Backprime wood which is to receive paint or enamel paint, with enamel undercoater paint.
- G. Prime top and bottom edges of wood doors with enamel undercoater when they are to be painted.
- H. Apply flame retardant coating to the wood surface prior to applying stain and/or paint per manufacturer's instructions. Furnish certification of application of flame retardant coating.

### 3.05 MECHANICAL AND ELECTRICAL EQUIPMENT

- A. Refer to mechanical and electrical sections of these specifications, as well as Drawings, with respect to painting and finishing requirements, color coding, identification banding of equipment, ductwork, piping and conduit.
- B. Remove grilles, covers and access panels for mechanical and electrical systems from location and paint separately.

- C. Finish paint primed equipment to colors selected.
- D. Prime and paint insulated and bare pipes, conduits, boxes, insulated and bare ducts, hangers, brackets, collars and supports, except where items are plated or covered with a pre-finished coating, or are not exposed-to-view.
- E. Replace identification markings on mechanical and electrical equipment when painted over or spattered.
- F. Paint interior surfaces of air ducts, convector and baseboard heating cabinets that are visible through grilles and louvers with one coat of flat black paint, to limit of sightline. Paint dampers exposed immediately behind louvers, grilles, convector and baseboard cabinets to match face panels, as applicable.
- G. Paint both sides and edges of plywood backboards for electrical equipment before installing backboards and mounting equipment on them.
- H. Color code equipment, piping, conduit, and exposed ductwork of mechanical and electrical work. Color banding and identification shall include flow arrows, naming, numbering, stenciling, etc.

**3.06 CLEANING**

- A. As work progresses and upon completion, promptly remove paint where spilled, splashed, smeared and splattered.
- B. During progress of work, keep premises free from unnecessary accumulations of tools, equipment, surplus materials and debris.
- C. Upon completion of work, leave premises neat and clean, to satisfaction of Owner.

**END OF SECTION**

**SECTION 10 14 00**

**SIGNAGE**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Site signs, building signs, room identification (door) signs, and code-required informational signs, except electrical light exit signs.
- B. Related Work Not Included: Electrical light exit signs.

**1.02 SUBMITTALS**

- A. Provide all submittals in accordance with the requirements of Section 01 33 00.
- B. Product Data: Submit manufacturer's technical data related to materials, component dimensions, profiles, finishes, and installation.
- C. Shop Drawings: Submit shop drawings for fabrication and erection of site signs. Show anchors, grounds, reinforcement, accessories, layout, and installation details.
  - 1. Submit full-scale layout for each sign larger than 48 inches in any dimension required for review of wording, spacing, and letter design.
- D. Samples: Submit sample of each product and material indicating color, finish, pattern, and texture.
  - 1. Submit samples of each color and finish of exposed materials and accessories required for specialty signs.
  - 2. Submit one full-size sample sign of type, style, and color specified, including method of attachment. If accepted, sample will become part of the job.

**1.03 QUALITY ASSURANCE**

- A. In addition to complying with pertinent codes and regulations, comply with industry and trade standards normally associated with this product or material.
- B. Design Data: Design, fabricate, and install exterior signs to withstand a wind pressure of 100 mph on the total sign area in all directions.
- C. Mock-up: Construct full-size mock-up, in medium of supplier's choice, of school site sign for approval.

**1.04 DELIVERY, STORAGE AND HANDLING**

- A. Protect signs components and surfaces against damage during transportation and unloading.

**1.05 WARRANTY**

- A. Provide written warranty to maintain, repair and replace products and materials for one year following Notice of Completion date, without additional cost to Owner, as specified in Section 01 78 30 – Warranties, Guarantees, and Bonds. Provide 20 year life

expectancy for legibility, color retention and resistance to climatic elements.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Provide products from Best Sign Systems - 1-800-235-2378, or ASI Sign Systems - 800-247-7732, or equal.

### 2.02 MATERIALS

- A. All signage shall conform to CBC, 2019, Title 24, Part 2, Sections 11B-603.2.3, 11B-604.8.1.2, and 11B-703. Tactile exit signage shall be provided per Section 1011.4.
- B. Fiberglass - Glass fiber reinforced thermosetting resin – 1/4-inch 2.48 lb/SF.
- C. Metal: Cast aluminum with baked enamel finish. Engraved areas shall be filled with contrasting color paint. Use only where existing signage is metal.
- D. Signage and graphics:

**Raised characters** shall comply with **CBC Section 11B-703.2**:

**Depth:** It shall be 1/32 inch (0.8 mm) minimum above their background and shall be sans serif uppercase and be duplicated in Braille.

**Height:** It shall be 5/8 inch (15.9 mm) minimum and 2 inches (51 mm) maximum based on the height of the uppercase letter "I". **CBC Section 11B-703.2.5**

**Finish and contrast:** Characters and their background shall have a non-glare finish. Character shall contrast with their background with either light characters on a dark background or dark characters on a light background.

**CBC Section 11B-703.5.1**

**Proportions:** It shall be selected from fonts where the width of the uppercase letter "O" is 60 % minimum and 110 % maximum of the height of the uppercase letter "I". Stroke thickness of the uppercase letter "I" shall be 15 % maximum of the height of the character. **CBC Sections 11B-703.4 and 11B-703.6**

#### **Character Spacing (CBC Section 11B-703.2)**

Character spacing shall be measured between the two closest points of adjacent raised characters within a message, excluding word spaces. Where characters have rectangular cross sections, spacing between individual raised characters shall be 1/8 inch (3.2 mm) minimum and 4 times the raised character stroke width maximum. Where characters have other cross sections, spacing between individual raised characters shall be 1/16 inch (1.6 mm) minimum and 4 times the raised character stroke width maximum at the base of the cross sections, and 1/8 inch (3.2 mm) minimum and 4 times the raised character stroke width maximum at the top of the cross sections. Characters shall be separated from raised borders and decorative elements 3/8 inch (9.5 mm) minimum.

**Line Spacing(CBC Section 11B-703.2.8)**

Spacing between the baselines of separate lines of raised characters within a message shall be 135 percent minimum and 170 percent maximum of the raised character height.

**Braille:** It shall be contracted (Grade 2) and shall comply with **CBC Sections 11B-703.3 and 11B-703.4**. Braille dots shall have a domed and rounded shape and shall comply with **CBC Table and Figure 11B-703.3.1**.

**Mounting height:** A tactile sign shall be located 48" minimum to the baseline of the lowest Braille cells and 60" maximum to the baseline of the highest line of raised characters above the finish floor or ground surface.

**Mounting location:** A tactile sign shall be located on the approach side, as one enters or exits rooms or space, and be reached within 0" of the required clear floor space per **CBC Section and Figure 11B -703.4.2** as follows:  
a clear floor space of 18' x 18" minimum, centered on the tactile characters, shall be provided beyond the arc of any door swings between the closed position and 45 degree open position.  
on the wall at the latch side of a single door.  
on the inactive leaf of a double door with one active leaf.  
on the wall at the right side of a double door with two active leaves.  
on the nearest adjacent wall where there is no wall space at the latch side of a single door or no space at the right side of a double door with two active leaves.

**Visual characters** shall comply with **CBC Section 11B-703.5** and shall be 40" minimum above finish floor or ground.

**Pictograms** shall comply with **CBC Section 11B-703.6**.

**Symbol of accessibility** shall comply with **CBC Section 11B-703.7**.

## 2.03 SIGNS

- A. Exterior Room Identification Signs: Equal to Best Sign Systems FG, Graphic Blast®, Format: borderless. Color as selected by Architect from manufacturer's standard colors. Color to contrast building background. Sign material 1/4-inch thick, non-glare, Fiberglass, size as indicated on plans, with 1/2-inch radius rounded corners and beveled edges. Tactile character/symbols shall be raised 1/32-inch from sign face. The size of the signage shall be confirmed with the Architect. The intention is for the new signage for this project to match the existing signage which has been used in recent construction elsewhere on the campus.

All text shall be accompanied by California Contracted (Grade 2) Braille. Provide one (1) sign per exterior door. Each sign to bear a room number and up to 16 letter text.

Unless shown otherwise on the Drawings, room number shall be 2 inches high, text shall be 1 inch high. Letter styles shall be Helvetica, medium. Signs shall comply with CBC 2019, Title 24, Part 2, Sections 11B-216 and 11B-703.

- B. Toilet Room Signs: Equal to Best Sign System FG, Graphic Blast®. Provide 1/4-inch thick, non-glare fiberglass with International symbols for RESTROOM. Locate 5'-0" above floor to center line of sign. (No Braille or raised Pictograms on door signs.) Sign color to contrast 70% with door leaf.

1. For unisex toilets, provide a door-mounted sign consisting of a circle 1/4-inch thick and 12 inches in diameter with a 1/4-inch thick triangle, 12 inches in diameter, with a vertex pointing upward, superimposed on the circle. Triangle shall contrast in color with circle, and circle shall contrast 70% with door leaf. Entire background color of geometric symbol sign must contrast with door. Sign shall comply with CBC 2019, Title 24, Part 2, Section 11B-703.7.2.6.3.
2. At toilets equipped for persons with disabilities, provide a wall mounted Best Sign Systems, size 8"x8" with 1/2 radius corners (as detailed on the Drawings) with an International Symbol of Accessibility pictogram, and California Contracted Grade 2 Braille.

### **PART 3 - EXECUTION**

#### **3.01 INSTALLATION**

- A. General: Locate signs where indicated on Drawings, and at heights as detailed, or where required by CBC 2019, Title 24, using mounting methods appropriate to application and in compliance with manufacturer's instructions.
- B. Install signs level, plumb, and at required height.
- C. Interior Wall and Door Mounted Signs:
  1. Glass Surfaces or Doors: Use double-sided foam tape and liquid silicone adhesive. At glass surfaces, provide a blank 9" x 9", 1/8-inch sign panel with 1/2-radius corners, at the opposite side of glass. Color to match sign panel.
  2. Irregular, Porous, or Vinyl-Covered Surfaces: Use one-way tamper proof screws, painted to match signs, in pre-drilled holes. Provide adequate spaces behind signs so signs are in a plumb, square, level plane.
  3. Brick, Masonry, and Concrete Surfaces: Use one-way tamperproof screws, painted to match signs, in pre-drilled holes. Provide adequate spaces behind signs so signs are in a plumb, square, level plane.
- D. Exterior Wall and Door Mounted Signs:
  1. Brick, Masonry, Plaster and Masonry Surfaces: Use tamper proof screws, painted to match signs, in pre-drilled holes; one at each corner, and set in liquid silicone adhesive. Provide adequate spaces behind signs so signs are in a plumb, square, level plane.

#### **3.02 CLEANING**

- A. Clean sign and surrounding surfaces to remove all dirt and debris from work of this section.

**END OF SECTION**



SECTION 10 28 13

TOILET ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes: Toilet accessories including attachment devices, and required rough-in frames as indicated on the Drawings and specified herein.
- B. Related Work:
  - 1. Blocking and unframed mirrors.

1.02 SUBMITTALS

- A. Manufacturer's catalog and data sheets, parts list, and installation requirements for each unit specified.
- B. Maintenance, operation instructions and keys required for each type of equipment and lock.

1.03 QUALITY ASSURANCE

- A. Manufacturers: Model numbers are for washroom accessories manufactured by Bobrick Washroom Equipment, Inc. and are listed as a standard of quality. Equivalent products of other manufacturers may be acceptable, if, in the judgment of the architect, they meet the intent of the specification in terms of design, function, materials, and quality of workmanship. Products by other manufacturers may be provided, if approved equal by Architect.
- B. Accessories shall be products of a single manufacturer. Keyed (tumbler lock) accessories shall be keyed alike with the exception of coin receiving boxes on vending equipment.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Deliver items in manufacturer's original unopened protective packaging.
- B. Store material in original protective packaging to prevent soiling, physical damage, or wetting.
- C. Handle so as to prevent damage to finished surfaces.
- D. Maintain protective covers on units until installation is complete. Remove covers at final clean-up of installation.

1.05 GUARANTEE

- A. Mirrors guaranteed 15 years against silver spoilage. Accessories guaranteed to be free from defects in workmanship and material for a period of one year, as specified in Section 01 78 30 – Warranties, Guarantees, and Bonds.

**PART 2 - PRODUCTS**

**2.01 MANUFACTURER**

- A. Contract documents are based on Bobrick Washroom Equipment, Inc., and are listed as a standard of quality. Products by other manufacturers may be acceptable if approved equal by Architect in terms of design, function, materials and quality of workmanship.
- B. Accessories shall be product of one manufacturer. Keyed accessories shall be keyed alike with exception of coin receiving boxes on vending equipment. Provide recessed accessories at all accessible compartments.
- C. Toilet Accessories required to be accessible shall be mounted at heights according to CBC 2019, Title 24, Part 2, Section 11B-213.
- D. Dispensing controls must be accessible without pinching, grasping, or twisting of the wrist, per CBC 2019, Title 24, Part 2, Section 11B-309.4

**2.02 REFERENCES**

- A. Toilet Accessories required to be accessible shall be mounted at heights according to CBC 2019, Title 24, Part 2, Section 11B-213
  - 1. Toilet paper and feminine napkin disposal shall comply with CBC 2019, Title 24, Part 2 Section 11B-604.7 and 11B-309.4.
  - 2. Toilet tissue dispensers to be continuous flow type, CBC 2019, Title 24, Part 2, Section 11B-604.7.
- B. Grab Bars (CBC 2019, Title 24, Part 2, Section 11B-213.3, 11B-604.5, and 11B-609)
  - 1. Length for rear and side walls:
    - a. 36 inches (914 mm) min. for rear wall, per Section 11B-604.5.2
    - b. 42 inches (1,067 mm) min. for side wall, per Section 11B-604.5.1
  - 2. Maximum and minimum diameters:
    - a. 1 1/4 - 1 1/2 inches (32-38 mm) diameter or equivalent gripping surface
    - b. 1 1/2 inches (38 mm) min. clearance between grab bar and wall.
- C. Following (but not limited to) operable parts (including coin slots) of table room accessories to be mounted within 40 inches (1,016 mm) max above finish floor per CBC 2019, Title 24, Part 2, Section 11B-603.5:
  - 1. Towel dispensers
  - 2. Sanitary napkin dispenser/receptacles
  - 3. Waste receptacles
  - 4. Other similar dispensing and disposal fixtures
  - 5. Bottom of reflective surface of mirrors to be 40 inches (1,0616 mm) maximum above finish floors per CBC 2019, Title 24, Part 2, Section 11B-603.3

- D. Elements of Sanitary facilities shall be mounted at locations in compliance with **CBC Sections 11B-602 through 11B-612.**
- E. Grab bars in toilet facilities and bathing facilities shall comply with **CBC Section 11B-609.** Grab bars and any wall or other surfaces adjacent to grab bars shall be free of sharp or abrasive elements and shall have rounded edges. The space around the grab bars shall be as follows:
- o 1 ½" between the grab bar and the wall.
  - o 1 ½" minimum between the grab bar and projecting objects below and at the ends.
  - o 12" minimum between the grab bar and projecting objects above.
- 2.03 ACCESSORIES
- A. Surface Mounted Soap Dispenser: B-2111 (OFOI)
- B. Stainless Steel Welded Frame Mirror: B-2908 18"x36"
- C. Surface Mounted Toilet Tissue Dispenser: B-2888 (OFOI)
- D. Surface Mounted Sanitary Napkin Disposal: B-254 (OFOI)
- E. Surface Mounted Toilet Seat Cover Dispenser: B-221 (OFOI)
- F. Surface Mounted Paper Towel Dispenser: B-262 (OFOI)
- G. Grab Bars:
- 1. 1-1/2 inches diameter, 42 inches length: B-5806x42
  - 2. Same as (1.) above, 36 inches length: B-5806x36
- Flanges shall be 1/8" thick stainless steel plate and each shall have two screw holes for attachment to wall. Flange covers shall be 22 gauge stainless steel and snap over mounting flange to conceal screws.
- H. Recessed Electric Hand Dryer: World Dryer, Model RA5, single phase 115V, color coated, push button, fixed model, (Recessed ADA compliant)

### PART 3 - EXECUTION

#### 3.01 INSPECTION

- A. Check wall opening for correct dimensions, plumbness of blocking, or frames, and other preparation that would affect installation of accessories.

#### 3.02 INSTALLATION

- A. Install manufacturers recommended anchor system for grab bars.
- B. Refer to Drawing details for mounting heights.
- C. Conceal evidence of drilling, cutting, and fitting on adjacent finishes.

- D. Fit flanges of accessories snug to wall surfaces. Provide for caulking in gaps between 90-degree return flanges and finish wall surface after accessories are installed.

**3.03 ADJUSTING**

- A. Adjust accessories for proper operation.

**3.04 CLEANING**

- A. Clean and polish exposed surfaces prior to final inspection.

**3.05 PROTECTION**

- A. Deliver accessory schedule, keys and parts manual as part of project-closeout documents. For Owner's permanent records, provide two sets of the following items of manufacturer's literature:
  - 1. Technical Data sheets of each item used for the project.
  - 2. Service and Parts Manuals.
  - 3. Name of local representative to be contacted in the event of need of field service or consultation.

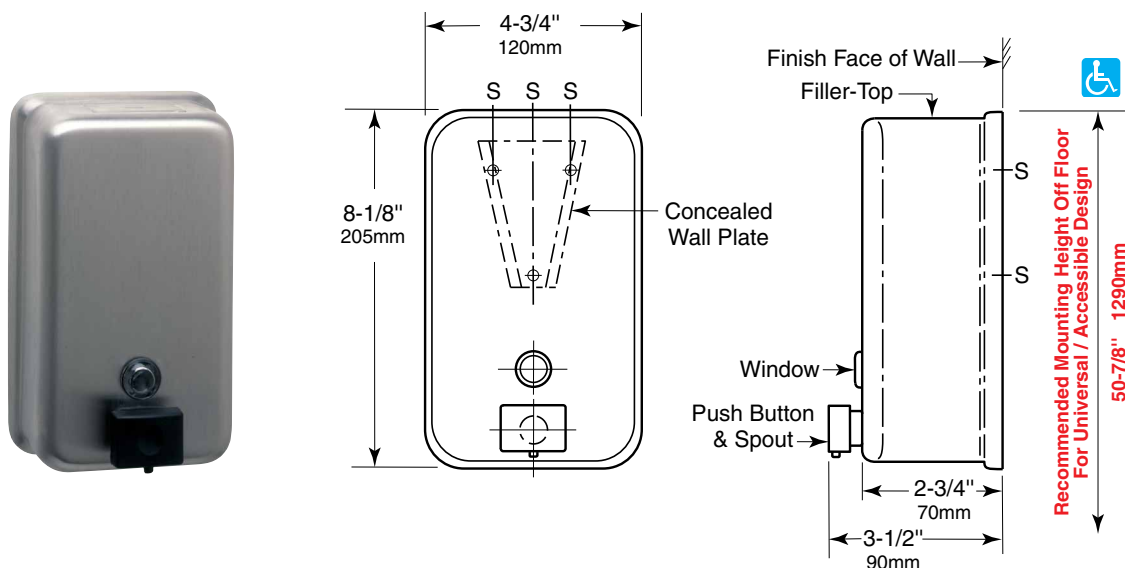
**END OF SECTION**



## Technical Data

# ClassicSeries® SURFACE-MOUNTED SOAP DISPENSER

# B-2111



### MATERIALS:

**Container** — 18-8, Type-304, 22-gauge (0.8mm) stainless steel with satin-finish. Body is drawn, one-piece, seamless construction. Back plate has mounting bracket attached. Furnished with concealed wall plate. Equipped with a clear acrylic refill-indicator window and a locked, hinged stainless steel lid for top filling. Capacity: 40-fl oz (1.2-L).

**Valve** — Black molded plastic push button and spout. Soap head-holding mushroom valve. Stainless steel spring. U-packing seal and duckbill. Antibacterial-soap-resistant plastic cylinder.

### OPERATION:

Corrosion-resistant valve dispenses commercially marketed all-purpose hand soaps. To prevent corrosion of the tank, use only chloride-free pH-neutral liquid soaps. Valve is operable with one hand, without tight grasping, pinching, or twisting of the wrist, and with less than 5 pounds of force (22.2 N) to comply with accessible design guidelines (including ADAAG in the U.S.A.). Window indicates when refill is required. The locked, hinged lid opens for top filling only with special key provided. Concealed, vandal-resistant mounting.

### INSTALLATION:

Secure wall plate to the wall with three sheet-metal screws, furnished by manufacturer, at points indicated by an S. Slide mounting bracket of container down onto wall plate and secure unit with furnished locking-screw. For plaster or dry wall construction, provide concealed backing to comply with local building codes and secure with sheet-metal screws furnished. For other wall surfaces, provide fiber plugs or expansion shields for use with sheet-metal screws furnished, or provide 1/8" (3mm) toggle bolts or expansion bolts.

**Note:** Surface-mount the dispenser plumb and true with valve 6" (150mm) to right or left of lavatory center. Provide 4" (100mm) minimum clearance from the lid to the underside of any horizontal projection. Push buttons should be located 44" (1120mm) maximum above the finish floor.

### SPECIFICATION:

Surface-mounted soap dispenser shall be Type-304 stainless steel with satin-finish. Corrosion-resistant valve shall dispense commercially marketed all-purpose hand soaps, non-iodine based soaps and do not use alcohol based sanitisers. To prevent corrosion of the tank, use only chloride-free pH-neutral liquid soaps. Valve shall be operable with one hand and with less than 5 pounds of force (22.2 N) to comply with accessible design guidelines (including ADAAG in the U.S.A.). Container shall be equipped with a clear acrylic refill-indicator window; a locked, hinged stainless steel lid for top filling; and shall have a capacity of 40-fl oz (1.2-L). Unit shall have concealed, vandal-resistant mounting.

**Surface-Mounted Soap Dispenser shall be Model B-2111 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**



## Technical Data

# MIRROR WITH STAINLESS STEEL ANGLE FRAME

**B-2906**  
**B-2908**  
**B-2909**

### SPECIAL-ORDER REFLECTIVE SURFACES

Specify Series Required:

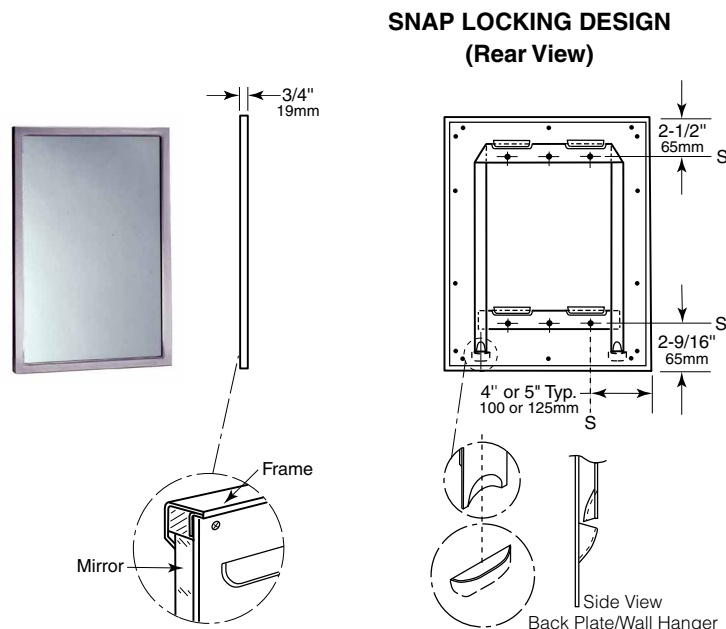


Figure: 1

- ❑ B-2908 Series Tempered Glass Mirror  
Standard Sizes —  
B-2908 1830 18" x 30" (46 x 76cm)  
B-2908 1836 18" x 36" (49 x 91cm)  
B-2908 2436 24" x 36" (61 x 91cm)

#### Designer's Notes:

1. Special-order only.
2. All Bobrick framed mirrors are manufactured to overall width and height dimensions. EXAMPLE: A 24" x 36" (61 x 91cm) mirror will be furnished 24" x 36" (610 x 915mm) outside-of-frame to outside-of-frame.
3. To specify sizes use Series Number followed by width then height in inches. EXAMPLE: B-2906 2024.
4. Bobrick framed mirrors are manufactured to a tolerance  $\pm 1/8"$  (3.2mm).
5. For sufficient space to lift mirror onto wall hanger(s), provide 3-1/4" (85mm) minimum clearance above center line of mounting screw holes.
6. Provide 1" (25mm) minimum clearance at bottom of mirror for engaging locking screws and 1" (25mm) clearance on each side.

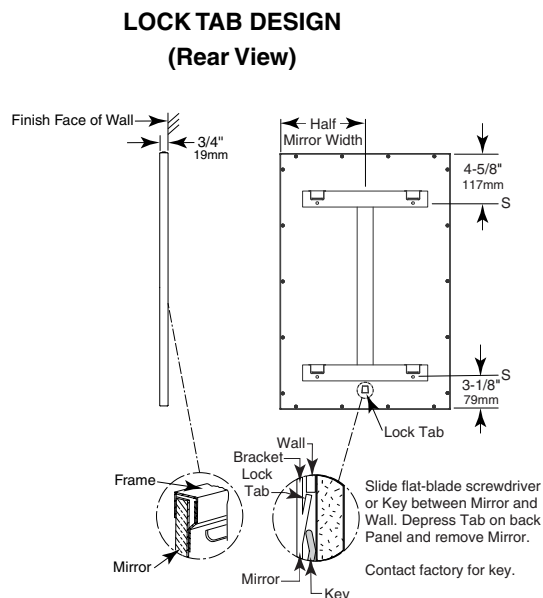


Figure: 2

- ❑ B-2906 Series Polished Stainless Steel Mirror —  
60" x 63" (152 x 91cm) or  
36" x 60" (91 x 152cm) maximum;  
12" x 12" (30 x 30cm) minimum.
- ❑ B-2908 Series Tempered Glass Mirror —  
115" x 48" (292 x 122cm) or  
48" x 155" (122 x 292cm) maximum;  
18" x 30" (46 x 76cm) or  
30" x 18" (76 x 46cm) minimum.
- ❑ B-2909 Series Laminated Glass Mirror —  
84" x 48" (213 x 122cm) or  
48" x 84" (122 x 213cm) maximum  
16" x 18" (41 x 46cm) or  
18" x 16" (46 x 41cm) minimum.

**Note:** Mirrors greater than 30" in width will have multiple hanger brackets with a typical 8" off each edge.

Width	Hanger Pockets
Up to 30" (76cm)	1
Over 30" up to 72" (76 to 183cm)	2
Over 72" up to 108" (183 to 274cm)	3
Over 108" (274cm)	4

continued . . .

## MATERIALS:

**Frame** — 18-8, Type-304, heavy-gauge stainless steel, 3/4" x 3/4" (19 x 19mm) angle with vertical-grain satin finish. One-piece, roll-formed construction forms continuous integral stiffener on all sides. Bevel design on front of angle holds frame tightly against mirror. Corners are welded, ground, and polished smooth. Galvanized steel back is fastened to frame with concealed screws and equipped with integral horizontal hanging brackets. Concealed Phillips-head locking screws securely fasten mirror to wall hanger(s).

*Designer's Note:* Type-304 stainless steel provides superior corrosion resistance, compared to 400 Series stainless steel, against environmental moisture, hose-down maintenance and strong cleaning solution.

**Mirror** — (B-2906 Series) Stretcher leveled stainless steel with reflective, highly polished strip finish. Tempered masonite backing.

(B-2908 Series) No. 1 quality, 1/4" (6mm) tempered select float glass: selected for silvering and electrolytically copper-plated by the galvanic process.

(B-2909 Series) 1/4" (6mm) thick. Two pieces of 1/8" (3mm) select float glass: selected for silvering, laminated with 0.015" (0.38mm) thick clear vinyl in the center, and electrolytically copper-plated by the galvanic process.

**Note:** These reflective surfaces resist breakage and provide a measure of safety from broken glass, but differ in color and reflective quality from standard glass mirrors.

All edges protected by plastic filler strips. Backs of all glass mirrors are protected by full-size, shock-absorbing, water-resistant, nonabrasive, 3/16" (5mm) thick polyethylene padding.

**Concealed Wall Hanger(s)** — 16 gauge cold roll steel construction. Incorporates lower support member, forming rigid rectangle, which engages lower backplate louvers to keep bottom of mirror against wall.

## INSTALLATION:

Mount wall hanger on wall with screws (not furnished) at points indicated by an S. For plaster or dry wall construction, provide concealed backing to comply with local building codes, then secure wall hanger with screws (not furnished). For other wall surfaces, provide fiber plugs or expansion shields for use with screws (not furnished), or provide 1/8" (3mm) toggle bolts or expansion bolts. Hang mirror on wall hanger. Lock mirror to wall hanger by tightening Phillips-head locking screws that are concealed in bottom of frame at points indicated by a T.

**Snap Locking Design** — Locking devices automatically secure mirror to concealed wall hanger when it is lowered into final position (see figure 3). Locking devices may be unlocked by inserting two flat blade screwdrivers behind each side of mirror near the bottom or under the bottom of the mirror and pulling mirror bottom forward and then up.

**Lock Tab Design** — Locking devices automatically secure mirror to concealed wall hanger when it is lowered into final position (see figure 4). Locking device may be unlocked by sliding a flat-blade screwdriver or Key between mirror and wall at center of mirror and depressing tab on back panel. If key is required, please contact the factory.

**SNAP LOCKING DESIGN  
(Front View)**

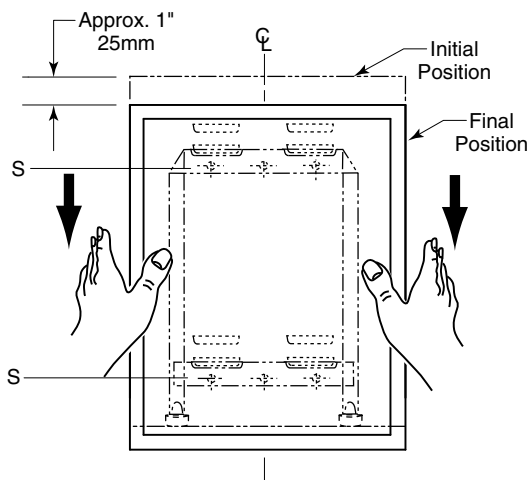


Figure: 3

**LOCK TAB DESIGN-UP TO 30" WIDTH  
(Front View)**

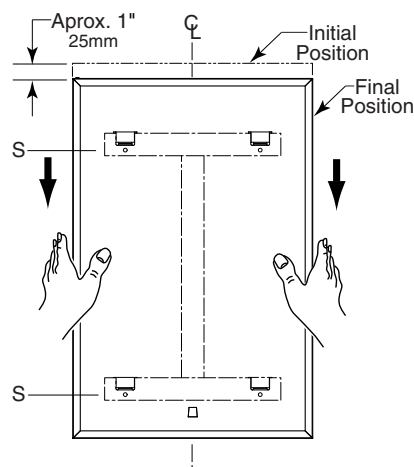
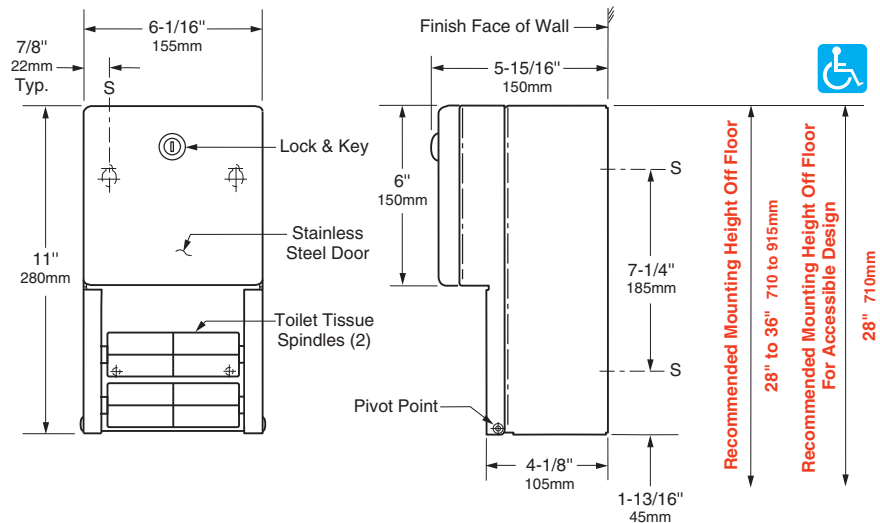


Figure: 4

## SPECIFICATION:

Mirror shall have a one-piece Type-304 stainless steel angle frame, 3/4" x 3/4" (19 x 19mm) with continuous integral stiffener on all sides and beveled front to hold frame tightly against mirror; corners shall be welded, ground, and polished smooth; all exposed surfaces shall have satin finish with vertical grain. Mirror shall be \_\_\_\_\_ (insert one: polished stainless steel, tempered glass, or laminated glass). All edges shall be protected by plastic filler strips. Backs of all glass mirrors shall be protected by full-size, shock-absorbing, water-resistant, nonabrasive, 3/16" (5mm) thick polyethylene padding. Galvanized steel back shall have integral horizontal hanging brackets located at top for mounting on concealed rectangular wall hanger. Mirror shall be secured to wall hanger with concealed Phillips-head locking screws located in bottom of frame.

**Framed Mirror shall be Model \_\_\_\_\_** (insert model number) of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.



### MATERIALS:

**Cabinet** — 18-8, type-304, 22-gauge (0.8mm) stainless steel. All-welded construction. Exposed surfaces have satin finish.

**Door** — 18-8, type-304, 22-gauge (0.8mm) stainless steel with 18-gauge (1.2mm) stainless steel door frame. Exposed surfaces have satin finish. Front of door is drawn, one-piece, seamless construction. Secured to cabinet with two rivets. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.

**Dispensing Mechanism, Inner Housing and Cam** — 18-8, type-304, 18-gauge (1.2mm) stainless steel.

**Spindles (2)** — Heavy-duty, one-piece, molded ABS. Theft-resistant. Retained in dispensing mechanism when door is locked.

### OPERATION:

Unit holds two standard-core toilet tissue rolls up to 5-1/4" (133mm) diameter (1800 sheets). Tissue rolls are loaded and locked into dispensing mechanism. Extra roll automatically drops in place when bottom roll is depleted. Depleted rolls can only be removed after unlocking door.

### INSTALLATION:

For partitions with particleboard or other solid core, secure with four #10 x 5/8" (4.8 x 16mm) sheet-metal screws (not furnished) at points indicated by an S, or provide through-bolts, nuts, and washers.

For hollow-core metal partitions, provide solid backing into which sheet-metal screws can be secured. If two units are installed back-to-back, then provide threaded sleeves and machine screws for the full thickness of partition.

For plaster or dry wall construction, provide concealed backing to comply with local building codes, then secure unit with sheet-metal screws.

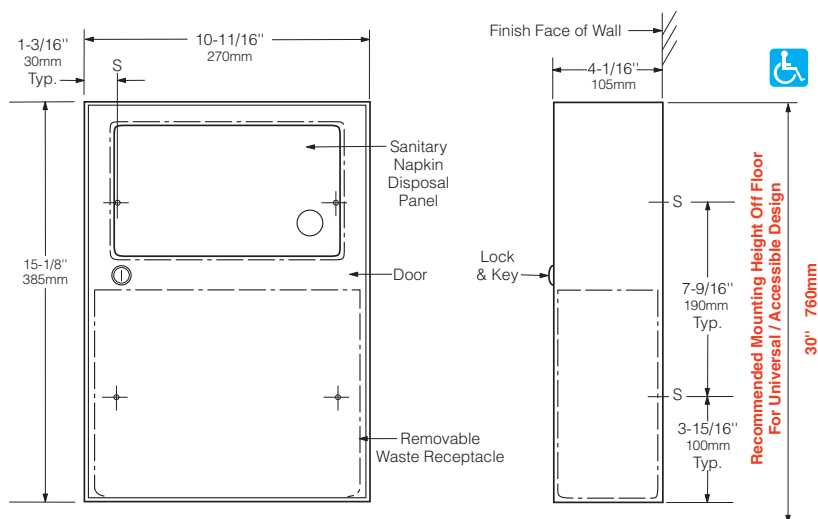
For other wall surfaces, provide fiber plugs or expansion shields for use with sheet-metal screws or provide 3/16" (5mm) toggle bolts or expansion bolts.

### SPECIFICATION:

Surface-mounted multi-roll toilet tissue dispenser shall be type-304 stainless steel with all-welded construction, including dispensing mechanism, inner housing and cam; exposed surfaces shall have satin finish. Front of toilet tissue dispenser door shall be drawn, one-piece, seamless construction. Door shall be secured to cabinet with two rivets and equipped with a tumbler lock keyed like other Bobrick washroom accessories. Unit shall dispense two standard-core toilet tissue rolls up to 5-1/4" (133mm) diameter (1800 sheets). Extra roll shall automatically drop in place when bottom roll is depleted. Unit shall be equipped with two theft-resistant, heavy-duty, one-piece, molded ABS spindles.

**Surface-Mounted Multi-Roll Toilet Tissue Dispenser shall be Model B-2888 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**





## MATERIALS:

**Cabinet** — 18-8, type-304, heavy-gauge stainless steel. All-welded construction. Exposed surfaces have satin finish.

**Door** — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Secured to cabinet with a full-length stainless steel piano-hinge. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.

**Disposal Panels (2)** — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Bottom edges hemmed for safety. Secured to door and permanent panel with spring-loaded, full-length stainless steel piano-hinge. Equipped with international graphic symbol identifying sanitary napkin disposal.

**Waste Receptacle** — Leak-proof, rigid molded polyethylene. Removable for servicing. Capacity: 1.2-gal. (4.6-L).

## OPERATION:

Unit is equipped with a self-closing panel covering each disposal opening. Napkin disposal is emptied by opening door with furnished key and removing waste receptacle.

## INSTALLATION:

For partitions with particle-board or other solid core, secure with four #8 x 1-1/4" (4.2 x 32mm) sheet-metal screws (not furnished), or provide through-bolts, nuts, and washers.

For hollow-core metal partitions, provide solid backing into which sheet-metal screws can be secured. If two units are installed back-to-back, then provide threaded sleeves and machine screws for the full thickness of partition.

For plaster or dry wall construction, provide concealed backing to comply with local building coeds, then secure unit with #8 x 1-1/4" (4.2 x 32mm) sheet-metal screws.

For other wall surfaces, provide fiber plugs or expansion shields for use with #8 x 1-1/4" (4.2 x 32mm) sheet-metal screws, or provide 3/16" (5mm) toggle bolts or expansion bolts.

## SPECIFICATION:

Surface-mounted sanitary napkin disposal shall be type-304 stainless steel with all-welded construction; exposed surfaces shall have satin finish. Door shall be secured to cabinet with a full-length stainless steel piano-hinge and equipped with a tumbler lock keyed like other Bobrick washroom accessories. Unit shall have a self-closing panel covering each disposal opening. Panel shall have bottom edge hemmed for safety, be secured to door with spring-loaded, full-length stainless steel piano-hinge, and equipped with international graphic symbols identifying sanitary napkin disposal. Unit shall be furnished with a removable, leak-proof molded polyethylene receptacle. Receptacle shall have a capacity of 1.2-gal. (4.6-L).

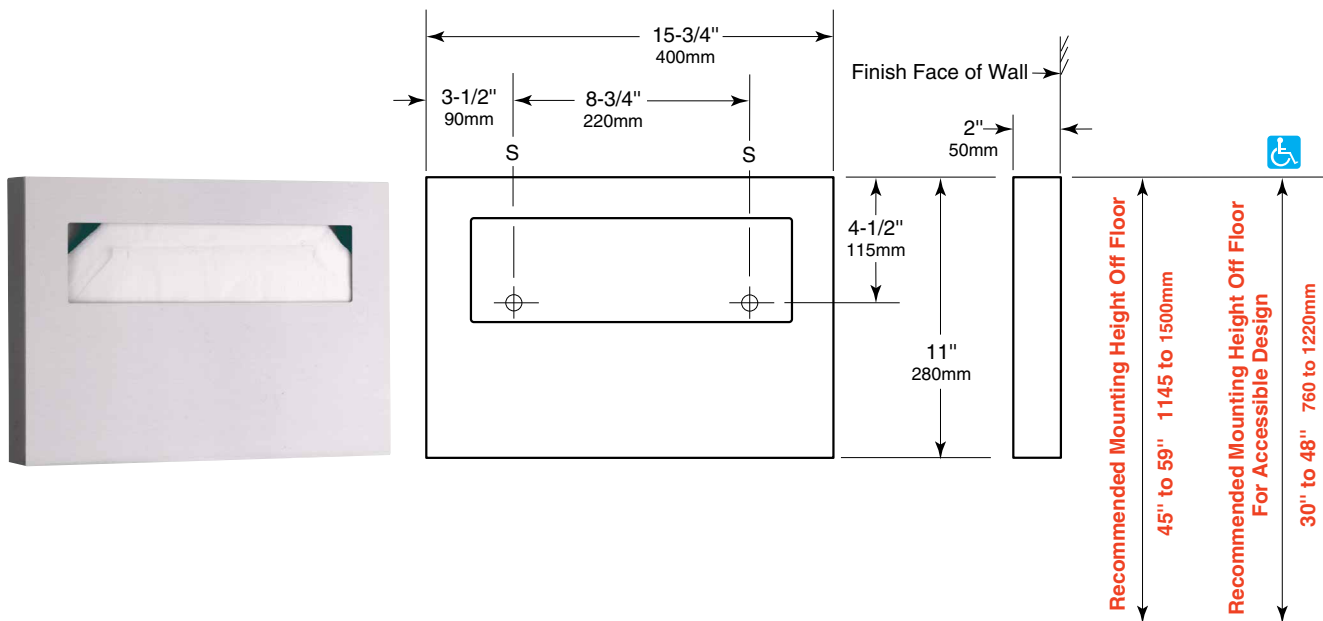
**Surface-Mounted Sanitary Napkin Disposal shall be Model B-254 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**



## Technical Data

# ClassicSeries® SURFACE-MOUNTED SEAT-COVER DISPENSER

# B-221



### MATERIALS:

18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. All-welded construction with beveled opening.

### OPERATION:

Dispenses single- or half-fold paper toilet seat covers from beveled opening. Dispenser fills from bottom through concealed opening. Capacity: 250 toilet seat covers or one box.

### INSTALLATION:

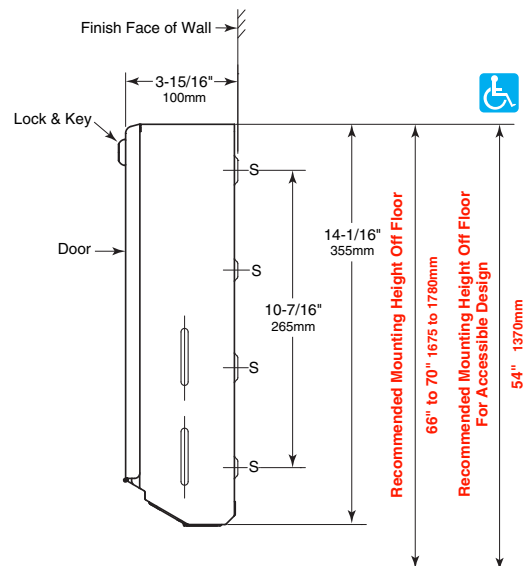
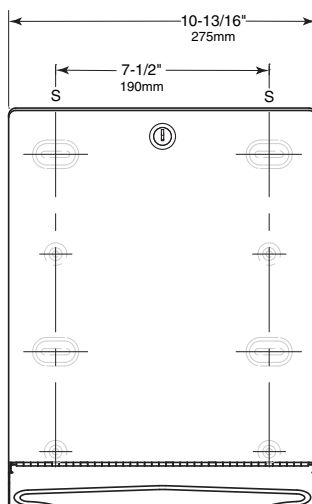
Mount unit on wall or toilet partition with two flat-head screws, not furnished by manufacturer, at points indicated by an S. For plaster or dry wall construction, provide concealed backing that complies with local building codes, then secure unit with flat-head screws not furnished. For other wall surfaces, provide fiber plugs or expansion shields for use with screws, not furnished, or provide 1/8" (3mm) toggle bolts or expansion bolts.

**Note:** Provide a 5" (125mm) minimum clearance from bottom of dispenser to top of any horizontal projection to provide room for filling dispenser from bottom.

### SPECIFICATION:

Surface-mounted toilet-seat-cover dispenser shall be type-304, 22-gauge (0.8mm) stainless steel with all-welded construction; exposed surfaces shall have satin finish. Dispenser shall have a concealed opening in bottom for filling. Capacity shall be 250 paper toilet seat covers or one box.

Surface-Mounted Seat-Cover Dispenser shall be Model B-221 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.

**BOBRICK****Technical Data****ClassicSeries®  
SURFACE-MOUNTED  
PAPER TOWEL DISPENSER****B-262****MATERIALS:**

**Cabinet** — 18-8, type-304, 22-gauge (0.8mm) stainless steel. All-welded construction. Exposed surfaces have satin finish. Towel tray has hemmed opening to dispense paper towels without tearing.

**Door** — 18-8, type-304, 22-gauge (0.8mm) stainless steel with satin finish. Secured to cabinet with a full-length stainless steel piano-hinge. Equipped with a tumbler lock keyed like other Bobrick washroom accessories.

**Optional:** Order Bobrick Part No. 262-130 TowelMate® available as an optional accessory. TowelMate accessory allows for paper towels to dispense one at a time without bulging, sagging or falling through the towel tray opening. TowelMate fits Gamco and most manufacturers' similar models.

**OPERATION:**

Unit dispenses C-fold and multifold paper towels 3-1/8" to 3-13/16" (79–97mm) deep. Slots in sides of cabinet indicate refill time. Capacity: 400 C-fold or 525 multifold paper towels. To dispense narrower towels 2-1/2" to 3-1/8" (64–79mm) deep, order optional TowelMate accessory Bobrick Part No. 262-130.

**INSTALLATION:**

Mount unit on wall with four #10 x 1-1/4" (4.8 x 32mm) sheet-metal screws (not furnished) at four of the eight mounting holes indicated by an S (top slots and bottom holes preferable). For plaster or dry wall construction, provide concealed backing to comply with local building codes, then secure with sheet-metal screws. For other wall surfaces, provide fiber plugs or expansion shields for use with sheet-metal screws, or provide 1/8" (3mm) toggle bolts or expansion bolts.

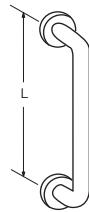
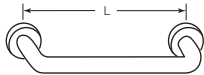
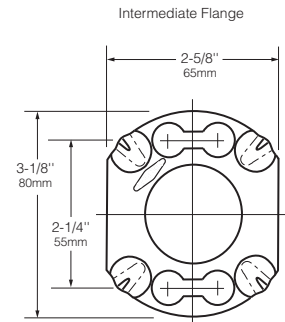
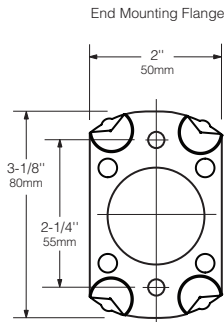
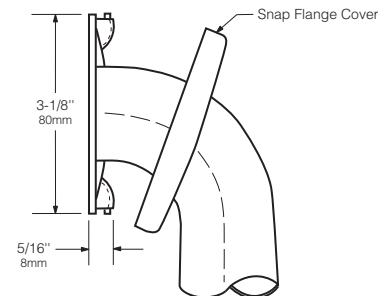
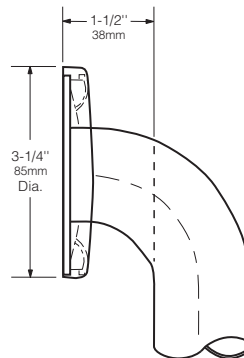
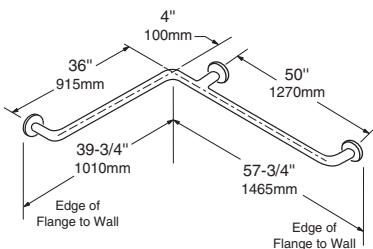
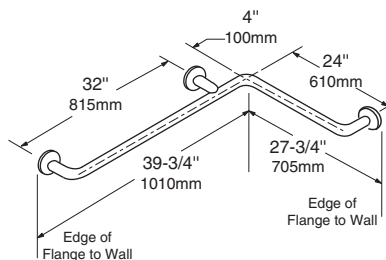
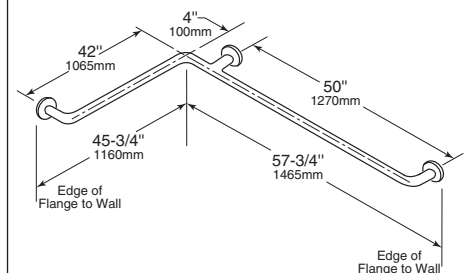
**SPECIFICATION:**

Surface-mounted paper towel dispenser shall be type-304 stainless steel with all-welded construction; exposed surfaces shall have satin finish. Door shall be secured to cabinet with a full-length stainless steel piano-hinge and equipped with a tumbler lock keyed like other Bobrick washroom accessories. Paper towel tray shall have hemmed opening to dispense paper towels without tearing. Unit shall be capable of dispensing 400 C-fold or 525 multifold paper towels measuring 3-1/8" to 3-13/16" (79 to 97mm) deep. Narrower paper towels 2-1/2" to 3-1/8" (65 to 79mm) deep may be efficiently dispensed with the use of an optional TowelMate accessory, Bobrick Part No. 262-130. TowelMate accessory allows for paper towels to dispense one at a time without bulging, sagging or falling through the towel tray opening.

**Surface-Mounted Paper Towel Dispenser shall be Model B-262 of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.**

**BOBRICK****Technical Data****1 1/4" (32mm) DIAMETER  
STAINLESS STEEL GRAB BARS  
WITH SNAP FLANGE****B-5806  
SERIES**

**Specify Finish Required:** ☐ Satin-finish, slip-resistant surface.  
☐ Peened surface; add suffix .99 to model number

**HORIZONTAL****VERTICAL****B-5806 x 18, 24, 30, 36, 42, 48****TWO-WALL  
TUB / SHOWER  
COMPARTMENT BAR****B-5837****HORIZONTAL  
TUB / SHOWER  
COMPARTMENT BAR 24 x 36****B-58616****TWO-WALL  
TOILET COMPARTMENT BAR 42 x 54****B-5897**

continued . . .

## MATERIALS:

**Grab Bar** — 18-8, Type-304, 18-gauge (1.2mm) stainless steel tubing with a satin-finish, slip-resistant surface. 1-1/4" (32mm) outside diameter. Ends are heliarc welded to concealed mounting flanges. Clearance between the grab bar and wall is 1-1/2" (38mm).

**Concealed Mounting Flanges** — 18-8, Type-304, 11-gauge (3.2mm) thick, stainless steel plate; end flanges 2" x 3-1/8" (50 x 80mm) with holes for attachment to wall. Intermediate flanges 2-5/8" x 3-1/8" (65 x 80mm) wide x 3-1/8" (80mm) diameter.

**Snap Flange Covers** — 18-8, Type-304, 22-gauge (0.8mm) drawn stainless steel with satin-finish. 3-1/4" (85mm) diameter x 5/8" (16mm) deep. Each cover snaps over mounting flange to conceal mounting screws.

## STRENGTH:

Bobrick grab bars that provide 1-1/2" (38mm) clearance from wall can support loads in excess of 900 pounds (408kg) if properly installed. Other grab bar configurations can support loads in excess of 250 pounds (113kg) if properly installed, complying with accessible design (including ADAAG in the U.S.A.) for structural strength.

**Safety Warning:** Grab bars are no stronger than the anchors and walls to which they are attached and, therefore, must be firmly secured in order to support the loads for which they are intended. To avoid potential injury, the building owner or maintenance personnel should remove the grab bar from service if the grab bar is not adequately secured to wall or if there is any observed damage to the welds.

## INSTALLATION:

Provide concealed anchor device or backing as specified or required in accordance with local building codes before wall is finished. Fasten concealed mounting flanges to anchor device or backing with at least two screws opposing each other in each flange. Snap flange covers over each mounting flange to conceal mounting screws. Concealed anchor devices and mounting screws are not included with Bobrick grab bars and must be specified as an accessory.

For Grab Bars with an Intermediate Flange(s), Pull Snap-Flange Covers away from mounting flanges. Place grab bar in desired mounting location. Use intermediate flange as a template to mark location of mounting screws at intermediate flange only. Mark screw locations at the center of the slot in the middle of the double-keyhole shaped mounting holes (2) in the intermediate flange. Remove grab bar from wall. Drive the intermediate flange mounting screws into wall at marked locations. **Note:** Make sure to leave a space of just over 1/8" (3.17mm) between the underside of the screw head and the wall. Install grab bar on the wall by placing the round ends of the intermediate flange double-keyhole shaped mounting holes over the mounting screws (2) are located in the middle of the flange slots. Install the mounting screws into the wall at the end flanges and secure tightly. Tighten the mounting screws at the intermediate flange. Press all snap-flange covers into place to conceal mounting flanges.

**Note:** Recommend use of 1/4" or #14 sheet metal or wood screws to install Intermediate Flange. #12 screws may also be used.

## Important Notes:

1. **Mounting Kits** — Bobrick offers a mounting kit for installing grab bars; **one Bobrick mounting kit is required for each flange.**

Mounting Kit No.	Description
252-30	Consists of (3) #14 x 2½" Type-304 stainless steel, Phillips round-head, sheet-metal screws.

2. **Grab Bar Fastener** — Bobrick offers a grab bar fastening system that secures all Bobrick grab bar series; **one Bobrick fastener is required for each flange.** Install grab bar without backing in wall requires minimum 5/8" (16mm) thick painted or tiled drywall.

WingIt™ Fastener No.	Description
251-4	Consists of 10–32 x 5/16" round-head, Phillips 18/8 stainless steel screws. (1) WingIt grab bar fastener.

3. **Optional Anchor Device** — Bobrick grab bar anchor device includes stainless steel machine screws to be used for attaching grab bars to anchors. **one Bobrick concealed anchor device is required for each flange.**

Optional Anchor No.	Description
2583	Anchor for 3/4" to 1" (19-25mm) panel 1 anchor required for each flange.
2586	Anchor for 1/2" to 1" (13mm) panel 1 anchor required for each flange.

## SPECIFICATION:

Grab bar shall be Type-304 stainless steel with a satin-finish, slip-resistant surface. Grab bar shall have 18-gauge (1.2mm) wall thickness and 1-1/4" (32mm) outside diameter. Clearance between the grab bar and wall shall be 1-1/2" (38mm). Concealed mounting flanges shall be 11-gauge (3.2 mm) thick stainless steel plate, 2" x 3-1/8" (50 x 80mm), and equipped with at least two screw holes for attachment to wall. Flange covers shall be 22-gauge (0.8mm) stainless steel, 3-1/4" (85mm) diameter, and shall snap over mounting flanges to conceal mounting screws and/or WingIt fasteners. Ends of grab bar shall pass through concealed mounting flanges and be heliarc welded to form one structural unit. Grab bar shall comply with accessible design (including ADAAG in the U.S.A.) for structural strength.

Grab Bar shall be Model \_\_\_\_\_ (insert model number) of Bobrick Washroom Equipment, Inc., Clifton Park, New York; Jackson, Tennessee; and Los Angeles, California; Bobrick Washroom Equipment Company, Scarborough, Ontario; Bobrick Washroom Equipment Pty. Ltd., Australia; and Bobrick Washroom Equipment Limited, United Kingdom.

# Model RA Hand Dryer

Recessed A.D.A. Compliant Push-Button Hand Dryer



**WORLD DRYER**

World Model RA hand dryer is an ADA compliant hand dryer with longest motor life and the best washroom solution for high traffic facilities.

## Product Benefits

- ADA compliant
- 30 second drying time
- Longest life of all dryers
- Lowest sound level
- Durable and vandal resistant
- Classic style design

## Design Features

### Dryer

- Activated by electro-mechanical timer with 25 Amp switch
- 30 second drying cycle
- Incorporates a 2100 (optional 1500) watt Nichrome wire heating element  
Protected by an automatic-resetting, thermal cutoff
- Provides a 70° F temperature rise
- IPX1 ingress protection

### Motor

- Thermally-protected, universal brush-type motor operating at 7,500 RPM
- Delivering 200 CFM air flow at a velocity of 7,300 LFM

### Materials

- Cover material: Cast Iron with porcelain enamel finish
- The wall-mounted base is constructed of die-cast aluminum
- The nozzle is constructed of die-cast zinc alloy finished in bright chrome with field option of rotating configuration.



## Model RA Product Specifications

### Electrical

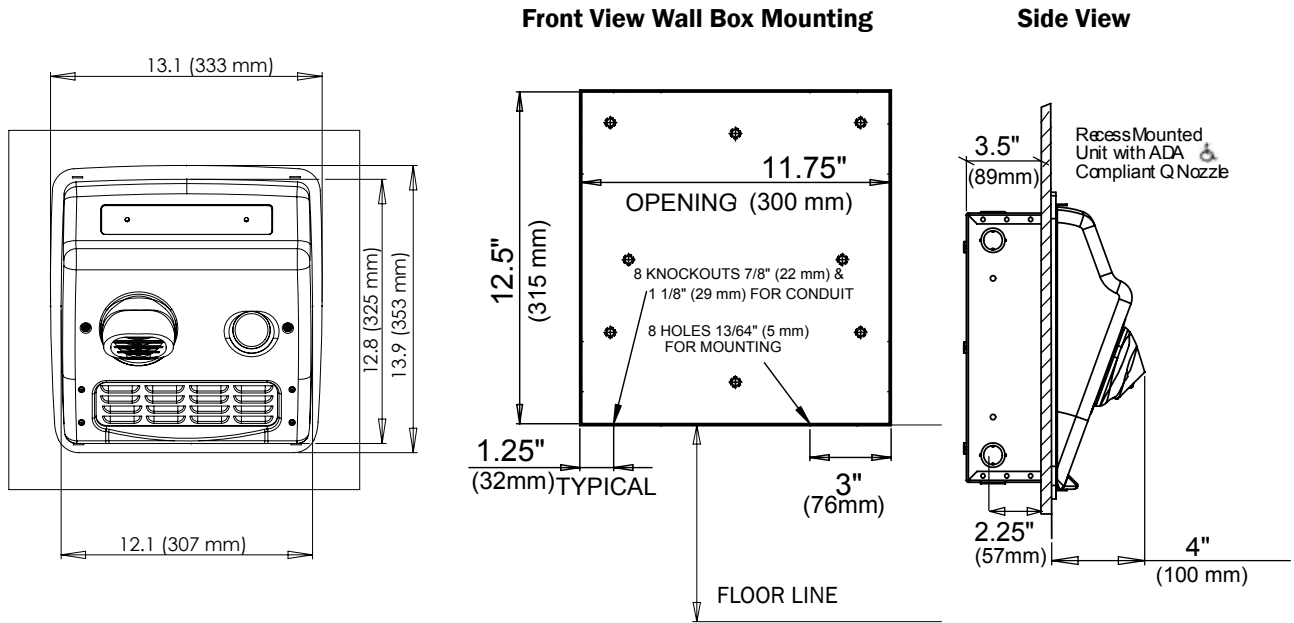
	115 V	115 V	208 - 230 V	220 - 240 V	277 V
Amps	20	15	10	10	8.5
Watts	2300	1725	2300	2300	2300
Hz	60	60	60	50	60

## Architecture & Engineering Specifications

World Dryer Model RA hand dryers shall include a cover made of 1/4" thick cast iron with porcelain enamel finish. Motor shall be universal type, 1/10 HP at 7500 RPM. Dryers shall deliver 200 cubic feet per minute of air volume (7300 LFM). Timer shall be electro-mechanical cam-style with 25 AMP rated switch to operate dryer for 30 second period. Recessed units use a 16-gauge steel wall mounting box. Hand dryers shall be listed under reexamination service of Underwriters Laboratories, Inc.

Stock #	Cover Finish	Cover Material	Electrical	Unit Weight	Unit Size (HxWxD) inch/mm	Shipping Size (HxWxD) inch/mm
RA5-Q974	White	Cast Iron	115 V (20 Amp)	35 lbs/15.8 kgs	13.8" x 13.1" x 4" 351 x 333 x 102	15" x 15" x 11.25 381 x 381 x 286
RA52-Q974	White	Cast Iron	115 V (15 Amp)	35 lbs/15.8 kgs	13.8" x 13.1" x 4" 351 x 333 x 102	15" x 15" x 11.25 381 x 381 x 286
RA54-Q974	White	Cast Iron	208 - 230V	35 lbs/15.8 kgs	13.8" x 13.1" x 4" 351 x 333 x 102	15" x 15" x 11.25 381 x 381 x 286
RA548-Q974	White	Cast Iron	220 - 240 V	35 lbs/15.8 kgs	13.8" x 13.1" x 4" 351 x 333 x 102	15" x 15" x 11.25 381 x 381 x 286
RA57-Q974	White	Cast Iron	277 V	35 lbs/15.8 kgs	13.8" x 13.1" x 4" 351 x 333 x 102	15" x 15" x 11.25 381 x 381 x 286

## Recess Mounted



## Placement Instruction

- Hand dryers should be spaced at least 2 feet apart, near but not over the wash basin
- In congested areas, dryers should be located to create a flow from wash basin to dryer to exit
- Dryer Quantity Recommendation:  
Average Traffic: 1 dryer per 2 wash basins  
Heavy Traffic: 1 dryer per wash basin  
Industrial 54" Circular wash fountains: 4 dryers per sink
- Recommended mounting heights from floor to dryer bottom edge

Men's washrooms	42" (107 cm)
Women's washrooms	40" (102 cm)
Children's washrooms, ages 4-7	28" (71 cm)
Children's washrooms, ages 7-10	32" (81 cm)
Children's washrooms, ages 10-13	36" (91 cm)
Children's washrooms, ages 13-17	40" (102 cm)
Handicap Mounting Height	34" (86 cm)

Measured from floor to the bottom of the unit.

## Installation Guide

- Model RA hand dryers require a dedicated 20 AMP circuit and must be properly grounded
- GFI circuit protection is recommended.
- One side of dryer should be mounted to a stud

## Certification Approved



IPX1



## Warranty



10 year limited warranty



5700 McDermott Drive  
Berkeley, IL 60163 U.S.A.  
800-323-0701  
www.worlddryer.com

92-MT040 Rev06

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**SECTION 10 44 00**

**FIRE PROTECTION SPECIALTIES**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: Fire extinguishers and fire extinguisher cabinets as indicated on the Drawings and specified herein.
- B. Related Work:
  - 1. Section 06 10 00 – Rough Carpentry.
  - 2. Section 09 24 00 – Cement Plastering.
  - 3. Section 09 29 00 – Gypsum Board.

**1.02 SUBMITTALS**

- A. Provide materials list of items proposed to be provided.
- B. Submit data sufficient to demonstrate compliance with specifications and drawing requirements.
- C. Submit shop drawing and catalog cuts of items to be provided. Manufacturer or producer's standard drawings and technical information may be acceptable where complete enough to determine acceptability.
- D. Submit samples of products and materials where options of color, finish, pattern, or texture exist.

**1.03 QUALITY ASSURANCE**

- A. Products and materials to be provided are to be from manufacturers and producers regularly engaged full-time in the manufacture or production of this and similar items, with a history of successful manufacture or production acceptable to the Owner.
- B. In addition to complying with pertinent codes and regulations, comply with industry and trade standards normally associated with this product or material, except where specified product or material is superior in quality to industry and trade standards.
- C. Comply with the requirements of Chapter 3, Title 19, California Code of Regulations (CCR), and 2019 California Building Code (CBC) Title 24, Sections 11B-205 and 11B, Division 3.

**1.04 DELIVERY, STORAGE AND HANDLING**

- A. Deliver products and materials to the project and store in a safe, dry place with shop-supplied protection and labeling intact and legible until set, applied, or installed.
- B. Use reasonable means necessary to protect products and materials before, during, and after installation.
- C. In event of damage, regardless of responsibility and culpability, make repairs and replacements necessary to satisfaction of Owner, and at no additional cost to Owner.

**1.05 WARRANTY**

- A. Provide Owner with a written warranty as a condition of work acceptance, signed by Contractor and Installer (where applicable), agreeing to maintain, repair and/or replace products and materials for one year following acceptance, and without additional cost to Owner, as specified in Section 01 78 30 – Warranties, Guarantees, and Bonds.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Fire Extinguisher Cabinets: Larsen's Manufacturing Company, Model 2409-SM, Stainless Steel, surface mounted cabinet or equal by Potter-Roemer or JL Industries by Activar, Inc. Full clear acrylic door with Larsen-Loc® (clear anodized aluminum) trim and door. Provide pressure sensitive decals or paint red letters, 1-inch high, reading:

**FIRE EXTINGUISHER**

Small instruction letters reading:

"IN CASE OF FIRE ONLY - PULL FIRMLY ON HANDLE".

Equip door with keyed-alike Yale tumbler locks with trip-bar-release inside.

- B. Extinguishers: 5 lb., Tri-Class, dry chemical by Larsen's Manufacturing Company, enameled steel extinguishers. Extinguishers shall be Model MP5 2A-10B:C or equal by Potter-Roemer or JL Industries, UL rated, conforming to the requirements of California Code of Regulations, Title 19, Division 1, Chapter 3 and 2019 California Fire Code, Title 24, Part 9, Section 906.
- C. Where indicated, at Custodial, Mechanical and Electric Rooms, provide surface mounted bracket with retainer straps. Larsen's Model 846 or equal.

**2.02 VERIFICATION OF PERFORMANCE**

- A. Fire extinguisher cabinets latching and locking hardware to be operable with a single effort by lever-type hardware, panic bars, push-pull activating bars or other hardware designed so as not to require the ability to grasp the opening hardware and not require a force greater than 5 lbs. (22.2 N) to open. Force required to activate controls shall not exceed 5 lbs.
- B. Surface Mounted Cabinets shall be mounted 15" max. above finished floor to bottom of cabinet.
- C. Fire Extinguisher Cabinets must comply with CBC Sections 11B-307, 11B-308, 11B-309 and 11B-403.

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

- A. Install equipment in strict accordance with manufacturer's instructions.
- B. Install fire extinguisher cabinet so that fire extinguisher handle is not more than 48 inches

above finished floor.

**3.02 CLEANING**

- A. Keep areas clean during entire operation and leave spaces broom clean.
- B. After completion, clean up and remove resultant debris from the site.

**END OF SECTION**

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**SECTION 22 05 17**

**SLEEVES AND SLEEVE SEALS FOR PLUMBING PIPING**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
  - 1. Sleeves.
  - 2. Sleeve-seal systems.
  - 3. Sleeve-seal fittings.
  - 4. Grout.

1.03 ACTION SUBMITTALS

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

**PART 2 - PRODUCTS**

2.01 SLEEVES

- A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
- B. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
- C. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

2.02 SLEEVE-SEAL SYSTEMS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Advance Products & Systems, Inc.
  - 2. CALPICO, Inc.
  - 3. Metraflex Company (The).
  - 4. Pipeline Seal and Insulator, Inc.
  - 5. Proco Products, Inc.

- B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
  - 1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
  - 2. Pressure Plates: Carbon steel.
  - 3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

**2.03 SLEEVE-SEAL FITTINGS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Presealed Systems.
- B. Description: Manufactured plastic, sleeve-type, waterstop assembly made for imbedding in concrete slab or wall. Unit has plastic or rubber waterstop collar with center opening to match piping OD.

**2.04 GROUT**

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

**PART 3 - EXECUTION**

**3.01 SLEEVE INSTALLATION**

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch (25-mm) annular clear space between piping and concrete slabs and walls.
  - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  - 1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
  - 2. Cut sleeves to length for mounting flush with both surfaces.

- a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches (50 mm) above finished floor level.
- 3. Using grout, seal the space outside of sleeves in slabs and walls without sleeve-seal system.
- D. Install sleeves for pipes passing through interior partitions.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
  - 2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
  - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint. Comply with requirements for sealants specified in Section 07 92 00 "Joint Sealants."
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.

### 3.02 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

### 3.03 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

### 3.04 SLEEVE AND SLEEVE-SEAL SCHEDULE

- A. Use sleeves and sleeve seals for the following piping-penetration applications:
  - 1. Exterior Concrete Walls above Grade:
    - a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.
  - 2. Exterior Concrete Walls below Grade:
    - a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel wall sleeves with sleeve-seal system.

- 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
3. Concrete Slabs-on-Grade:
  - a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel wall sleeves with sleeve-seal system.
    - 1) Select sleeve size to allow for 1-inch (25-mm) annular clear space between piping and sleeve for installing sleeve-seal system.
4. Interior Partitions:
  - a. Piping Smaller Than NPS 6 (DN 150): Galvanized-steel-pipe sleeves.

**END OF SECTION**



SECTION 22 05 18

**ESCUTCHEONS FOR PLUMBING PIPING**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
  - 1. Escutcheons.

1.03 ACTION SUBMITTALS

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

**PART 2 - PRODUCTS**

2.01 ESCUTCHEONS

- A. One-Piece, Cast-Brass Type: With polished, chrome-plated finish and setscrew fastener.

**PART 3 - EXECUTION**

3.01 INSTALLATION

- A. Install escutcheons for piping penetrations of walls, ceilings, and finished floors.
- B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.
  - 1. Escutcheons for New Piping:
    - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
    - b. Chrome-Plated Piping: One-piece, cast-brass type with polished, chrome-plated finish.
    - c. Insulated Piping: One-piece, stamped-steel type.
    - d. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

- e. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, stamped-steel type.
- f. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece, cast-brass type with polished, chrome-plated finish.
- g. Bare Piping in Unfinished Service Spaces: One-piece, cast-brass type with polished, chrome-plated finish.

**3.02 FIELD QUALITY CONTROL**

- A. Replace broken and damaged escutcheons and floor plates using new materials.

**END OF SECTION**

**SECTION 22 05 19**

**METERS AND GAGES FOR PLUMBING PIPING**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
  - 1. Bimetallic-actuated thermometers.
  - 2. Liquid-in-glass thermometers.
  - 3. Thermowells.
  - 4. Dial-type pressure gages.
  - 5. Test plugs.
- B. Related Sections:
  - 1. Division 22 Section " Domestic Water Piping" for water meters inside the building.

1.03 ACTION SUBMITTALS

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

1.04 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of meter and gage, from manufacturer.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For meters and gages to include in operation and maintenance manuals.

**PART 2 - PRODUCTS**

2.01 BIMETALLIC-ACTUATED THERMOMETERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Terice, H. O. Co.

- 2. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
- 3. Weiss Instruments, Inc.
- B. Standard: ASME B40.200.
- C. Case: Liquid-filled and sealed type(s); stainless steel with 3-inch (76-mm) nominal diameter.
- D. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F (deg C).
- E. Connector Type(s): Union joint, rigid, back and rigid, bottom, with unified-inch screw threads.
- F. Connector Size: 1/2 inch (13 mm), with ASME B1.1 screw threads.
- G. Stem: 0.25 or 0.375 inch (6.4 or 9.4 mm) in diameter; stainless steel.
- H. Window: Plain glass.
- I. Ring: Stainless steel.
- J. Element: Bimetal coil.
- K. Pointer: Dark-colored metal.
- L. Accuracy: Plus or minus 1 percent of scale range.

**2.02 LIQUID-IN-GLASS THERMOMETERS**

- A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Terice, H. O. Co.
    - b. Weiss Instruments, Inc.
    - c. Or approved equal.
  - 2. Standard: ASME B40.200.
  - 3. Case: Cast aluminum; 7-inch (178-mm) nominal size unless otherwise indicated.
  - 4. Case Form: Straight unless otherwise indicated.
  - 5. Tube: Glass with magnifying lens and blue or red organic liquid.
  - 6. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).
  - 7. Window: Glass.

8. Stem: Aluminum and of length to suit installation.
  - a. Design for Thermowell Installation: Bare stem.
9. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.
10. Accuracy: Plus or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

## 2.03 THERMOWELLS

### A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

### B. Heat-Transfer Medium: Mixture of graphite and glycerin.

## 2.04 PRESSURE GAGES

### A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. AMETEK, Inc.; U.S. Gauge.
  - b. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
  - c. Weiss Instruments, Inc.
2. Standard: ASME B40.100.

3. Case: Liquid-filled type(s); cast aluminum or drawn steel; 4-1/2-inch (114-mm) nominal diameter.
4. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.
5. Pressure Connection: Brass, with NPS 1/4 or NPS 1/2 (DN 8 or DN 15), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.
6. Movement: Mechanical, with link to pressure element and connection to pointer.
7. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).
8. Pointer: Dark-colored metal.
9. Window: Glass.
10. Ring: Metal.
11. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

## **2.05 TEST PLUGS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Terice, H. O. Co.
  2. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
  3. Weiss Instruments, Inc.
- B. Description: Test-station fitting made for insertion into piping tee fitting.
- C. Body: Brass or stainless steel with core inserts and gasketed and threaded cap. Include extended stem on units to be installed in insulated piping.
- D. Thread Size: NPS 1/4 (DN 8) or NPS 1/2 (DN 15), ASME B1.20.1 pipe thread.
- E. Minimum Pressure and Temperature Rating: 500 psig at 200 deg F (3450 kPa at 93 deg C).
- F. Core Inserts: Chlorosulfonated polyethylene synthetic and EPDM self-sealing rubber.

## **PART 3 - EXECUTION**

### **3.01 INSTALLATION**

- A. Install thermowells with socket extending to center of pipe and in vertical position in piping tees.

- B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.
- C. Install thermowells with extension on insulated piping.
- D. Fill thermowells with heat-transfer medium.
- E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.
- F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.
- G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.
- H. Install remote-mounted pressure gages on panel.
- I. Install valve and snubber in piping for each pressure gage for fluids.
- J. Install test plugs in piping tees.
- K. Install thermometers in the following locations:
  - 1. Inlet and outlet of each water heater.
- L. Install pressure gages in the following locations:
  - 1. Building water service entrance into building.
  - 2. Inlet and outlet of each pressure-reducing valve.
  - 3. Suction and discharge of each domestic water pump.

### 3.02 CONNECTIONS

- A. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

### 3.03 ADJUSTING

- A. Adjust faces of meters and gages to proper angle for best visibility.

### 3.04 THERMOMETER SCHEDULE

- A. Thermometers at inlet and outlet of each domestic water heater shall be one of the following:
  - 1. Liquid-filled, bimetallic-actuated type.
  - 2. Direct-mounted, metal-case, vapor-actuated type.
  - 3. Industrial-style, liquid-in-glass type.

4. Direct-mounted, light-activated type.
5. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

B. Thermometer stems shall be of length to match thermowell insertion length.

**3.05 THERMOMETER SCALE-RANGE SCHEDULE**

- A. Scale Range for Domestic Cold-Water Piping: 0 to 150 deg F (Minus 20 to plus 70 deg C).
- B. Scale Range for Domestic Hot-Water Piping: 0 to 250 deg F (0 to 150 deg C).

**3.06 PRESSURE-GAGE SCHEDULE**

- A. Pressure gages at discharge of each water service into building shall be the following:
  1. Liquid-filled, direct -mounted, metal case.
  2. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.
- B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:
  1. Liquid-filled Solid-front, pressure-relief, direct-mounted, metal case.
  2. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.
- C. Pressure gages at suction and discharge of each domestic water pump shall be the following:
  1. Liquid-filled, direct-mounted, metal case.
  2. Test plug with chlorosulfonated polyethylene synthetic self-sealing rubber inserts.

**3.07 PRESSURE-GAGE SCALE-RANGE SCHEDULE**

- A. Scale Range for Water Service Piping: 0 to 160 psi (0 to 1100 kPa).
- B. Scale Range for Domestic Water Piping: 0 to 160 psi (0 to 1100 kPa).

**END OF SECTION**



SECTION 22 05 23.12

**BALL VALVES FOR PLUMBING PIPING**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
  - 1. Bronze ball valves.

1.03 DEFINITIONS

- A. CWP: Cold working pressure.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of valve.
  - 1. Certification that products comply with NSF 61 Annex G.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Prepare valves for shipping as follows:
  - 1. Protect internal parts against rust and corrosion.
  - 2. Protect threads, flange faces, and soldered ends.
  - 3. Set ball valves open to minimize exposure of functional surfaces.
- B. Use the following precautions during storage:
  - 1. Maintain valve end protection.
  - 2. Store valves indoors and maintain at higher-than-ambient-dew-point temperature. If outdoor storage is necessary, store valves off the ground in watertight enclosures.
- C. Use sling to handle large valves; rig sling to avoid damage to exposed parts. Do not use operating handles or stems as lifting or rigging points.

**PART 2 - PRODUCTS**

**2.01 GENERAL REQUIREMENTS FOR VALVES**

- A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.
- B. ASME Compliance:
  - 1. ASME B1.20.1 for threads for threaded end valves.
  - 2. ASME B16.1 for flanges on iron valves.
  - 3. ASME B16.5 for flanges on steel valves.
  - 4. ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
  - 5. ASME B16.18 for solder-joint connections.
  - 6. ASME B31.9 for building services piping valves.
- C. NSF Compliance: NSF 61 Annex G for valve materials for potable-water service.
- D. Bronze valves shall be made with dezincification-resistant materials. Bronze valves made with copper alloy (brass) containing more than 15 percent zinc are not permitted.
- E. Valve Pressure-Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
- F. Valve Sizes: Same as upstream piping unless otherwise indicated.
- G. Valves in Insulated Piping:
  - 1. Include 2-inch (50-mm) stem extensions.
  - 2. Extended operating handles of nonthermal-conductive material and protective sleeves that allow operation of valves without breaking vapor seals or disturbing insulation.
  - 3. Memory stops that are fully adjustable after insulation is applied.

**2.02 BRONZE BALL VALVES**

- A. Bronze Ball Valves, Two-Piece with Full Port, and Bronze or Brass Trim:
  - 1. Description:
    - a. Standard: MSS SP-110.
    - b. CWP Rating: 600 psig.
    - c. Body Design: Two piece.
    - d. Body Material: Bronze.

- e. Ends: Threaded and soldered.
- f. Seats: PTFE.
- g. Stem: Bronze or brass.
- h. Ball: Chrome-plated brass.
- i. Port: Full.

B. Bronze Ball Valves, Two-Piece with Full Port and Stainless-Steel Trim:

- 1. Description:
  - a. Standard: MSS SP-110.
  - b. CWP Rating: 600 psig.
  - c. Body Design: Two piece.
  - d. Body Material: Bronze.
  - e. Ends: Threaded or soldered.
  - f. Seats: PTFE.
  - g. Stem: Stainless steel.
  - h. Ball: Stainless steel, vented.
  - i. Port: Full.

C. Bronze Ball Valves, Three-Piece with Full Port and Bronze or Brass Trim:

- 1. Description:
  - a. Standard: MSS SP-110.
  - b. CWP Rating: 600 psig
  - c. Body Design: Three piece.
  - d. Body Material: Bronze.
  - e. Ends: Threaded.
  - f. Seats: PTFE.
  - g. Stem: Bronze or brass.
  - h. Ball: Chrome-plated brass.
  - i. Port: Full.

D. Bronze Ball Valves, Three-Piece with Full Port and Stainless-Steel Trim:

1. Description:
  - a. Standard: MSS SP-110.
  - b. CWP Rating: 600 psig.
  - c. Body Design: Three piece.
  - d. Body Material: Bronze.
  - e. Ends: Threaded.
  - f. Seats: PTFE.
  - g. Stem: Stainless steel.
  - h. Ball: Stainless steel, vented.
  - i. Port: Full.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.
- B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.
- C. Examine threads on valve and mating pipe for form and cleanliness.
- D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.
- E. Do not attempt to repair defective valves; replace with new valves.

#### **3.02 VALVE INSTALLATION**

- A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
- B. Locate valves for easy access and provide separate support where necessary.
- C. Install valves in horizontal piping with stem at or above center of pipe.
- D. Install valves in position to allow full stem movement.
- E. Install valve tags. Comply with requirements in Section 220553 "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

**3.03 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS**

- A. If valves with specified CWP ratings are unavailable, the same types of valves with higher CWP ratings may be substituted.
- B. Select valves with the following end connections:
  - 1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
  - 2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.

**3.04 DOMESTIC HOT- AND COLD-WATER VALVE SCHEDULE**

- A. Pipe NPS 2 (DN 50) and Smaller:
  - 1. Bronze Valves: May be provided with solder-joint ends instead of threaded ends.
  - 2. Brass ball valves, two-piece with full port and brass trim.
  - 3. Bronze ball valves, two-piece with full port and stainless-steel trim.
  - 4. Brass ball valves, three-piece with full port and brass trim.
  - 5. Bronze ball valves, three-piece with full port and stainless-steel trim.

**END OF SECTION**

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SECTION 22 05 29

**HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
  - 1. Metal pipe hangers and supports.
  - 2. Trapeze pipe hangers.
  - 3. Metal framing systems.
  - 4. Fastener systems.
  - 5. Equipment supports.
- B. Related Sections:
  - 1. Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment" for vibration isolation devices.

1.03 DEFINITIONS

- A. MSS: Manufacturers Standardization Society of The Valve and Fittings Industry Inc.

1.04 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design trapeze pipe hangers and equipment supports, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.
- B. Structural Performance: Hangers and supports for plumbing piping and equipment shall withstand the effects of gravity loads and stresses within limits and under conditions indicated according to ASCE/SEI 7.
  - 1. Design supports for multiple pipes, including pipe stands, capable of supporting combined weight of supported systems, system contents, and test water.
  - 2. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
  - 3. Design seismic-restraint hangers and supports for piping and equipment and obtain approval from authorities having jurisdiction.

**1.05 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Signed and sealed by a qualified professional engineer. Show fabrication and installation details and include calculations for the following; include Product Data for components:
  - 1. Trapeze pipe hangers.
  - 2. Metal framing systems.
  - 3. Equipment supports.

**1.06 INFORMATIONAL SUBMITTALS**

- A. Welding certificates.

**1.07 QUALITY ASSURANCE**

- A. Structural Steel Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Pipe Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

**PART 2 - PRODUCTS**

**2.01 METAL PIPE HANGERS AND SUPPORTS**

- A. Carbon-Steel Pipe Hangers and Supports:
  - 1. Description: MSS SP-58, Types 1 through 58, factory-fabricated components.
  - 2. Galvanized Metallic Coatings: Pre-galvanized or hot dipped.
  - 3. Nonmetallic Coatings: Plastic coating, jacket, or liner.
  - 4. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion to support bearing surface of piping.
  - 5. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.

**2.02 TRAPEZE PIPE HANGERS**

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

**2.03 METAL FRAMING SYSTEMS**

- A. MFMA Manufacturer Metal Framing Systems:



1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Cooper B-Line, Inc.
  - b. Flex-Strut Inc.
  - c. Unistrut Corporation; Tyco International, Ltd.
2. Description: Shop- or field-fabricated pipe-support assembly for supporting multiple parallel pipes.
3. Standard: MFMA-4.
4. Channels: Continuous slotted steel channel with inturned lips.
5. Channel Nuts: Formed or stamped steel nuts or other devices designed to fit into channel slot and, when tightened, prevent slipping along channel.
6. Hanger Rods: Continuous-thread rod, nuts, and washer made of carbon steel.
7. Metallic Coating: Hot-dipped galvanized.
8. Paint Coating: Vinyl.
9. Plastic Coating: PVC.

#### 2.04 FASTENER SYSTEMS

- A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
- B. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel anchors, for use in hardened portland cement concrete; with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

#### 2.05 PIPE STANDS

- A. General Requirements for Pipe Stands: Shop- or field-fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Low-Type, Single-Pipe Stand: One-piece stainless-steel base unit with plastic roller, for roof installation without membrane penetration.
- C. High-Type, Single-Pipe Stand:
  1. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
  2. Base: Stainless steel.
  3. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.

4. Horizontal Member: Cadmium-plated-steel or stainless-steel rod with plastic or stainless-steel, roller-type pipe support.

D. High-Type, Multiple-Pipe Stand:

1. Description: Assembly of bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
2. Bases: One or more; plastic.
3. Vertical Members: Two or more protective-coated-steel channels.
4. Horizontal Member: Protective-coated-steel channel.
5. Pipe Supports: Galvanized-steel, clevis-type pipe hangers.

E. Curb-Mounting-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

**2.06 PIPE POSITIONING SYSTEMS**

- A. Description: IAPMO PS 42, positioning system of metal brackets, clips, and straps for positioning piping in pipe spaces; for plumbing fixtures in commercial applications.

**2.07 EQUIPMENT SUPPORTS**

- A. Description: Welded, shop- or field-fabricated equipment support made from structural carbon-steel shapes.

**2.08 MISCELLANEOUS MATERIALS**

- A. Structural Steel: ASTM A 36/A 36M, carbon-steel plates, shapes, and bars; black and galvanized.
- B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, nonshrink and nonmetallic grout; suitable for interior and exterior applications.
1. Properties: Nonstaining, noncorrosive, and nongaseous.
  2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

**PART 3 - EXECUTION**

**3.01 HANGER AND SUPPORT INSTALLATION**

- A. Metal Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from the building structure.
- B. Metal Trapeze Pipe-Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping, and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified for individual pipe hangers.
  2. Field fabricate from ASTM A 36/A 36M, carbon-steel shapes selected for loads being supported. Weld steel according to AWS D1.1/D1.1M.
- C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping, and support together on field-assembled metal framing systems.
- D. Fastener System Installation:
1. Install powder-actuated fasteners for use in lightweight concrete or concrete slabs less than 4 inches (100 mm) thick in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
  2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.
- E. Pipe Stand Installation:
1. Pipe Stand Types except Curb-Mounted Type: Assemble components and mount on smooth roof surface. Do not penetrate roof membrane.
- F. Pipe Positioning-System Installation: Install support devices to make rigid supply and waste piping connections to each plumbing fixture.
- G. Install hangers and supports complete with necessary attachments, inserts, bolts, rods, nuts, washers, and other accessories.
- H. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
- I. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- J. Install lateral bracing with pipe hangers and supports to prevent swaying.
- K. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.
- L. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- M. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and to not exceed maximum pipe deflections allowed by ASME B31.9 for building services piping.
- N. Insulated Piping:

1. Attach clamps and spacers to piping.
  - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
  - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
  - c. Do not exceed pipe stress limits allowed by ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
  - a. Option: Thermal-hanger shield inserts may be used. Include steel weight-distribution plate for pipe NPS 4 (DN 100) and larger if pipe is installed on rollers.
4. Shield Dimensions for Pipe: Not less than the following:
  - a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
  - b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
5. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

### **3.02 EQUIPMENT SUPPORTS**

- A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
- B. Grouting: Place grout under supports for equipment and make bearing surface smooth.
- C. Provide lateral bracing, to prevent swaying, for equipment supports.

### **3.03 METAL FABRICATIONS**

- A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.
- B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

- C. Field Welding: Comply with AWS D1.1/D1.1M procedures for shielded, metal arc welding; appearance and quality of welds; and methods used in correcting welding work; and with the following:
1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. Finish welds at exposed connections so no roughness shows after finishing and so contours of welded surfaces match adjacent contours.

#### 3.04 ADJUSTING

- A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- B. Trim excess length of continuous-thread hanger and support rods to 1-1/2 inches (40 mm).

#### 3.05 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
1. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- B. Touchup: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal are specified in Section 09 91 23 "Interior Painting."
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

#### 3.06 HANGER AND SUPPORT SCHEDULE

- A. Specific hanger and support requirements are in Sections specifying piping systems and equipment.
- B. Comply with MSS SP-69 for pipe-hanger selections and applications that are not specified in piping system Sections.
- C. Use hangers and supports with galvanized metallic coatings for piping and equipment that will not have field-applied finish.
- D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- E. Use carbon-steel pipe hangers and supports, metal trapeze pipe hangers and metal framing systems and attachments for general service applications.

- F. Use padded hangers for piping that is subject to scratching.
- G. Use thermal-hanger shield inserts for insulated piping and tubing.
- H. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
  - 1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of noninsulated or insulated, stationary pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
  - 2. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes NPS 3/4 to NPS 36 (DN 20 to DN 900), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
  - 3. Steel Pipe Clamps (MSS Type 4): For suspension of cold and hot pipes NPS 1/2 to NPS 24 (DN 15 to DN 600) if little or no insulation is required.
  - 4. Pipe Hangers (MSS Type 5): For suspension of pipes NPS 1/2 to NPS 4 (DN 15 to DN 100), to allow off-center closure for hanger installation before pipe erection.
  - 5. Adjustable, Swivel Split- or Solid-Ring Hangers (MSS Type 6): For suspension of noninsulated, stationary pipes NPS 3/4 to NPS 8 (DN 20 to DN 200).
  - 6. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
  - 7. Adjustable Band Hangers (MSS Type 9): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
  - 8. Adjustable, Swivel-Ring Band Hangers (MSS Type 10): For suspension of noninsulated, stationary pipes NPS 1/2 to NPS 8 (DN 15 to DN 200).
  - 9. Split Pipe Ring with or without Turnbuckle Hangers (MSS Type 11): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 8 (DN 10 to DN 200).
  - 10. Extension Hinged or Two-Bolt Split Pipe Clamps (MSS Type 12): For suspension of noninsulated, stationary pipes NPS 3/8 to NPS 3 (DN 10 to DN 80).
  - 11. U-Bolts (MSS Type 24): For support of heavy pipes NPS 1/2 to NPS 30 (DN 15 to DN 750).
  - 12. Clips (MSS Type 26): For support of insulated pipes not subject to expansion or contraction.
  - 13. Adjustable Pipe Saddle Supports (MSS Type 38): For stanchion-type support for pipes NPS 2-1/2 to NPS 36 (DN 65 to DN 900) if vertical adjustment is required, with steel-pipe base stanchion support and cast-iron floor flange.
  - 14. Single-Pipe Rolls (MSS Type 41): For suspension of pipes NPS 1 to NPS 30 (DN 25 to DN 750), from two rods if longitudinal movement caused by expansion and contraction might occur.

15. Adjustable Roller Hangers (MSS Type 43): For suspension of pipes NPS 2-1/2 to NPS 24 (DN 65 to DN 600), from single rod if horizontal movement caused by expansion and contraction might occur.
  16. Complete Pipe Rolls (MSS Type 44): For support of pipes NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.
  17. Pipe Roll and Plate Units (MSS Type 45): For support of pipes NPS 2 to NPS 24 (DN 50 to DN 600) if small horizontal movement caused by expansion and contraction might occur and vertical adjustment is not necessary.
  18. Adjustable Pipe Roll and Base Units (MSS Type 46): For support of pipes NPS 2 to NPS 30 (DN 50 to DN 750) if vertical and lateral adjustment during installation might be required in addition to expansion and contraction.
- I. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers NPS 3/4 to NPS 24 (DN 24 to DN 600).
  2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers NPS 3/4 to NPS 24 (DN 20 to DN 600) if longer ends are required for riser clamps.
- J. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
  2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
  3. Swivel Turnbuckles (MSS Type 15): For use with MSS Type 11, split pipe rings.
  4. Malleable-Iron Sockets (MSS Type 16): For attaching hanger rods to various types of building attachments.
  5. Steel Weldless Eye Nuts (MSS Type 17): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- K. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
  2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joint construction, to attach to top flange of structural shape.
  3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.

4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  6. C-Clamps (MSS Type 23): For structural shapes.
  7. Top-Beam Clamps (MSS Type 25): For top of beams if hanger rod is required tangent to flange edge.
  8. Side-Beam Clamps (MSS Type 27): For bottom of steel I-beams.
  9. Steel-Beam Clamps with Eye Nuts (MSS Type 28): For attaching to bottom of steel I-beams for heavy loads.
  10. Linked-Steel Clamps with Eye Nuts (MSS Type 29): For attaching to bottom of steel I-beams for heavy loads, with link extensions.
  11. Malleable-Beam Clamps with Extension Pieces (MSS Type 30): For attaching to structural steel.
  12. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb (340 kg).
    - b. Medium (MSS Type 32): 1500 lb (680 kg).
    - c. Heavy (MSS Type 33): 3000 lb (1360 kg).
  13. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  14. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
  15. Horizontal Travelers (MSS Type 58): For supporting piping systems subject to linear horizontal movement where headroom is limited.
- L. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
1. Steel-Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
  3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.
- M. Comply with MSS SP-69 for trapeze pipe-hanger selections and applications that are not specified in piping system Sections.
- N. Comply with MFMA-103 for metal framing system selections and applications that are not specified in piping system Sections.



**APRIL 6, 2020**

**GROSSMONT UNION HIGH SCHOOL DISTRICT  
HELIX CHS RESTROOM AND STORAGE BLDGS**

- O. Use powder-actuated fasteners or mechanical-expansion anchors instead of building attachments where required in concrete construction.
- P. Use pipe positioning systems in pipe spaces behind plumbing fixtures to support supply and waste piping for plumbing fixtures.

**END OF SECTION**

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SECTION 22 05 48

**VIBRATION AND SEISMIC CONTROLS FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
  - 1. Pipe-riser resilient supports.
  - 2. Restraint channel bracings.
  - 3. Restraint cables.
  - 4. Seismic-restraint accessories.
  - 5. Mechanical anchor bolts.

1.03 DEFINITIONS

- A. IBC: International Building Code.
- B. ICC-ES: ICC-Evaluation Service.
- C. OSHPD: Office of Statewide Health Planning & Development (for the State of California).

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
  - 2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of vibration isolation device and seismic-restraint component required.
    - a. Tabulate types and sizes of seismic restraints, complete with report numbers and rated strength in tension and shear as evaluated by an agency acceptable to authorities having jurisdiction.
    - b. Annotate to indicate application of each product submitted and compliance with requirements.
- B. Shop Drawings:

1. Detail fabrication and assembly of equipment bases. Detail fabrication including anchorages and attachments to structure and to supported equipment.

**1.05 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Show coordination of vibration isolation device installation and seismic bracing for plumbing piping and equipment with other systems and equipment in the vicinity, including other supports and restraints, if any.
- B. Qualification Data: For professional engineer.
- C. Welding certificates.
- D. Field quality-control reports.

**1.06 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7 and that is acceptable to authorities having jurisdiction.
- B. Comply with seismic-restraint requirements in the IBC unless requirements in this Section are more stringent.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPM number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are unavailable, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

**PART 2 - PRODUCTS**

**2.01 PERFORMANCE REQUIREMENTS**

- A. Seismic-Restraint Loading:
  1. Assigned Seismic Use Group or Building Category as Defined in the CBC: II.
    - a. Component Importance Factor: 1.0.
    - b. Component Response Modification Factor: 2.5.
    - c. Component Amplification Factor: 2.5.
  2. Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

- a. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they are subjected.

2.02 RESTRAINT CHANNEL BRACINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper B-Line, Inc.
  - 2. Hilti, Inc.
  - 3. Mason Industries, Inc.
- B. Description: MFMA-4, shop- or field-fabricated bracing assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; rated in tension, compression, and torsion forces.

2.03 MECHANICAL ANCHOR BOLTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper B-Line, Inc.
  - 2. Hilti, Inc.
  - 3. Mason Industries, Inc.
- B. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488.

**PART 3 - EXECUTION**

3.01 EXAMINATION

- A. Examine areas and equipment to receive vibration isolation and seismic-control devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 APPLICATIONS

- A. Hanger-Rod Stiffeners: Install hanger-rod stiffeners where indicated or scheduled on Drawings to receive them and where required to prevent buckling of hanger rods due to seismic forces.

- B. Strength of Support and Seismic-Restraint Assemblies: Where not indicated, select sizes of components so strength is adequate to carry present and future static and seismic loads within specified loading limits.

**3.03 VIBRATION CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION**

- A. Coordinate the location of embedded connection hardware with supported equipment attachment and mounting points and with requirements for concrete reinforcement and formwork specified in Section 03 30 00 "Cast-in-Place Concrete."
- B. Installation of vibration isolators must not cause any change of position of equipment, piping, or ductwork resulting in stresses or misalignment.
- C. Piping Restraints:
  - 1. Comply with requirements in MSS SP-127.
  - 2. Space lateral supports a maximum of 40 feet (12 m) o.c., and longitudinal supports a maximum of 80 feet (24 m) o.c.
  - 3. Brace a change of direction longer than 12 feet (3.7 m).
- D. Install cables so they do not bend across edges of adjacent equipment or building structure.
- E. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction that provides required submittals for component.
- F. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.
- G. Install bushing assemblies for mounting bolts for wall-mounted equipment, arranged to provide resilient media where equipment or equipment-mounting channels are attached to wall.
- H. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.
- I. Drilled-in Anchors:
  - 1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
  - 2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
  - 3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.

4. Adhesive Anchors: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
5. Set anchors to manufacturer's recommended torque, using a torque wrench.
6. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.04 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

- A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Section 22 11 16 "Domestic Water Piping" for piping flexible connections.

3.05 FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
  1. Provide evidence of recent calibration of test equipment by a testing agency acceptable to authorities having jurisdiction.
  2. Schedule test with Owner, through Architect, before connecting anchorage device to restrained component (unless postconnection testing has been approved), and with at least seven days' advance notice.
  3. Obtain Architect's approval before transmitting test loads to structure. Provide temporary load-spreading members.
  4. Test at least four of each type and size of installed anchors and fasteners selected by Architect.
  5. Test to 90 percent of rated proof load of device.
  6. Measure isolator restraint clearance.
  7. Measure isolator deflection.
  8. Verify snubber minimum clearances.
- D. Remove and replace malfunctioning units and retest as specified above.
- E. Prepare test and inspection reports.

3.06 ADJUSTING

- A. Adjust isolators after piping system is at operating weight.

- B. Adjust limit stops on restrained-spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

**END OF SECTION**



**SECTION 22 05 53**

**IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
  - 1. Equipment labels.
  - 2. Warning signs and labels.
  - 3. Pipe labels.
  - 4. Stencils.
  - 5. Valve tags.
  - 6. Warning tags.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For color, letter style, and graphic representation required for each identification material and device.
- C. Equipment Label Schedule: Include a listing of all equipment to be labeled with the proposed content for each label.
- D. Valve numbering scheme.
- E. Valve Schedules: For each piping system to include in maintenance manuals.

1.04 COORDINATION

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

**PART 2 - PRODUCTS**

**2.01 EQUIPMENT LABELS**

**A. Metal Labels for Equipment:**

1. Material and Thickness: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
2. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
3. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
4. Fasteners: Stainless-steel rivets.
5. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

**B. Plastic Labels for Equipment:**

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Green.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

**C. Label Content:** Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

- D. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

## 2.02 WARNING SIGNS AND LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
- B. Letter Color: White.
- C. Background Color: Red.
- D. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
- E. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
- F. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- G. Fasteners: Stainless-steel rivets or self-tapping screws.
- H. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- I. Label Content: Include caution and warning information, plus emergency notification instructions.

## 2.03 PIPE LABELS

- A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
- B. Pretensioned Pipe Labels: Precoiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
- C. Self-Adhesive Pipe Labels: Printed plastic with contact-type, permanent-adhesive backing.
- D. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.
  - 1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
  - 2. Lettering Size: At least 1-1/2 inches (38 mm) high.

**2.04 STENCILS**

- A. Stencils: Prepared with letter sizes according to ASME A13.1 for piping; and minimum letter height of 3/4 inch (19 mm) for access panel and door labels, equipment labels, and similar operational instructions.
  - 1. Stencil Material: Aluminum.
  - 2. Stencil Paint: Exterior, gloss, alkyd enamel black unless otherwise indicated. Paint may be in pressurized spray-can form.
  - 3. Identification Paint: Exterior, alkyd enamel in colors according to ASME A13.1 unless otherwise indicated.

**2.05 VALVE TAGS**

- A. Valve Tags: Stamped or engraved with 1/4-inch (6.4-mm) letters for piping system abbreviation and 1/2-inch (13-mm) numbers.
  - 1. Tag Material: Brass, 0.032-inch (0.8-mm) minimum thickness, and having predrilled or stamped holes for attachment hardware.
  - 2. Fasteners: Brass wire-link or beaded chain; or S-hook.
- B. Valve Schedules: For each piping system, on 8-1/2-by-11-inch (A4) bond paper. Tabulate valve number, piping system, system abbreviation (as shown on valve tag), location of valve (room or space), normal-operating position (open, closed, or modulating), and variations for identification. Mark valves for emergency shutoff and similar special uses.
  - 1. Valve-tag schedule shall be included in operation and maintenance data.

**2.06 WARNING TAGS**

- A. Warning Tags: Preprinted or partially preprinted, accident-prevention tags, of plasticized card stock with matte finish suitable for writing.
  - 1. Size: Approximately 4 by 7 inches (100 by 178 mm).
  - 2. Fasteners: Brass grommet and wire.
  - 3. Nomenclature: Large-size primary caption such as "DANGER," "CAUTION," or "DO NOT OPERATE."
  - 4. Color: Yellow background with black lettering.

**PART 3 - EXECUTION**

**3.01 PREPARATION**

- A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.02 EQUIPMENT LABEL INSTALLATION

- A. Install or permanently fasten labels on each major item of mechanical equipment.
- B. Locate equipment labels where accessible and visible.

3.03 PIPE LABEL INSTALLATION

- A. Stenciled Pipe Label Option: Stenciled labels may be provided instead of manufactured pipe labels, at Installer's option. Install stenciled pipe labels with painted, color-coded bands or rectangles, complying with ASME A13.1, on each piping system.
  - 1. Identification Paint: Use for contrasting background.
  - 2. Stencil Paint: Use for pipe marking.
- B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
  - 1. Near each valve and control device.
  - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
  - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
  - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
  - 5. Near major equipment items and other points of origination and termination.
  - 6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
  - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.
- C. Pipe Label Color Schedule:
  - 1. Low-Pressure, Compressed-Air Piping:
    - a. Background Color: Blue.
    - b. Letter Color: White.
  - 2. Domestic Water Piping:
    - a. Background Color: Green.
    - b. Letter Color: White.
  - 3. Sanitary Waste and Storm Drainage Piping:
    - a. Background Color: Green.

- b. Letter Color: White.

**3.04 VALVE-TAG INSTALLATION**

- A. Install tags on valves and control devices in piping systems, except check valves; valves within factory-fabricated equipment units; shutoff valves; faucets; convenience and lawn-watering hose connections; and similar roughing-in connections of end-use fixtures and units. List tagged valves in a valve schedule.
- B. Valve-Tag Application Schedule: Tag valves according to size, shape, and color scheme and with captions similar to those indicated in the following subparagraphs:
  - 1. Valve-Tag Size and Shape:
    - a. Cold Water: 1-1/2 inches (38 mm), round.
    - b. Hot Water: 1-1/2 inches (38 mm), round.
    - c. Low-Pressure Compressed Air: 1-1/2 inches (38 mm), round.
  - 2. Valve-Tag Color:
    - a. Cold Water: Green.
    - b. Hot Water: Green .
    - c. Low-Pressure Compressed Air: Blue.
  - 3. Letter Color:
    - a. Cold Water: White.
    - b. Hot Water: White.
    - c. Low-Pressure Compressed Air: White.

**3.05 WARNING-TAG INSTALLATION**

- A. Write required message on, and attach warning tags to, equipment and other items where required.

**END OF SECTION**

SECTION 22 07 19

**PLUMBING PIPING INSULATION**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes insulating the following plumbing piping services:
  - 1. Domestic hot-water piping.
  - 2. Domestic recirculating hot-water piping.
  - 3. Supplies and drains for handicap-accessible lavatories and sinks.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied, if any).

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.
- C. Field quality-control reports.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84 by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.
  - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
  - 2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

- C. Mockups: Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Architect. Use materials indicated for the completed Work.

1. Piping Mockups:
    - a. One 10-foot section of NPS 2 straight pipe.
    - b. One each of a 90-degree threaded, welded, and flanged elbow.
    - c. One each of a threaded, welded, and flanged tee fitting.
    - d. One NPS 2 or smaller valve, and one NPS 2-1/2 or larger valve.
    - e. Four support hangers including hanger shield and insert.
    - f. One threaded strainer and one flanged strainer with removable portion of insulation.
    - g. One threaded reducer and one welded reducer.
    - h. One pressure temperature tap.
    - i. One mechanical coupling.
  2. For each mockup, fabricate cutaway sections to allow observation of application details for insulation materials, adhesives, mastics, attachments, and jackets.
  3. Notify Architect seven days in advance of dates and times when mockups will be constructed.
  4. Obtain Architect's approval of mockups before starting insulation application.
  5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
  6. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  7. Demolish and remove mockups when directed.
- D. Comply with the following applicable standards and other requirements specified for miscellaneous components:
1. Supply and Drain Protective Shielding Guards: ICC A117.1.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard designation, type and grade, and maximum use temperature.



1.07 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.08 SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

**PART 2 - PRODUCTS**

2.01 INSULATION MATERIALS

- A. Comply with requirements in "Piping Insulation Schedule, General," "Indoor Piping Insulation Schedule," "Outdoor, Aboveground Piping Insulation Schedule," and "Outdoor, Underground Piping Insulation Schedule" articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
  - 1. Products: Subject to compliance with requirements, provide the following:
    - a. Pittsburgh Corning Corporation; Foamglas.
  - 2. Block Insulation: ASTM C 552, Type I.
  - 3. Special-Shaped Insulation: ASTM C 552, Type III.

4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
  5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
  6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
- G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Aeroflex USA, Inc.; Aerocel.
    - b. Armacell LLC; AP Armaflex.
    - c. K-Flex USA; Insul-Lock, Insul-Tube, and K-FLEX LS.
- H. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. CertainTeed Corp.; SoftTouch Duct Wrap.
    - b. Johns Manville; Microlite.
    - c. Manson Insulation Inc.; Alley Wrap.
- I. Mineral-Fiber, Preformed Pipe Insulation:
1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Johns Manville; Micro-Lok.
    - b. Knauf Insulation; 1000-Degree Pipe Insulation.
    - c. Manson Insulation Inc.; Alley-K.
  2. Type I, 850 Deg F Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, without factory-applied jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

## **2.02 INSULATING CEMENTS**

- A. Mineral-Fiber Insulating Cement: Comply with ASTM C 195.
1. Products: Subject to compliance with requirements, provide one of the following:

- a. Ramco Insulation, Inc.; Super-Stik.
- B. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Ramco Insulation, Inc.; Ramcote 1200 and Quik-Cote.

2.03 ADHESIVES

- A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
  - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.
    - b. Eagle Bridges - Marathon Industries; 225.
  - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.04 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
  - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
    - b. Vimasco Corporation; 749.
  - 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
  - 3. Service Temperature Range: Minus 20 to plus 180 deg F.

4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
5. Color: White.

**2.05 LAGGING ADHESIVES**

- A. Description: Comply with MIL-A-3316C, Class I, Grade A, and shall be compatible with insulation materials, jackets, and substrates.
  1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.
    - b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
    - c. Vimasco Corporation; 713 and 714.
  3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over pipe insulation.
  4. Service Temperature Range: 0 to plus 180 deg F.
  5. Color: White.

**2.06 FACTORY-APPLIED JACKETS**

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
  1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
  2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
  3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.

**2.07 FIELD-APPLIED FABRIC-REINFORCING MESH**

- A. Woven Glass-Fiber Fabric: Approximately 2 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. in. for covering pipe and pipe fittings.
  1. Products: Subject to compliance with requirements, provide the following:
    - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Chil-Glas Number 10.

2.08 TAPES

- A. ASJ Tape: White vapor-retarder tape matching factory-applied jacket with acrylic adhesive, complying with ASTM C 1136.
- B. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive; suitable for indoor and outdoor applications.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. ABI, Ideal Tape Division; 370 White PVC tape.
    - b. Compac Corporation; 130.
    - c. Venture Tape; 1506 CW NS.
  - 2. Width: 2 inches.
  - 3. Thickness: 6 mils.
  - 4. Adhesion: 64 ounces force/inch in width.
  - 5. Elongation: 500 percent.
  - 6. Tensile Strength: 18 lbf/inch in width.

2.09 SECUREMENTS

- A. Bands:
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. ITW Insulation Systems; Gerrard Strapping and Seals.
    - b. RPR Products, Inc.; Insul-Mate Strapping and Seals.
  - 2. Stainless Steel: ASTM A 167 or ASTM A 240/A 240M, Type 304 or Type 316; 0.015 inch thick, 1/2 inch wide with closed seal.
  - 3. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.
- C. Wire: 0.080-inch nickel-copper alloy.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. C & F Wire.

**2.10 PROTECTIVE SHIELDING GUARDS**

**A. Protective Shielding Pipe Covers:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. McGuire Manufacturing.
  - b. Plumberex.
  - c. Truebro; a brand of IPS Corporation.
  - d. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic wraps for covering plumbing fixture hot-water supply and trap and drain piping. Comply with Americans with Disabilities Act (ADA) requirements.

**B. Protective Shielding Piping Enclosures:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Truebro; a brand of IPS Corporation.
  - b. Zurn Industries, LLC; Tubular Brass Plumbing Products Operation.
2. Description: Manufactured plastic enclosure for covering plumbing fixture hot-and cold-water supplies and trap and drain piping. Comply with ADA requirements.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A.** Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
1. Verify that systems to be insulated have been tested and are free of defects.
  2. Verify that surfaces to be insulated are clean and dry.
- B.** Proceed with installation only after unsatisfactory conditions have been corrected.

**3.02 PREPARATION**

- A.** Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B.** Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
  2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
- C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

### 3.03 GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
1. Install insulation continuously through hangers and around anchor attachments.
  2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.

3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
1. Draw jacket tight and smooth.
  2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
  3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches o.c.
    - a. For below-ambient services, apply vapor-barrier mastic over staples.
  4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
  5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above-ambient services, do not install insulation to the following:
1. Vibration-control devices.
  2. Testing agency labels and stamps.
  3. Nameplates and data plates.
  4. Cleanouts.



## 3.04 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
  - 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.
- C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
  - 1. Seal penetrations with flashing sealant.
  - 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
  - 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
  - 4. Seal jacket to wall flashing with flashing sealant.
- D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
- F. Insulation Installation at Floor Penetrations:
  - 1. Pipe: Install insulation continuously through floor penetrations.
  - 2. Seal penetrations through fire-rated assemblies.

## 3.05 GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
  2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
  3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
  4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
  5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.
  6. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
  7. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
  8. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
3. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
4. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

### 3.06 INSTALLATION OF CELLULAR-GLASS INSULATION

#### A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

#### B. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

#### C. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.

**3.07 INSTALLATION OF MINERAL-FIBER INSULATION**

**A. Insulation Installation on Straight Pipes and Tubes:**

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

**B. Insulation Installation on Pipe Fittings and Elbows:**

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

**C. Insulation Installation on Valves and Pipe Specialties:**

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

**3.08 FIELD QUALITY CONTROL**

**A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.**

**B. Perform tests and inspections.**

**C. Tests and Inspections:**

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.09 PIPING INSULATION SCHEDULE, GENERAL

- A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.
- B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:
  - 1. Drainage piping located in crawl spaces.
  - 2. Underground piping.
  - 3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.10 INDOOR PIPING INSULATION SCHEDULE

- A. Domestic Hot and Recirculated Hot Water:
  - 1. NPS 1-1/4 and Smaller: Insulation shall be one of the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 3/4 inch thick.
- B. Exposed Sanitary Drains, Domestic Water, Domestic Hot Water, and Stops for Plumbing Fixtures for People with Disabilities:
  - 1. All Pipe Sizes: Insulation shall be one of the following:
    - a. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1/2 inch thick.

**END OF SECTION**

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SECTION 22 11 16

**DOMESTIC WATER PIPING**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
  - 1. Under-building-slab and aboveground domestic water pipes, tubes, and fittings inside buildings.
  - 2. Encasement for piping.

1.03 ACTION SUBMITTALS

- A. Product Data: For transition fittings and dielectric fittings.

1.04 INFORMATIONAL SUBMITTALS

- A. System purging and disinfecting activities report.
- B. Field quality-control reports.

1.05 FIELD CONDITIONS

- A. Interruption of Existing Water Service: Do not interrupt water service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary water service according to requirements indicated:
  - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of water service.
  - 2. Do not interrupt water service without Construction Manager's written permission.

**PART 2 - PRODUCTS**

2.01 PIPING MATERIALS

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.
- B. Potable-water piping and components shall comply with NSF 14 and NSF 61. Plastic piping components shall be marked with "NSF-pw."

**2.02 COPPER TUBE AND FITTINGS**

- A. Hard Copper Tube: ASTM B 88, Type L water tube, drawn temper.
- B. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) water tube, annealed temper.
- C. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- D. Copper Unions:
  - 1. MSS SP-123.
  - 2. Cast-copper-alloy, hexagonal-stock body.
  - 3. Ball-and-socket, metal-to-metal seating surfaces.
  - 4. Solder-joint or threaded ends.

**2.03 ENCASEMENT FOR PIPING**

- A. Standard: ASTM A 674 or AWWA C105/A21.5.
- B. Form: Sheet.
- C. Color: Natural.

**2.04 TRANSITION FITTINGS**

- A. General Requirements:
  - 1. Same size as pipes to be joined.
  - 2. Pressure rating at least equal to pipes to be joined.
  - 3. End connections compatible with pipes to be joined.
- B. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
- C. Sleeve-Type Transition Coupling: AWWA C219.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Cascade Waterworks Manufacturing.
    - b. Dresser, Inc.; Piping Specialties Products.
    - c. Ford Meter Box Company, Inc. (The).



2.05 DIELECTRIC FITTINGS

- A. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
- B. Dielectric Unions:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following:
    - a. Capitol Manufacturing Company; member of the Phoenix Forge Group.
    - b. Watts; a division of Watts Water Technologies, Inc.
    - c. Wilkins; a Zurn company.
  - 2. Standard: ASSE 1079.
  - 3. Pressure Rating: 125 psig minimum at 180 deg F.
  - 4. End Connections: Solder-joint copper alloy and threaded ferrous.
- C. Dielectric Nipples:
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Elster Perfection Corporation.
    - b. Grinnell Mechanical Products; Tyco Fire Products LP.
    - c. Precision Plumbing Products, Inc.
    - d. Victaulic Company.
  - 2. Standard: IAPMO PS 66.
  - 3. Electroplated steel nipple complying with ASTM F 1545.
  - 4. Pressure Rating and Temperature: 300 psig at 225 deg F.
  - 5. End Connections: Male threaded or grooved.
  - 6. Lining: Inert and noncorrosive, propylene.

**PART 3 - EXECUTION**

3.01 EARTHWORK

- A. Install below grade piping per Contract Documents, CPC, School District and Local Codes.

**3.02 PIPING INSTALLATION**

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."
- C. Install underground copper tube in PE encasement according to ASTM A 674 or AWWA C105/A21.5.
- D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve inside the building at each domestic water-service entrance. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping" and with requirements for drain valves and strainers in Section 22 11 19 "Domestic Water Piping Specialties."
- E. Install shutoff valve immediately upstream of each dielectric fitting.
- F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements for pressure-reducing valves in Section 22 11 19 "Domestic Water Piping Specialties."
- G. Install domestic water piping level without pitch and plumb.
- H. Rough-in domestic water piping for water-meter installation according to utility company's requirements.
- I. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- J. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.
- K. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- L. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal, and coordinate with other services occupying that space.
- M. Install piping to permit valve servicing.
- N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than the system pressure rating used in applications below unless otherwise indicated.
- O. Install piping free of sags and bends.
- P. Install fittings for changes in direction and branch connections.

- Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.
- R. Install pressure gages on suction and discharge piping for each plumbing pump and packaged booster pump. Comply with requirements for pressure gages in Section 22 05 19 "Meters and Gages for Plumbing Piping."
- S. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- T. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- U. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

### 3.03 JOINT CONSTRUCTION

- A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- D. Brazed Joints for Copper Tubing: Comply with CDA's "Copper Tube Handbook," "Braze Joints" chapter.
- E. Soldered Joints for Copper Tubing: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."
- F. Joints for Dissimilar-Material Piping: Make joints using adapters compatible with materials of both piping systems.

### 3.04 TRANSITION FITTING INSTALLATION

- A. Install transition couplings at joints of dissimilar piping.
- B. Transition Fittings in Underground Domestic Water Piping:
  - 1. Fittings for NPS 1-1/2 and Smaller: Fitting-type coupling.
  - 2. Fittings for NPS 2 and Larger: Sleeve-type coupling.

- C. Transition Fittings in Aboveground Domestic Water Piping NPS 2 and Smaller: Plastic-to-metal transition fittings or unions.

**3.05 DIELECTRIC FITTING INSTALLATION**

- A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
- B. Dielectric Fittings for NPS 2 and Smaller: Use dielectric couplings or nipples.

**3.06 HANGER AND SUPPORT INSTALLATION**

- A. Comply with requirements for seismic-restraint devices in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger, support products, and installation in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
  - 1. Vertical Piping: MSS Type 8 or 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs:
    - a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
    - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
    - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
  - 3. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
  - 4. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support vertical piping and tubing at base and at each floor.
- D. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch.
- E. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 3/4 and Smaller: 60 inches with 3/8-inch rod.
  - 2. NPS 1 and NPS 1-1/4: 72 inches with 3/8-inch rod.
  - 3. NPS 1-1/2 and NPS 2: 96 inches with 3/8-inch rod.
- F. Install supports for vertical copper tubing every 10 feet.

**3.07 CONNECTIONS**

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. When installing piping adjacent to equipment and machines, allow space for service and maintenance.

- C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.
- D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
  - 1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller than sizes of water heater connections.
  - 2. Plumbing Fixtures: Cold- and hot-water-supply piping in sizes indicated, but not smaller than that required by plumbing code.
  - 3. Equipment: Cold- and hot-water-supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 and larger.

### 3.08 IDENTIFICATION

- A. Identify system components. Comply with requirements for identification materials and installation in Section 22 05 53 "Identification for Plumbing Piping and Equipment."
- B. Label pressure piping with system operating pressure.

### 3.09 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. Piping Inspections:
    - a. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
    - b. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
      - 1) Roughing-in Inspection: Arrange for inspection of piping before concealing or closing in after roughing in and before setting fixtures.
      - 2) Final Inspection: Arrange for authorities having jurisdiction to observe tests specified in "Piping Tests" Subparagraph below and to ensure compliance with requirements.
    - c. Reinspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections and arrange for reinspection.
    - d. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
  - 2. Piping Tests:
    - a. Fill domestic water piping. Check components to determine that they are not air bound and that piping is full of water.

- b. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
  - c. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  - d. Cap and subject piping to static water pressure of 50 psig above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow it to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
  - e. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.
  - f. Prepare reports for tests and for corrective action required.
- B. Domestic water piping will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

**3.10 ADJUSTING**

- A. Perform the following adjustments before operation:
  - 1. Close drain valves, hydrants, and hose bibbs.
  - 2. Open shutoff valves to fully open position.
  - 3. Open throttling valves to proper setting.
  - 4. Adjust balancing valves in hot-water-circulation return piping to provide adequate flow.
    - a. Manually adjust ball-type balancing valves in hot-water-circulation return piping to provide hot-water flow in each branch.
    - b. Adjust calibrated balancing valves to flows indicated.
  - 5. Remove plugs used during testing of piping and for temporary sealing of piping during installation.
  - 6. Remove and clean strainer screens. Close drain valves and replace drain plugs.
  - 7. Remove filter cartridges from housings and verify that cartridges are as specified for application where used and are clean and ready for use.
  - 8. Check plumbing specialties and verify proper settings, adjustments, and operation.

3.11 CLEANING

- A. Clean and disinfect potable domestic water piping as follows:
  - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  - 2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Fill and isolate system according to either of the following:
      - 1) Fill system or part thereof with water/chlorine solution with at least 50 ppm of chlorine. Isolate with valves and allow to stand for 24 hours.
      - 2) Fill system or part thereof with water/chlorine solution with at least 200 ppm of chlorine. Isolate and allow to stand for three hours.
    - c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
    - d. Repeat procedures if biological examination shows contamination.
    - e. Submit water samples in sterile bottles to authorities having jurisdiction.
- B. Clean non-potable domestic water piping as follows:
  - 1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
  - 2. Use purging procedures prescribed by authorities having jurisdiction or; if methods are not prescribed, follow procedures described below:
    - a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
    - b. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.
- C. Prepare and submit reports of purging and disinfecting activities. Include copies of water-sample approvals from authorities having jurisdiction.
- D. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.12 PIPING SCHEDULE

- A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

- B. Flanges and unions may be used for aboveground piping joints unless otherwise indicated.
- C. Under-building-slab, domestic water, building-service piping, NPS 3 (DN 80) and smaller, shall be the following:
  - 1. Soft copper tube, ASTM B 88, Type K (ASTM B 88M, Type A); wrought-copper, solder-joint fittings; and brazed joints.
- D. Aboveground domestic water piping, NPS 2 and smaller, shall be the following:
  - 1. Hard copper tube, ASTM B 88, Type L; wrought-copper, solder-joint fittings; and soldered joints.

**3.13 VALVE SCHEDULE**

- A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:
  - 1. Shutoff Duty: Use ball valves for piping NPS 2 and smaller. Use ball valves with flanged ends for piping NPS 2-1/2 and larger.
  - 2. Drain Duty: Hose-end drain valves.
- B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

**END OF SECTION**



SECTION 22 11 19

**DOMESTIC WATER PIPING SPECIALTIES**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following domestic water piping specialties:
  - 1. Backflow preventers.
  - 2. Balancing valves.
  - 3. Strainers.
  - 4. Hose bibbs.
  - 5. Wall hydrants.
  - 6. Drain valves.
  - 7. Water hammer arresters.
  - 8. Trap-seal primer valves.
- B. Related Sections include the following:
  - 1. Division 22 Section "Meters and Gages For Plumbing Piping" for thermometers, pressure gages, and flow meters in domestic water piping.

1.03 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.04 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. NSF Compliance:

1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
2. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

## **PART 2 - PRODUCTS**

### **2.01 VACUUM BREAKERS**

#### **A. Hose-Connection Vacuum Breakers:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Woodford Manufacturing Company.
  - b. Zurn Plumbing Products Group; Wilkins Div.
  - c. Watts Industries, Inc.; Water Products Div.
  - d. MIFAB, Inc.
2. Standard: ASSE 1011.
3. Body: Bronze, nonremovable, with manual drain.
4. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
5. Finish: Chrome or nickel plated.

### **2.02 BACKFLOW PREVENTERS**

#### **A. Reduced-Pressure-Principle Backflow Preventers:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. FEBCO; SPX Valves & Controls.
  - b. Watts Industries, Inc.; Water Products Div.
  - c. Zurn Plumbing Products Group; Wilkins Div.
2. Standard: ASSE 1013.
3. Operation: Continuous-pressure applications.
4. Body: Bronze for and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for and larger.
5. End Connections: Threaded.
6. Configuration: Designed for horizontal, straight through flow.

7. Accessories:
  - a. Valves: Ball type with threaded ends on inlet and outlet of and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of and larger.
  - b. Air-Gap Fitting: ASME A112.1.2, matching backflow-preventer connection.
- B. Hose-Connection Backflow Preventers:
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Conbraco Industries, Inc.
    - b. Watts Industries, Inc.; Water Products Div.
    - c. Woodford Manufacturing Company.
  2. Standard: ASSE 1052.
  3. Operation: Up to back pressure.
  4. Inlet Size: 3/4".
  5. Outlet Size: Garden-hose thread complying with ASME B1.20.7.
  6. Capacity: At least flow.

## 2.03 BALANCING VALVES

- A. Copper-Alloy Calibrated Balancing Valves:
  1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  3. Basis-of-Design Product: Subject to compliance with requirements, provide a product by one of the following:
    - a. Taco, Inc.
    - b. Watts Industries, Inc.; Water Products Div.
    - c. NIBCO INC.
  4. Type: Ball valve with two readout ports and memory setting indicator.
  5. Body: Bronze,
  6. Size: Same as connected piping, but not larger than.

7. Accessories: Meter hoses, fittings, valves, differential pressure meter, and carrying case.

**2.04 STRAINERS FOR DOMESTIC WATER PIPING**

**A. Y-Pattern Strainers:**

1. Pressure Rating: minimum, unless otherwise indicated.
2. Body: Bronze for and smaller; cast iron with interior lining complying with AWWA C550 or FDA-approved, epoxy coating and for and larger.
3. End Connections: Threaded and smaller; flanged for and larger.
4. Screen: Stainless steel with round perforations, unless otherwise indicated.
5. Drain: Factory-installed, hose-end drain valve.

**2.05 HOSE BIBBS**

**A. Hose Bibbs (Exterior):**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Josam Company
  - b. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc,
  - c. Zurn Plumbing Products Group; Light Commercial Operation
2. Standard: ASME A112.21.3M for concealed-outlet, self-draining wall hydrants.
3. Operation: Loose Key.
4. Outlet: Concealed, with integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011; and garden-hose thread complying with ASME B1.20.7.
5. Box: Deep, flush mounting with cover.
6. Box and Cover Finish: Chrome plated.
7. Outlet: Exposed, with integral vacuum breaker or nonremovable hose-connection vacuum breaker complying with ASSE 1011; and garden-hose thread complying with ASME B1.20.7
8. Nozzle and Wall-Plate Finish: Polished nickel bronze.
9. Operating Key(s): Two with each wall hydrant.

**B. Hose Bibbs (Interior & Roof):**

1. Standard: ASME A112.18.1 for sediment faucets.

2. Body Material: Bronze.
3. Seat: Bronze, replaceable.
4. Supply Connections: NPS 3/4 (DN 20) threaded or solder-joint inlet.
5. Outlet Connection: Garden-hose thread complying with ASME B1.20.7.
6. Pressure Rating: 125 psig.
7. Vacuum Breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASSE 1011.
8. Finish for Equipment Rooms: Rough bronze, or chrome or nickel plated.
9. Finish for Service Areas: Rough bronze.
10. Finish for Finished Rooms: Chrome or nickel plated.
11. Operation for Equipment Rooms: Wheel handle or operating key.
12. Operation for Service Areas: Operating key.
13. Operation for Finished Rooms: Operating key.
14. Include operating key with each operating-key hose bibb.
15. Include integral wall flange with each chrome- or nickel-plated hose bibb.

## 2.06 DRAIN VALVES

### A. Ball-Valve-Type, Hose-End Drain Valves:

1. Standard: MSS SP-110 for standard-port, two-piece ball valves.
2. Pressure Rating: minimum CWP.
3. Body: Copper alloy.
4. Ball: Chrome-plated brass.
5. Seats and Seals: Replaceable.
6. Handle: Vinyl-covered steel.
7. Inlet: Threaded or solder joint.
8. Outlet: Threaded, short nipple with garden-hose thread complying with ASME B1.20.7 and cap with brass chain.

## 2.07 WATER HAMMER ARRESTERS

### A. Water Hammer Arresters:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
  - b. PPP Inc.
  - c. MIFAB, Inc.
2. Standard: ASSE 1010 or PDI-WH 201.
3. Type: Copper tube with piston.
4. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

**2.08 TRAP-SEAL PRIMER VALVES**

**A. Supply-Type (Single), Trap-Seal Primer Valves:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. MIFAB, Inc.
  - b. PPP Inc.
  - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
2. Standard: ASSE 1018.
3. Pressure Rating: minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

**B. Supply-Type (Multiple), Trap-Seal Primer Valves:**

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. MIFAB, Inc.
  - b. PPP Inc.
  - c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
2. Standard: ASSE 1018.

3. Pressure Rating: minimum.
4. Body: Bronze.
5. Inlet and Outlet Connections: threaded, union, or solder joint.
6. Gravity Drain Outlet Connection: threaded or solder joint.
7. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.
  1. Locate backflow preventers in same room as connected equipment or system.
  2. Install drain for backflow preventers with atmospheric-vent drain connection with air-gap fitting, fixed air-gap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
  3. Do not install bypass piping around backflow preventers.
- C. Install balancing valves in locations where they can easily be adjusted.
- D. Install Y-pattern strainers for water on supply side of each solenoid valve, and pump.
- E. Install water hammer arresters in water piping according to PDI-WH 201.
- F. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

#### 3.02 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.
- B. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- C. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

**3.03 LABELING AND IDENTIFYING**

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:
  - 1. Reduced-pressure-principle backflow preventers.
  - 2. Double-check backflow-prevention assemblies.
  - 3. Calibrated balancing valves.
  - 4. Supply-type, trap-seal primer valves.
- B. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 23 Section "Mechanical Identification."

**3.04 FIELD QUALITY CONTROL**

- A. Perform the following tests and prepare test reports:
  - 1. Test each reduced-pressure-principle backflow preventer according to authorities having jurisdiction and the device's reference standard.
- B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

**3.05 ADJUSTING**

- A. Set field-adjustable pressure set points of water pressure-reducing valves.
- B. Set field-adjustable flow set points of balancing valves.
- C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

**END OF SECTION**



SECTION 22 13 16

**SANITARY WASTE AND VENT PIPING**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
  - 1. Pipe, tube, and fittings.
  - 2. Specialty pipe fittings.
  - 3. Encasement for underground metal piping.

1.03 PERFORMANCE REQUIREMENTS

- A. Components and installation shall be capable of withstanding the following minimum working pressure unless otherwise indicated:
  - 1. Soil, Waste, and Vent Piping: 10-foot head of water.
- B. Seismic Performance: Soil, waste, and vent piping and support and installation shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1.04 ACTION SUBMITTALS

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

1.05 INFORMATIONAL SUBMITTALS

- A. Seismic Qualification Certificates: For waste and vent piping, 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. Detailed description of piping anchorage devices on which the certification is based and their installation requirements.
- B. Field quality-control reports.

1.06 QUALITY ASSURANCE

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

- B. Comply with NSF/ANSI 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping and "NSF-sewer" for plastic sewer piping.

**1.07 PROJECT CONDITIONS**

- A. Interruption of Existing Sanitary Waste Service: Do not interrupt service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary service according to requirements indicated:
  - 1. Notify Construction Manager no fewer than two days in advance of proposed interruption of sanitary waste service.
  - 2. Do not proceed with interruption of sanitary waste service without Construction Manager's written permission.

**PART 2 - PRODUCTS**

**2.01 PIPING MATERIALS**

- A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

**2.02 HUBLESS, CAST-IRON SOIL PIPE AND FITTINGS**

- A. Pipe and Fittings: ASTM A 888 or CISPI 301.
- B. CISPI, Hubless-Piping Couplings:
  - 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. ANACO-Husky.
    - b. Fernco Inc.
    - c. Matco-Norca, Inc.
    - d. MIFAB, Inc.
    - e. Tyler Pipe.
  - 2. Standards: ASTM C 1277 and CISPI 310.
  - 3. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.

**2.03 SPECIALTY PIPE FITTINGS**

- A. Transition Couplings:

1. General Requirements: Fitting or device for joining piping with small differences in OD's or of different materials. Include end connections same size as and compatible with pipes to be joined.
  2. Fitting-Type Transition Couplings: Manufactured piping coupling or specified piping system fitting.
  3. Unshielded, Nonpressure Transition Couplings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Dallas Specialty & Mfg. Co.
      - 2) Fernco Inc.
      - 3) Mission Rubber Company; a division of MCP Industries, Inc.
      - 4) Plastic Oddities; a division of Diverse Corporate Technologies, Inc.
    - b. Standard: ASTM C 1173.
    - c. Description: Elastomeric, sleeve-type, reducing or transition pattern. Include shear ring and corrosion-resistant-metal tension band and tightening mechanism on each end.
    - d. Sleeve Materials:
      - 1) For Cast-Iron Soil Pipes: ASTM C 564, rubber.
      - 2) For Plastic Pipes: ASTM F 477, elastomeric seal or ASTM D 5926, PVC.
      - 3) For Dissimilar Pipes: ASTM D 5926, PVC or other material compatible with pipe materials being joined.
  4. Shielded, Nonpressure Transition Couplings:
    - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - 1) Cascade Waterworks Mfg. Co.
      - 2) Mission Rubber Company; a division of MCP Industries, Inc.
    - b. Standard: ASTM C 1460.
    - c. Description: Elastomeric or rubber sleeve with full-length, corrosion-resistant outer shield and corrosion-resistant-metal tension band and tightening mechanism on each end.
- B. Dielectric Fittings:

1. General Requirements: Assembly of copper alloy and ferrous materials with separating nonconductive insulating material. Include end connections compatible with pipes to be joined.
2. Dielectric Unions:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Capitol Manufacturing Company.
    - 2) Watts Regulator Co.; a division of Watts Water Technologies, Inc.
    - 3) Wilkins; a Zurn company.
  - b. Description:
    - 1) Standard: ASSE 1079.
    - 2) Pressure Rating: 125 psig minimum at 180 deg F.
    - 3) End Connections: Solder-joint copper alloy and threaded ferrous.
3. Dielectric Nipples:
  - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1) Elster Perfection.
    - 2) Precision Plumbing Products, Inc.
    - 3) Victaulic Company.
  - b. Description:
    - 1) Standard: IAPMO PS 66
    - 2) Electroplated steel nipple.
    - 3) Pressure Rating: 300 psig at 225 deg F.
    - 4) End Connections: Male threaded or grooved.
    - 5) Lining: Inert and noncorrosive, propylene.

2.04 ENCASEMENT FOR UNDERGROUND METAL PIPING

- A. Standard: ASTM A 674 or AWWA C105/A 21.5.
- B. Material: Linear low-density polyethylene film of 0.008-inch.
- C. Form: Sheet.

**PART 3 - EXECUTION**

3.01 EARTH MOVING

- A. Install below grade piping per Contract Documents, CPC, School District and Local Codes.

3.02 PIPING INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on coordination drawings.
- B. Install piping in concealed locations unless otherwise indicated and except in equipment rooms and service areas.
- C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- E. Install piping to permit valve servicing.
- F. Install piping at indicated slopes.
- G. Install piping free of sags and bends.
- H. Install fittings for changes in direction and branch connections.
- I. Install piping to allow application of insulation.
- J. Install seismic restraints on piping. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- K. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if two fixtures are installed back to back or side by side with common drain pipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.
- L. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.
- M. Install soil and waste drainage and vent piping at the following minimum slopes unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 and smaller; 2 percent downward in direction of flow for piping NPS 4 and larger.
  2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
- N. Install cast-iron soil piping according to CISPI's "Cast Iron Soil Pipe and Fittings Handbook," Chapter IV, "Installation of Cast Iron Soil Pipe and Fittings."
1. Install encasement on underground piping according to ASTM A 674 or AWWA C105/A 21.5.
- O. Plumbing Specialties:
1. Install backwater valves in sanitary waster gravity-flow piping. Comply with requirements for backwater valves specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
  2. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers in sanitary drainage gravity-flow piping. Install cleanout fitting with closure plug inside the building in sanitary drainage force-main piping. Comply with requirements for cleanouts specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
  3. Install drains in sanitary drainage gravity-flow piping. Comply with requirements for drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
- P. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.
- Q. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- R. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 22 05 17 "Sleeves and Sleeve Seals for Plumbing Piping."
- S. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 22 05 18 "Escutcheons for Plumbing Piping."

### **3.03 JOINT CONSTRUCTION**

- A. Join hubless, cast-iron soil piping according to CISPI 310 and CISPI's "Cast Iron Soil Pipe and Fittings Handbook" for hubless-piping coupling joints.

### **3.04 SPECIALTY PIPE FITTING INSTALLATION**

- A. Transition Couplings:
1. Install transition couplings at joints of piping with small differences in OD's.
  2. In Drainage Piping: Shielded, nonpressure transition couplings.

3. In Aboveground Force Main Piping: Fitting-type transition couplings.
4. In Underground Force Main Piping:
  - a. NPS 1-1/2 and Smaller: Fitting-type transition couplings.
  - b. NPS 2 and Larger: Pressure transition couplings.
- B. Dielectric Fittings:
  1. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.
  2. Dielectric Fittings for NPS 2 and Smaller: Use dielectric unions.
  3. Dielectric Fittings for NPS 2-1/2 to NPS 4: Use dielectric nipples.

3.05 VALVE INSTALLATION

- A. Backwater Valves: Install backwater valves in piping subject to backflow.
  1. Horizontal Piping: Horizontal backwater valves.
  2. Floor Drains: Drain outlet backwater valves unless drain has integral backwater valve.
  3. Install backwater valves in accessible locations.
  4. Comply with requirements for backwater valve specified in Section 22 13 19 "Sanitary Waste Piping Specialties."

3.06 HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for seismic-restraint devices specified in Section 22 05 48 "Vibration and Seismic Controls for Plumbing Piping and Equipment."
- B. Comply with requirements for pipe hanger and support devices and installation specified in Section 22 05 29 "Hangers and Supports for Plumbing Piping and Equipment."
  1. Install carbon-steel pipe hangers for horizontal piping in noncorrosive environments.
  2. Install stainless-steel pipe hangers for horizontal piping in corrosive environments.
  3. Install carbon-steel pipe support clamps for vertical piping in noncorrosive environments.
  4. Install stainless-steel pipe support clamps for vertical piping in corrosive environments.
  5. Vertical Piping: MSS Type 8 or Type 42, clamps.
  6. Install individual, straight, horizontal piping runs:

- a. 100 Feet and Less: MSS Type 1, adjustable, steel clevis hangers.
  - b. Longer Than 100 Feet: MSS Type 43, adjustable roller hangers.
  - c. Longer Than 100 Feet if Indicated: MSS Type 49, spring cushion rolls.
- 7. Multiple, Straight, Horizontal Piping Runs 100 Feet or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
- 8. Base of Vertical Piping: MSS Type 52, spring hangers.
- C. Support horizontal piping and tubing within 12 inches of each fitting, valve, and coupling.
- D. Support vertical piping and tubing at base and at each floor.
- E. Rod diameter may be reduced one size for double-rod hangers, with 3/8-inch minimum rods.
- F. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:
  - 1. NPS 1-1/2 and NPS 2: 60 inches with 3/8-inch rod.
  - 2. NPS 3: 60 inches with 1/2-inch rod.
  - 3. NPS 4 and NPS 5: 60 inches with 5/8-inch rod.
- G. Install supports for vertical cast-iron soil piping every 15 feet.
- H. According to MSS SP-69 and manufacturer's written instructions.

### **3.07 CONNECTIONS**

- A. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.
- C. Connect drainage and vent piping to the following:
  - 1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
  - 2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
  - 3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
  - 4. Install test tees (wall cleanouts) in conductors near floor and floor cleanouts with cover flush with floor.
  - 5. Install horizontal backwater valves with cleanout cover flush with floor.



6. Comply with requirements for cleanouts and drains specified in Section 22 13 19 "Sanitary Waste Piping Specialties."
  7. Equipment: Connect drainage piping as indicated. Provide shutoff valve if indicated and union for each connection. Use flanges instead of unions for connections NPS 2-1/2 and larger.
- D. Where installing piping adjacent to equipment, allow space for service and maintenance of equipment.
- E. Make connections according to the following unless otherwise indicated:
1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.
  2. Install flanges, in piping NPS 2-1/2 and larger, adjacent to flanged valves and at final connection to each piece of equipment.

3.08 IDENTIFICATION

- A. Identify exposed sanitary waste and vent piping. Comply with requirements for identification specified in Section 22 05 53 "Identification for Plumbing Piping and Equipment."

3.09 FIELD QUALITY CONTROL

- A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.
1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
  2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
- B. Reinspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections and arrange for reinspection.
- C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.
- D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction or, in absence of published procedures, as follows:
1. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit separate report for each test, complete with diagram of portion of piping tested.
  2. Leave uncovered and unconcealed new, altered, extended, or replaced drainage and vent piping until it has been tested and approved. Expose work that was covered or concealed before it was tested.
  3. Roughing-in Plumbing Test Procedure: Test drainage and vent piping except outside leaders on completion of roughing-in. Close openings in piping system

and fill with water to point of overflow, but not less than 10-foot head of water. From 15 minutes before inspection starts to completion of inspection, water level must not drop. Inspect joints for leaks.

4. Finished Plumbing Test Procedure: After plumbing fixtures have been set and traps filled with water, test connections and prove they are gastight and watertight. Plug vent-stack openings on roof and building drains where they leave building. Introduce air into piping system equal to pressure of 1-inch wg. Use U-tube or manometer inserted in trap of water closet to measure this pressure. Air pressure must remain constant without introducing additional air throughout period of inspection. Inspect plumbing fixture connections for gas and water leaks.
5. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
6. Prepare reports for tests and required corrective action.

### 3.10 CLEANING AND PROTECTION

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

### 3.11 PIPING SCHEDULE

- A. Flanges and unions may be used on aboveground pressure piping unless otherwise indicated.
- B. Aboveground, soil and waste piping NPS 4 and smaller shall be any of the following:
  1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
- C. Aboveground, vent piping NPS 4 and smaller shall be the following:
  1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.
- D. Underground, soil, waste, and vent piping NPS 4 and smaller shall be the following:
  1. Hubless, cast-iron soil pipe and fittings; CISPI hubless-piping couplings; and coupled joints.

**END OF SECTION**

SECTION 22 13 19

**DRAINAGE PIPING SPECIALTIES**

**PART 1 - GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following plumbing specialties:

1. Balancing valves.
2. Water Filters.
3. Cleanouts.
4. Floor drains.
5. Floor sinks.
6. Drain Receptors.

1.3 PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing piping systems with following minimum working-pressure ratings, unless otherwise indicated:
  1. Domestic Water Piping: 125 psig.
  2. Sanitary Waste and Vent Piping: 10-foot head of water.

1.4 SUBMITTALS

- A. Product Data: Include rated capacities and shipping, installed, and operating weights. Indicate materials, finishes, dimensions, required clearances, and methods of assembly of components; and piping and wiring connections for the following:
  1. Balancing valves, water filters, and strainers.
  2. Thermostatic water mixing valves and water tempering valves.
  3. Water hammer arresters, air vents, and trap seal primer valves and systems.
  4. Drain valves, hose bibbs, hydrants, and hose stations.
  5. Sleeve penetration systems.
- B. Shop Drawings: Diagram power, signal, and control wiring.

- C. Field test reports.
- D. Maintenance Data: For plumbing specialties to include in maintenance manuals. Include the following:
  - 1. Water filters.
  - 2. Thermostatic water mixing valves and water tempering valves.
  - 3. Trap seal primer valves and systems.

**1.5 QUALITY ASSURANCE**

- A. Product Options: Drawings indicate size, profiles, and dimensional requirements of plumbing specialties and are based on the specific system indicated. Refer to Division 01 Section "Product Requirements."
- B. Plumbing specialties shall bear label, stamp, or other markings of specified testing agency.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for piping materials and installation.
- E. NSF Compliance:
  - 1. Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components. Include marking "NSF-pw" on plastic potable-water piping and "NSF-dwv" on plastic drain, waste, and vent piping.
  - 2. Comply with NSF 61, "Drinking Water System Components--Health Effects, Sections 1 through 9," for potable domestic water plumbing specialties.

**1.6 EXTRA MATERIALS**

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Water Filter Cartridges: Equal to 200 percent of amount installed for each type and size indicated.
  - 2. Operating Key Handles: Equal to 100 percent of amount installed for each key-operated hose bibb and hydrant installed.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

- A. In other Part 2 articles where subparagraph titles below introduce lists, the following requirements apply for product selection:
  - 1. Products: Subject to compliance with requirements, provide one of the products specified.
  - 2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified.

**2.2 BALANCING VALVES**

- A. Calibrated Balancing Valves: Adjustable, with two readout ports and memory setting indicator. Include manufacturer's standard hoses, fittings, valves, differential pressure meter, and carrying case.
  - 1. Manufacturers:
    - a. Amtrol, Inc.
    - b. Taco, Inc.
    - c. Watts Industries, Inc.; Water Products Div.
  - 2. NPS 2 and Smaller: Bronze body with brass ball, adjustment knob, calibrated nameplate, and threaded or solder-joint ends.
  - 3. NPS 2 and Smaller: Bronze, Y-pattern body with adjustment knob and threaded ends.

**2.3 WATER FILTERS**

- A. Manufacturers:
  - 1. Filtrine Manufacturing Company; Drinking Water Division.
  - 2. Osmonics.
  - 3. PURA, Inc.
  - 4. U.S. Filter; Filterite Div.
  - 5. Watts Industries, Inc.; Water Products Div.
- B. General: Cartridge-type assemblies suitable for potable water. Include housing, fittings, filter cartridges, and cartridge end caps.

**2.4 CLEANOUTS**

- A. Cleanouts, WCO: Comply with ASME A112.36.2M or ASME A112.3.1.
  - 1. Application: Wall cleanout.

2. Products:
  - a. Josam Co.
  - b. Smith, Jay R. Mfg. Co.
  - c. Zurn Industries, Inc., Specification Drainage Operation
3. Body or Ferrule Material: Cast iron.
4. Clamping Device: Required.
5. Outlet Connection: Threaded.
6. Closure: Brass plug with straight threads and gasket.
7. Adjustable Housing Material: Cast iron with threads.
8. Frame and Cover Material and Finish: Polished bronze.
9. Frame and Cover Shape: Round.

## 2.5 FLOOR DRAINS

- A. Floor Drains, FD-1: Comply with ASME A112.21.1M.
  1. Application: Shower drain.
  2. Products:
    - a. Josam Co.; Model 30000-Z-A.
    - b. Smith, Jay R. Mfg. Co.; Fig. 2005-A.
    - c. Zurn Industries, Inc., Specification Drainage Operation; Model Z-415.
  3. Body Material: Gray iron.
  4. Seepage Flange: Required.
  5. Clamping Device: Required.
  6. Outlet: Bottom.
  7. Exposed Surfaces and Interior Lining: Not required.
  8. Sediment Bucket: Not required.
  9. Top or Strainer Material: Nickel bronze.
  10. Top of Body and Strainer Finish: Chrome.
  11. Top Shape: Round.
  12. Dimensions of Top or Strainer: 5-inches diameter.

13. Top Loading Classification: Light Duty.
  14. Trap Material: Cast iron.
  15. Trap Pattern: Standard P-trap with trap primer connection.
  16. Trap Features: Not required.
- B. Drain Receptor, DR-1: Comply with ASME A112.21.2M.
1. Applications: Drain receptor.
  2. Products:
    - a. Smith, Jay R. Mfg. Co.; Fig. 3970.
    - b. Or approved equal.
  3. Body Material: Cast iron.
  4. Dimensions of Body: 10 ½ inches diameter.
  5. Combination Flashing Ring and Gravel Stop: Required.
  6. Outlet: Bottom.
  7. Solid Water Dam.
  8. Extension Collars: Required.
  9. Underdeck Clamp: Required.
  10. Sump Receiver: Required.

### **PART 3 - EXECUTION**

#### **3.1 INSTALLATION**

- A. Refer to Division 23 Section "Basic Mechanical Materials and Methods" for piping joining materials, joint construction, and basic installation requirements.
- B. Install expansion joints on vertical risers, stacks, and conductors if indicated.
- C. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
  1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
  2. Locate at each change in direction of piping greater than 45 degrees.
  3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.

4. Locate at base of each vertical soil and waste stack.
- D. Install cleanout deck plates with top flush with finished floor, for floor cleanouts for piping below floors.
- E. Install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall, for cleanouts located in concealed piping.
- F. Install flashing flange and clamping device with each stack and cleanout passing through floors with waterproof membrane.
- G. Install vent flashing sleeves on stacks passing through roof. Secure over stack flashing according to manufacturer's written instructions.
- H. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
  1. Position floor drains for easy access and maintenance.
  2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
    - a. Radius, 30 Inches or Less: Equivalent to 1 percent slope, but not less than 1/4-inch total depression.
    - b. Radius, 30 to 60 Inches: Equivalent to 1 percent slope.
    - c. Radius, 60 Inches or Larger: Equivalent to 1 percent slope, but not greater than 1-inch total depression.
  3. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
  4. Install individual traps for floor drains connected to sanitary building drain, unless otherwise indicated.
- I. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
- J. Fasten recessed-type plumbing specialties to reinforcement built into walls.
- K. Install wood-blocking reinforcement for wall-mounting and recessed-type plumbing specialties.
- L. Install traps on plumbing specialty drain outlets. Omit traps on indirect wastes unless trap is indicated.
- M. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipefittings.



**3.2 CONNECTIONS**

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Install piping adjacent to equipment to allow service and maintenance.
- C. Connect plumbing specialties to piping specified in other Division 22 Sections.
- D. Ground equipment.
- E. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- F. Connect plumbing specialties and devices that require power according to Division 26 Sections.

**3.3 LABELING AND IDENTIFYING**

- A. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each backflow preventer, thermostatic water mixing valve, and trap seal primer system.
  - 1. Text: Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit.
  - 2. Refer to Division 23 Section "Identification for HVAC Piping and Equipment" for nameplates and signs.

**3.4 FIELD QUALITY CONTROL**

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect field-assembled trap seal primer systems and their installation, including piping and electrical connections. Report results in writing.
  - 1. Leak Test: After installation, charge system and test for leaks. Repair leaks and retest until no leaks exist.
  - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

**3.5 PROTECTION**

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

**3.6 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain trap seal primer systems. Refer to Division 1 Section "Closeout Procedures."

END OF SECTION

**SECTION 22 42 13.13**

**COMMERCIAL WATER CLOSETS**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
  - 1. Water closets.
  - 2. Flushometer valves.
  - 3. Toilet seats.

1.03 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 water closets.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.04 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flushometer valves to include in operation and maintenance manuals.

1.05 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Flushometer-Valve Repair Kits: Equal to 10 percent of amount of each type installed, but no fewer than one of each type.

1.06 PLUMBING FIXTURES

- A. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Sections 11B-213.3.
- B. Accessible plumbing fixtures shall comply with all the requirements in CBC Division 6.
- C. Heights and location of all accessible fixtures shall be mounted according to CBC Section 11B-602 through 11B-612.

- D. Accessible fixture controls shall comply with CBC Sections 11B-604.6 for water closets.

**PART 2 - PRODUCTS**

**2.01 WALL-MOUNTED WATER CLOSETS**

- A. Water Closets WC-1: Wall mounted, top spud, accessible.
1. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - a. Kohler Co. #K4325
    - b. Or Approved Equal.
  2. Bowl:
    - a. Standards: ASME A112.19.2/CSA B45.1 and ASME A112.19.5.
    - b. Material: Vitreous china.
    - c. Type: Siphon jet.
    - d. Style: Flushometer valve.
    - e. Height: Standard.
    - f. Rim Contour: Elongated.
    - g. Water Consumption: 1.28 gal. (4.8 L) per flush.
    - h. Spud Size and Location: NPS 1-1/2 (DN 40); top.
  3. Flushometer Valve: WC-1.
  4. Toilet Seat: WC-1.
  5. Support:
    - a. Standard: ASME A112.6.1M.
    - b. Description: Waste-fitting assembly as required to match drainage piping material and arrangement with faceplates, couplings gaskets, and feet; bolts and hardware matching fixture.
    - c. Water-Closet Mounting Height: Standard (WC-1), Adult Accessible according to ICC/ANSI A117.1.

**2.02 FLUSHOMETER VALVES**

- A. Lever-Handle, Diaphragm Flushometer Valves WC-1:
1. Manufacturers: Subject to compliance with requirements, provide products by the following:

- a. Sloan
  - b. Zurn
  - c. Toto
2. Standard: ASSE 1037.
  3. Minimum Pressure Rating: 125 psig (860 kPa).
  4. Features: Include integral check stop and backflow-prevention device.
  5. Material: Brass body with corrosion-resistant components.
  6. Exposed Flushometer-Valve Finish: Chrome plated.
  7. Panel Finish: Chrome plated or stainless steel.
  8. Style: Exposed.
  9. Consumption: 1.28 gal. (4.8 L) per flush.
  10. Minimum Inlet: NPS 1 (DN 25).
  11. Minimum Outlet: NPS 1-1/4 (DN 32).

2.03 TOILET SEATS

A. Toilet Seats WC-1:

1. Olsonite.
2. Church.
3. Bemis.
4. Standard: IAPMO/ANSI Z124.5.
5. Material: Plastic.
6. Type: Commercial (Heavy duty).
7. Shape: Elongated rim, open front.
8. Hinge: Self-sustaining, check.
9. Hinge Material: Noncorroding metal.
10. Seat Cover: Not required.
11. Color: White.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before water-closet installation.
- B. Examine walls and floors for suitable conditions where water closets will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.02 INSTALLATION**

- A. Water-Closet Installation:
  - 1. Install level and plumb according to roughing-in drawings.
- B. Flushometer-Valve Installation:
  - 1. Install flushometer-valve, water-supply fitting on each supply to each water closet.
  - 2. Attach supply piping to supports or substrate within pipe spaces behind fixtures.
  - 3. Install lever-handle flushometer valves for accessible water closets with handle mounted on open side of water closet.
  - 4. Install actuators in locations that are easy for people with disabilities to reach.
- C. Install toilet seats on water closets.
- D. Wall Flange and Escutcheon Installation:
  - 1. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations and within cabinets and millwork.
  - 2. Install deep-pattern escutcheons if required to conceal protruding fittings.
  - 3. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."
- E. Joint Sealing:
  - 1. Seal joints between water closets and walls and floors using sanitary-type, one-part, mildew-resistant silicone sealant.
  - 2. Match sealant color to water-closet color.
  - 3. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

**3.03 CONNECTIONS**

- A. Connect water closets with water supplies and soil, waste, and vent piping. Use size fittings required to match water closets.

- B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."
- D. Where installing piping adjacent to water closets, allow space for service and maintenance.

3.04 ADJUSTING

- A. Operate and adjust water closets and controls. Replace damaged and malfunctioning water closets, fittings, and controls.
- B. Adjust water pressure at flushometer valves to produce proper flow.

3.05 CLEANING AND PROTECTION

- A. Clean water closets and fittings with manufacturers' recommended cleaning methods and materials.
- B. Install protective covering for installed water closets and fittings.
- C. Do not allow use of water closets for temporary facilities unless approved in writing by Owner.

**END OF SECTION**

**KOHLER®****Kingston™****Bowl  
K-4325****Features**

- Vitreous china.
- Elongated bowl.
- Siphon jet.
- Wall-mount.
- 1-1/2" top spud.
- 1.28 gpf (4.8 lpf) or 1.6 gpf (6 lpf) depending on flushometer specified.
- 10-1/2" (267 mm) x 9" (229 mm) water area.
- 26-1/2" (673 mm) x 16-1/2" (419 mm) x 13-1/4" (337 mm).
- Will replace K-4330 and K-4330-L bowls.

**Recommended Accessories**

K- 4731-C Commercial Heavy-duty Toilet Seat  
 K- 4731-SC Commercial Heavy-duty Toilet Seat  
 K- 4731-GC Commercial Heavy-duty Toilet Seat  
 K- 10673 WAVE DC 0.5 GPF Urinal Flushometer  
 K- 10956 Tripoint™ DC 1.28 GPF WC Flushometer  
 K- 13517 Manual 1.28 GPF WC Flushometer  
 K- 10674 Wave DC 1.6 GPF WC Flushometer  
 K- 10957 Tripoint™ DC 1.6 GPF WC Flushometer  
 K- 13516 Manual 1.6 GPF WC Flushometer

**Components**

Additional included component/s: Spud.

**ADA****CSA B651****Codes/Standards**

ASME A112.19.2/CSA B45.1  
 DOE - Energy Policy Act 1992

**ADA**





ICC/ANSI A117.1  
 CSA B651

**KOHLER® One-Year Limited Warranty**

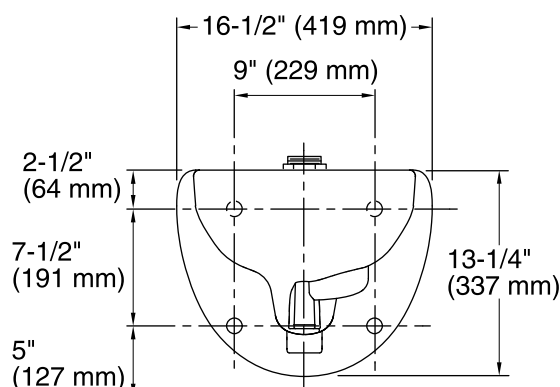
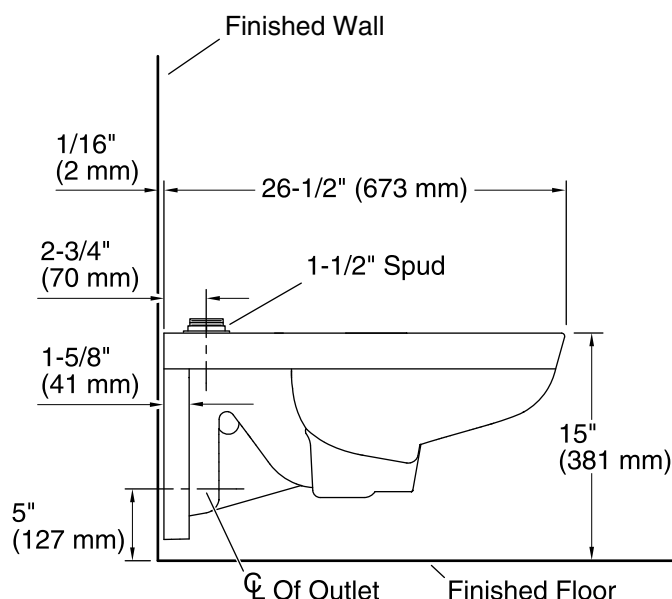
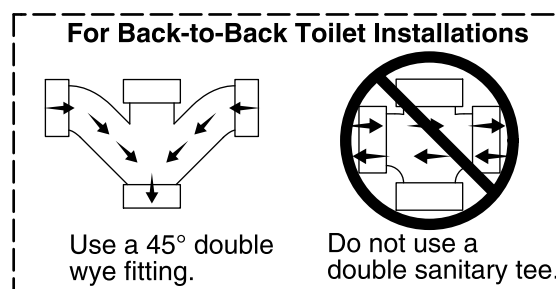
See website for detailed warranty information.

**Available Color/Finishes**

*Color tiles intended for reference only.*

Color	Code	Description
	0	<b>White</b>
	96	Biscuit
	47	Almond
	7	Black Black™





### Technical Information

All product dimensions are nominal.

Bowl shape:	Elongated front
Spud size:	1-1/2", Inlet, Top
Trap passageway:	2-1/8" (54 mm)
Water surface size:	10-1/2" x 9" (267 mm x 229 mm)
Rim to water surface:	5-1/4" (133 mm)
Seat-mounting holes:	5-1/2" (140 mm)

### Fixture Supply Requirements

Min static pressure:	35 psi (241.3 kPa)
Max static pressure:	80 psi (551.6 kPa)
Min flow rate:	25 gpm (94.6 lpm)

### Notes

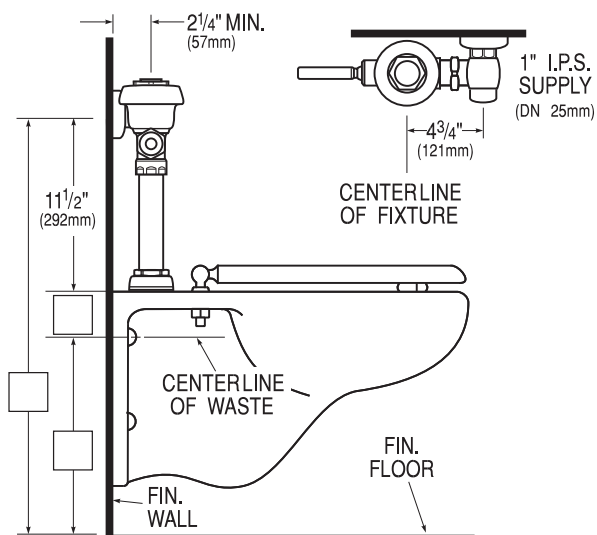
Install this product according to the installation guide.

Refer to manufacturer's instructions and local codes for flushometer requirements.

For back-to-back toilet installations: Use only a 45° double wye fitting.

ADA, CSA B651 compliant when installed to the specific requirements of these regulations.

The Model Plumbing Codes require the installation of elongated open-front toilet seats on public bathrooms.



## Royal® Model Flushometer

# 111-1.28

### Description

Exposed Water Closet Flushometer, for floor mounted or wall hung top spud bowls.

### Flush Cycle

**Model 111-1.28 High Efficiency** (1.28 gpf/4.8 Lpf)

### Specifications

Quiet, Exposed, Diaphragm Type, Chrome Plated Closet Flushometer for left or right hand supply with the following features:

- PERMEX™ Synthetic Rubber Diaphragm with Dual Filtered Fixed Bypass
- **ADA Compliant Metal Oscillating Non-Hold-Open Handle** with Triple Seal Handle Packing
- 1" I.P.S. Screwdriver Bak-Chek® Angle Stop
- Free Spinning Vandal Resistant Stop Cap
- Adjustable Tailpiece
- High Back Pressure Vacuum Breaker Flush Connection with One-piece Bottom Hex Coupling Nut
- Spud Coupling and Flange for 1 1/2" Top Spud
- Sweat Solder Adapter w/Cover Tube & Cast Wall Flange w/Set Screw
- High Copper, Low Zinc Brass Castings for Dezincification Resistance
- Non-Hold-Open Handle, Fixed Metering Bypass and No External Volume Adjustment to Ensure Water Conservation
- Flush Accuracy Controlled by CID™ Technology
- Diaphragm, Handle Packing, Stop Seat and Vacuum Breaker molded from PERMEX™ Rubber Compound for Chloramine Resistance

Valve Body, Cover, Tailpiece and Control Stop shall be in conformance with ASTM Alloy Classification for Semi-Red Brass. Valve shall be in compliance to the applicable sections of ASSE 1037.

### Variations

- ☐ **XV** Valve Less Vacuum Breaker
- ☐ **SG** SaniGuard® Antimicrobial Handle and Socket

### Accessories

See Accessories Section of the Sloan catalog for details on these and other Flushometer variations.

### Fixtures

Consult Sloan for Sloan brand matching fixture options.



Made In The  
**USA**



This space for Architect/Engineer approval

Job Name \_\_\_\_\_ Date \_\_\_\_\_

Model Specified \_\_\_\_\_ Quantity \_\_\_\_\_

Variations Specified \_\_\_\_\_

Customer/Wholesaler \_\_\_\_\_

Contractor \_\_\_\_\_

Architect \_\_\_\_\_

The information contained in this document is subject to change without notice.

**SLOAN**

SLOAN VALVE COMPANY • 10500 SEYMOUR AVE. • FRANKLIN PARK, IL 60131

Ph: 1-800-982-5839 or 1-847-671-4300 • Fax: 1-800-447-8329 or 1-847-671-4380

www.sloanvalve.com



# COMMERCIAL EXTRA HEAVY-DUTY PLASTIC TOILET SEAT

MODEL #

COLOR #

**1655CT/1655SSCT****DESCRIPTION:**

Open front less cover, elongated, extra heavy-duty, injection molded solid plastic toilet seat. Features four molded-in bumpers, non self-sustaining (1655CT) or self-sustaining (1655SSCT) check hinges with non-corrosive 300 Series stainless steel posts and pintles and STA-TITE® Commercial Fastening System™. This seat complies with IAPMO/ANSI Z124.5-2013 Plastic Toilet Seats as a class Commercial Heavy Duty.

**SPECIFICATIONS:**

Size:	Elongated
Material:	Plastic
Style:	Open Front less Cover
Bumpers:	Four
Hinges:	Plastic Non Self-Sustaining (1655CT) or Self-Sustaining (1655SSCT) with 300 Series Stainless Steel Posts and Pintles
Fastening System:	STA-TITE® Commercial Fastening System™

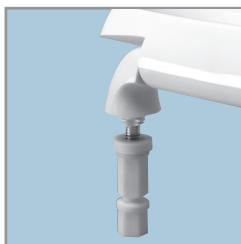
**FEATURES:**

STA-TITE® Commercial Fastening System™

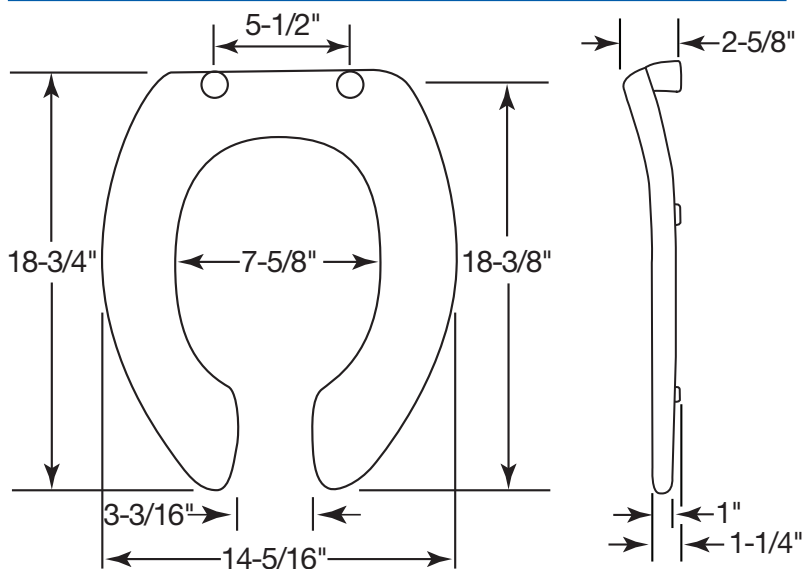
Non-Corrosive 300 Series Stainless Steel Posts and Pintles



PLASTIC HINGES WITH  
STAINLESS STEEL POSTS  
AND PINTLES



STA-TITE® COMMERCIAL  
FASTENING SYSTEM™

**DIMENSIONS:**

Proudly Made in the USA

Bemis Manufacturing Co., Sheboygan Falls, WI 53085  
www.ToiletSeats.com

Phone: 800-558-7651 Fax: 800-292-3647  
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SECTION 22 42 16.13

**COMMERCIAL LAVATORIES**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section Includes:
  - 1. Lavatories.
  - 2. Faucets.

1.03 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 lavatories.
  - 2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

1.04 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Counter cutout templates for mounting of counter-mounted lavatories.

1.05 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For lavatories and faucets to include in operation and maintenance manuals.
  - 1. In addition to items specified in Section 01 78 23 "Operation and Maintenance Data," include the following:
    - a. Servicing and adjustments of automatic faucets.

1.06 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. Faucet Washers and O-Rings: Equal to 10 percent of amount of each type and size installed.
  - 2. Faucet Cartridges and O-Rings: Equal to 5 percent of amount of each type and size installed.

**1.07 PLUMBING FIXTURES**

- A. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Sections 11B-213.3.
- B. Accessible plumbing fixtures shall comply with all the requirements in CBC Division 6.
- C. Heights and location of all accessible fixtures shall be mounted according to CBC Section 11B-602 through 11B-612.
- D. Accessible fixture controls shall comply with CBC Sections 11B-604.4 for lavatories and sinks.
- E. Accessible lavatories and sinks shall be mounted with the front of the higher of the rim or counter surface 34" maximum above the finish floor or ground. Depth of lavatories or sinks shall not interfere with knee and toe clearance provided in accordance with CBC Section 11B-306 when a forward approach is required. CBC Sections 11B-606.3 and 11B-606.7
- F. Water supply and drain pipes under accessible lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under accessible lavatories and sinks. CBC Section 11B-606.5

**PART 2 - PRODUCTS**

**2.01 VITREOUS-CHINA, WALL-MOUNTED LAVATORIES**

- A. Accessible plumbing fixtures shall comply with all of the requirements of 2019 CBC Division 6.
- B. Heights and location of all fixtures shall be according to 2019 CBC Sections 11B-602 through 11B-612 and DSA Check List Fig. 15-A.
- C. Fixture controls shall comply with 2019 CBC Sections 11B-606.4 for lavatories and sinks.
- D. Each accessible sink shall be a maximum of 6-1/2" deep. Sinks shall be mounted with the counter or rim no higher than 34" above the finish floor. 2019 CBC Section 11B-213.3.
- E. Water supply and drain pipes under lavatories and sinks shall be insulated or otherwise configured to protect against contact. There shall be no sharp or abrasive surfaces under lavatories and sinks. CBC Section 11B-606.
- F. Lavatory L-1: Ledge back, vitreous china, wall mounted, accessible.
  - 1. Kohler #K-2005
  - 2. Or approved equal.
  - 3. Fixture:
    - a. Standard: ASME A112.19.2/CSA B45.1.

- b. Type: For wall hanging.
  - c. Nominal Size: Rectangle, 21 inches by 18 inches..
  - d. Faucet-Hole Punching: Three holes, 2-inch (51-mm) centers.
  - e. Faucet-Hole Location: Top.
  - f. Color: White.
  - g. Mounting Material: Chair carrier.
- 4. Faucet: L-1.
  - 5. Support: ASME A112.6.1M, Type II, concealed-arm lavatory carrier.

2.02 SOLID-BRASS, MANUALLY OPERATED FAUCETS

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for faucet materials that will be in contact with potable water.
- B. Lavatory Faucets L-1: Manual-type, single-handle mixing, commercial, solid-brass valve.
  - 1. Chicago Faucets #333-E2805-665PSHAB
  - 2. Or Approved Equal.
  - 3. Standard: ASME A112.18.1/CSA B125.1.
  - 4. General: Include hot- and cold-water indicators; coordinate faucet inlets with supplies and fixture hole punchings; coordinate outlet with spout and fixture receptor.
  - 5. Body Type: Centerset.
  - 6. Body Material: Commercial, solid brass.
  - 7. Finish: Polished chrome plate.
  - 8. Maximum Flow Rate: 0.5 gpm.
  - 9. Maximum Flow: 0.20 gal. per metering cycle.
  - 10. Mounting Type: Deck, exposed.
  - 11. Valve Handle(s): Push button.
  - 12. Spout: Rigid type.
  - 13. Spout Outlet: Aerator.
  - 14. Operation: Non-compression, manual.

- 15. Drain: Grid.

**2.03 SUPPLY FITTINGS**

- A. NSF Standard: Comply with NSF/ANSI 61 Annex G, "Drinking Water System Components - Health Effects," for supply-fitting materials that will be in contact with potable water.
- B. Standard: ASME A112.18.1/CSA B125.1.
- C. Supply Piping: Chrome-plated-brass pipe or chrome-plated copper tube matching water-supply piping size. Include chrome-plated-brass or stainless-steel wall flange.
- D. Supply Stops: Chrome-plated-brass, one-quarter-turn, ball-type or compression valve with inlet connection matching supply piping.
- E. Operation: Loose key.
- F. Risers:
  - 1. NPS 1/2 (DN 15).
  - 2. Chrome-plated, soft-copper flexible tube riser.

**2.04 WASTE FITTINGS**

- A. Standard: ASME A112.18.2/CSA B125.2.
- B. Drain: Grid type with NPS 1-1/4 (DN 32) offset and straight tailpiece.
- C. Trap:
  - 1. Size: NPS 1-1/2 by NPS 1-1/4 (DN 40 by DN 32).
  - 2. Material: Chrome-plated, two-piece, cast-brass trap and swivel elbow with 0.032-inch- (0.83-mm-) thick brass tube to wall; and chrome-plated, brass or steel wall flange.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Examine roughing-in of water supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before lavatory installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.02 INSTALLATION**

- A. Install lavatories level and plumb according to roughing-in drawings.
- B. Install supports, affixed to building substrate, for wall-mounted lavatories.



- C. Install accessible wall-mounted lavatories at handicapped/elderly mounting height for people with disabilities or the elderly, according to ICC/ANSI A117.1.
- D. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons if required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."
- E. Seal joints between lavatories, counters, and walls using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."
- F. Install protective shielding pipe covers and enclosures on exposed supplies and waste piping of accessible lavatories. Comply with requirements in Section 22 07 19 "Plumbing Piping Insulation."

3.03 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
- C. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.04 ADJUSTING

- A. Operate and adjust lavatories and controls. Replace damaged and malfunctioning lavatories, fittings, and controls.
- B. Adjust water pressure at faucets to produce proper flow.

3.05 CLEANING AND PROTECTION

- A. After completing installation of lavatories, inspect and repair damaged finishes.
- B. Clean lavatories, faucets, and other fittings with manufacturers' recommended cleaning methods and materials.
- C. Provide protective covering for installed lavatories and fittings.
- D. Do not allow use of lavatories for temporary facilities unless approved in writing by Owner.

**END OF SECTION**

**KOHLER®**
**Kingston™**  
 Wall-Mount Bathroom Sink  
**K-2007**
**Features**

- Made from premium materials that withstand high-volume usage.
- 21-1/4" (540 mm) x 18-1/8" (460 mm).
- Faucet not included.
- Includes wall hanger.
- Drilled for concealed arm carrier.

**Material**

- Vitreous china.

**Installation**

- **Wall-mount.**

**Recommended Products/Accessories**

K-8998 P-Trap  
 K-23726 Drain treatment  
 K-23725 Cast iron cleaner

**Included Components**

Additional Components:  
 Hanger(s)



ADA

CSA B651

OBC

**Codes/Standards**

ASME A112.19.2/CSA B45.1

**ADA**

ICC/ANSI A117.1

CSA B651

OBC

**KOHLER® One-Year Limited Warranty**

See website for detailed warranty information.

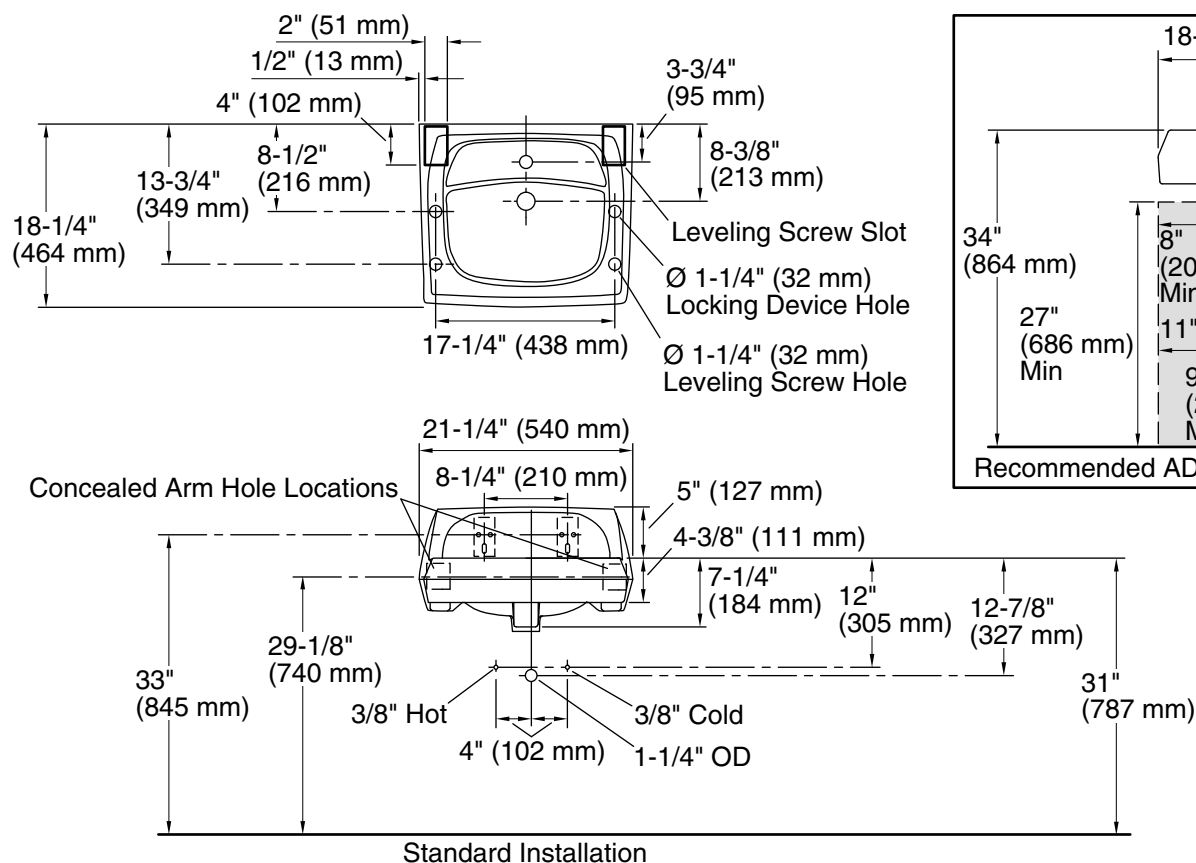
**Available Colors/Finishes***Color tiles intended for reference only.***Color Code Description**

0

**White**

47

Almond



### Technical Information

All product dimensions are nominal.

Bowl configuration: Single

Installation: Wall-mount

Bowl area (Center): Length: 10" (254 mm)

Width: 15" (381 mm)

With overflow: Yes

Water depth: 3-1/4" (83 mm)

Number of deck holes: 1

Faucet hole spacing: 8" (203 mm)

Faucet hole(s): 1-3/8" (35 mm)

Soap/Lotion hole: 1-1/4" (32 mm)

Drain hole: 1-3/4" (44 mm)

### Notes

Install this product according to the installation instructions.

ADA, OBC, CSA B651 compliant when installed to the specific requirements of these regulations.

# Manual Sink Faucets

## 333-E2805-665PSHAB

### Product Type

Deck-mounted metering sink faucet, single-hole, single-supply

### Features & Specifications

- Single hole
- Vandal Proof Pressure compensating Econo-Flo™ non-aerating laminar spray 0.5 GPM
- Vandal Proof 1-3/4" MVP metering push handle
- MVP Actuator Assembly
- MVP metering cartridge
- ECAST® design provides durable construction with total lead content equal to or less than 0.25% by weighted average
- Complies with the requirements of the Buy American Act of 1933.
- CFNow! Item Ships in 3 Days

### Performance Specification

- Rated Operating Pressure: 20-125 PSI
- Rated Operating Temperature: 40-140°F

### Warranty

- 5-Year Limited Cartridge Warranty
- Lifetime Limited Faucet Warranty
- 1-Year Limited Finish Warranty

### Codes & Standards

- ADA ANSI/ICC A117.1
- ASME A112.18.1/CSA B125.1
- NSF/ANSI 372 Low Lead Content
- NSF/ANSI 61, Section 9
- WARNING: This product can expose you to lead, which is known to the State of California to cause cancer and birth defects or other reproductive harm. For more information go to [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).

Job Name \_\_\_\_\_

Item Number \_\_\_\_\_

Section/Tag \_\_\_\_\_

Model Specified \_\_\_\_\_

Architect \_\_\_\_\_

Engineer \_\_\_\_\_

Contractor \_\_\_\_\_

☐ Submitted as Shown ☐ Submitted with Variations

Date \_\_\_\_\_

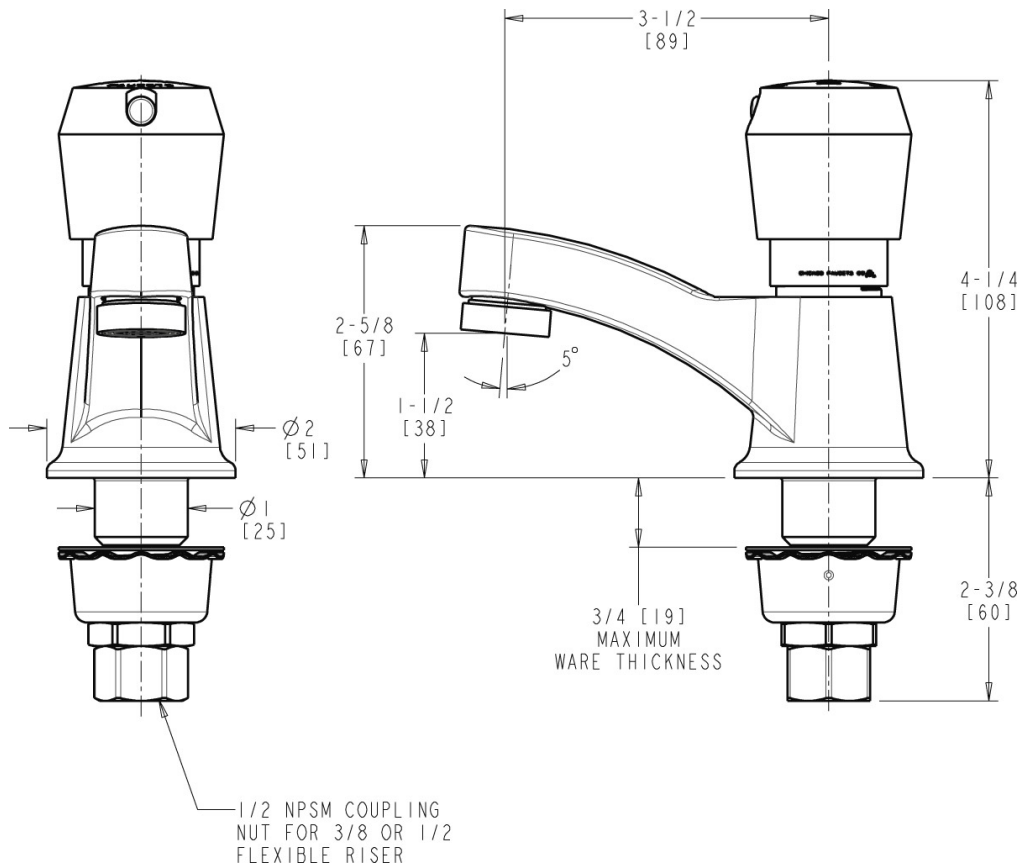


### ECAST

ECAST products are intended for installation where state laws and local codes mandate lead content levels or in any location where lead content is a concern.

## Architect/Engineer Specification

Chicago Faucets No. 333-E2805-665PSHAB, Sink Faucet, metering, single-hole deck mount, chrome plated. Integral, cast brass spout, 3-3/8" center-to-center. 0.5 GPM (1.9 L/min) vandal-proof, pressure compensating, Econo-Flo, non-aerating spray. 1-3/4" metal, vandal-proof, push handle with blue or red index button. MVP self-closing, auto-timed metering cartridge, adjustable run time from 2 to 15 seconds, opens with push, 0.20 max gallon/cycle. 1/2" NPSM supply inlet with coupling nut for 3/8" or 1/2" flexible riser. Mounting hardware included. ECAST® construction with less than 0.25% lead content by weighted average. CALGreen compliant. This product meets ADA ANSI/ICC A117.1 requirements and is tested and certified to industry standards: ASME A112.18.1/CSA B125.1, Certified to NSF/ANSI 61, Section 9 by CSA, California Health and Safety Code 116875 (AB1953-2006), Vermont Bill S.152, NSF/ANSI 372 Low Lead Content, and California Green Building Standards Code (CALGreen).



## Operation and Maintenance

Installation should be in accordance with local plumbing codes. Flush all pipes thoroughly before installation. After installation, remove spout outlet or flow control and flush faucet thoroughly to clear any debris. Care should be taken when cleaning the product. Do not use abrasive cleaners, chemicals or solvents as they can result in surface damage. Use mild soap and warm water for cleaning and protecting the life of Chicago Faucet products. For specific operation and maintenance refer to the installation instructions and repair parts documents that are located at [www.chicagofaucets.com](http://www.chicagofaucets.com).

Chicago Faucets, member of the Geberit Group, is the leading brand of commercial faucets and fittings in the United States, offering a complete range of products for schools, laboratories, hospitals, office buildings, food service, airports and sport facilities. Call 1.800.TECTRUE or 1.847.803.5000 Option 1 for installation or other technical assistance.



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SECTION 22 47 13

**DRINKING FOUNTAINS**

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Section includes drinking fountains and related components.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of drinking fountain.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
  - 2. Include operating characteristics, and furnished specialties and accessories.

1.04 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For drinking fountains to include in maintenance manuals.

1.05 PLUMBING FIXTURES

- A. Plumbing fixtures and accessories provided in a toilet room or bathing room required to comply with CBC Section 11B-213.2 shall comply with CBC Sections 11B-213.3.
- B. Accessible plumbing fixtures shall comply with all the requirements in CBC Division 6.
- C. Heights and location of all accessible fixtures shall be mounted according to CBC Section 11B-602 through 11B-612.
- D. Accessible fixture controls shall comply with CBC Sections 11B-602.3 for drinking fountains.

**PART 2 - PRODUCTS**

2.01 DRINKING FOUNTAINS DF-1: Stainless Steel, wall mounted.

- 1. Stainless-Steel Drinking Fountains:
  - a. Manufacturers: Subject to compliance with requirements, provide products by the following:
    - 1) Murdock Manufacturing Co Model A172UBLVR-BF1S-CSC3-SK5-WF1

- 2) Or equal.
- 2. Standards:
  - a. Comply with ICC A117.1
  - b. Comply with NSF 61.
- 3. Type Receptor: Slab.
- 4. Receptor Shape: Rectangular.
- 5. Back Panel: Stainless-steel wall plate behind drinking fountain.
- 6. Bubblers: Two, with adjustable stream regulator, located on deck.
- 7. Control: Push button.
- 8. Drain: Grid type with NPS 1-1/4 (DN 32) tailpiece.
- 9. Supply: NPS 3/8 (DN 10) with shutoff valve.
- 10. Waste Fitting: ASME A112.18.2/CSA B125.2, NPS 1-1/4 (DN 32) chrome-plated brass P-trap and waste.
- 11. Support: ASME A112.6.1M, concealed support carrier.
- 12. Bottle filler: Required.
- 13. Filter: Required. 1-micron lead reduction, NSF, 1500-gallon capacity.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine roughing-in for water-supply and sanitary drainage and vent piping systems to verify actual locations of piping connections before fixture installation.
- B. Examine walls and floors for suitable conditions where fixtures will be installed.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

#### **3.02 INSTALLATION**

- A. Install fixtures level and plumb according to roughing-in drawings. For fixtures indicated for children, install at height required by authorities having jurisdiction.
- B. Install off-the-floor carrier supports, affixed to building substrate, for wall-mounted fixtures.
- C. Install water-supply piping with shutoff valve on supply to each fixture to be connected to domestic-water distribution piping. Use ball or gate valve. Install valves in locations where they can be easily reached for operation. Valves are specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping."



- D. Install trap and waste piping on drain outlet of each fixture to be connected to sanitary drainage system.
- E. Install wall flanges or escutcheons at piping wall penetrations in exposed, finished locations. Use deep-pattern escutcheons where required to conceal protruding fittings. Comply with escutcheon requirements specified in Section 22 05 18 "Escutcheons for Plumbing Piping."
- F. Seal joints between fixtures and walls using sanitary-type, one-part, mildew-resistant, silicone sealant. Match sealant color to fixture color. Comply with sealant requirements specified in Section 07 92 00 "Joint Sealants."

3.03 CONNECTIONS

- A. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.
- B. Comply with water piping requirements specified in Section 22 11 16 "Domestic Water Piping."
- C. Install ball or gate shutoff valve on water supply to each fixture. Comply with valve requirements specified in Section 22 05 23.12 "Ball Valves for Plumbing Piping."
- D. Comply with soil and waste piping requirements specified in Section 22 13 16 "Sanitary Waste and Vent Piping."

3.04 ADJUSTING

- A. Adjust fixture flow regulators for proper flow and stream height.

3.05 CLEANING

- A. After installing fixtures, inspect unit. Remove paint splatters and other spots, dirt, and debris. Repair damaged finish to match original finish.
- B. Clean fixtures, on completion of installation, according to manufacturer's written instructions.
- C. Provide protective covering for installed fixtures.
- D. Do not allow use of fixtures for temporary facilities unless approved in writing by Owner.

**END OF SECTION**



# DRINKING FOUNTAIN

## A172UBLVR-BF1S Series

**BARRIER FREE, VANDAL RESISTANT, UNIVERSAL BI-LEVEL, WALL MOUNTED DRINKING FOUNTAIN WITH -BF1S PUSHBUTTON OPERATED BOTTLE FILLER**

### STANDARD FEATURES

#### Drinking Fountain

- **Child or Adult ADA Compliant (when properly installed)**
- **Universal Bi-Level - Can be installed left unit high right unit low or opposite with no additional parts required.**
- **304 Stainless Steel Basin and Flush Mounted Chrome Plated Brass Button**
- **Polished Stainless Steel, Anti-Rotation, Non-Squirt Bubblers**
- **Vandal Resistant Screws and Screened Louvers**
- **Auto-Stop allows Cartridge and Strainer service without removing Drinking Fountain Deck to access Water Supply Stop**
- **Lead free**

#### Bottle Filler

- **ADA Compliant**
- **100-Mesh Inlet Strainer**
- **1 GPM Laminar Flow**
- **100% Lead & Brass Free**

### SUGGESTED SPECIFICATIONS

#### Drinking Fountain

Model A172400S-UBL-VR-BF1S is a self-contained, enhanced Vandal Resistant Bi-Level Drinking Fountain. Units shall be activated by Chrome Plated Brass Front Pushbuttons by using less than 5 pounds of force. Bubblers shall be Lead-Free Stainless Steel with an integrally designed non-squirt feature and operate on a water pressure range of 20-105 PSIG. Basins shall be constructed from 304 Stainless Steel and have an Integral Drain. Cabinets shall be Stainless Steel. Unit is certified to ANSI A117.1, Public Law 111-380 (NO-LEAD), CHSC 116875 and NSF/ANSI 61, Section 9. Fixture meets ADA, ADA Standing Person, and ADA Child requirements when mounted appropriately.

#### Bottle Filler BF1S

BF1S is a Pushbutton Operated Bottle Filler. Housing construction will be 18 gage Stainless Steel with a satin finish. Bottle Filler shall provide approximately 1 GPM flow rate with a Laminar Flow Spout to minimize splashing. Optional -WF1 has a 1500-gallon capacity, has NSF/ANSI 42 & 53 certification and reduces lead content in the drinking water by 99%.



**"RATED FOR INDOOR AND OUTDOOR USE"**

#### MODEL:

(Must Specify)

- ☐ **A172400S-UBL-VR-BF1S Satin Stainless Finish**

#### OPTIONS

(additional costs may be incurred)

- ☐ -CSC3 **Concealed Support Carrier**
- ☐ -SK5 **Skirt Kit for upper unit**
- ☐ -WB3 Wall Bezel, left unit high, right low
- ☐ -WB4 Wall Bezel, right unit high, left low
- ☐ -WF1 **1500-gallon capacity, NSF 42+53, 1 micron Lead Reduction Filter**

Complies with the following standards:



Member of  
U.S. Green  
Building  
Council



Recyclable  
Product



Water  
Conserving  
Product

**WARNING:** Cancer and Reproductive Harm - [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov)

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**A172UBLVR-BF1S**

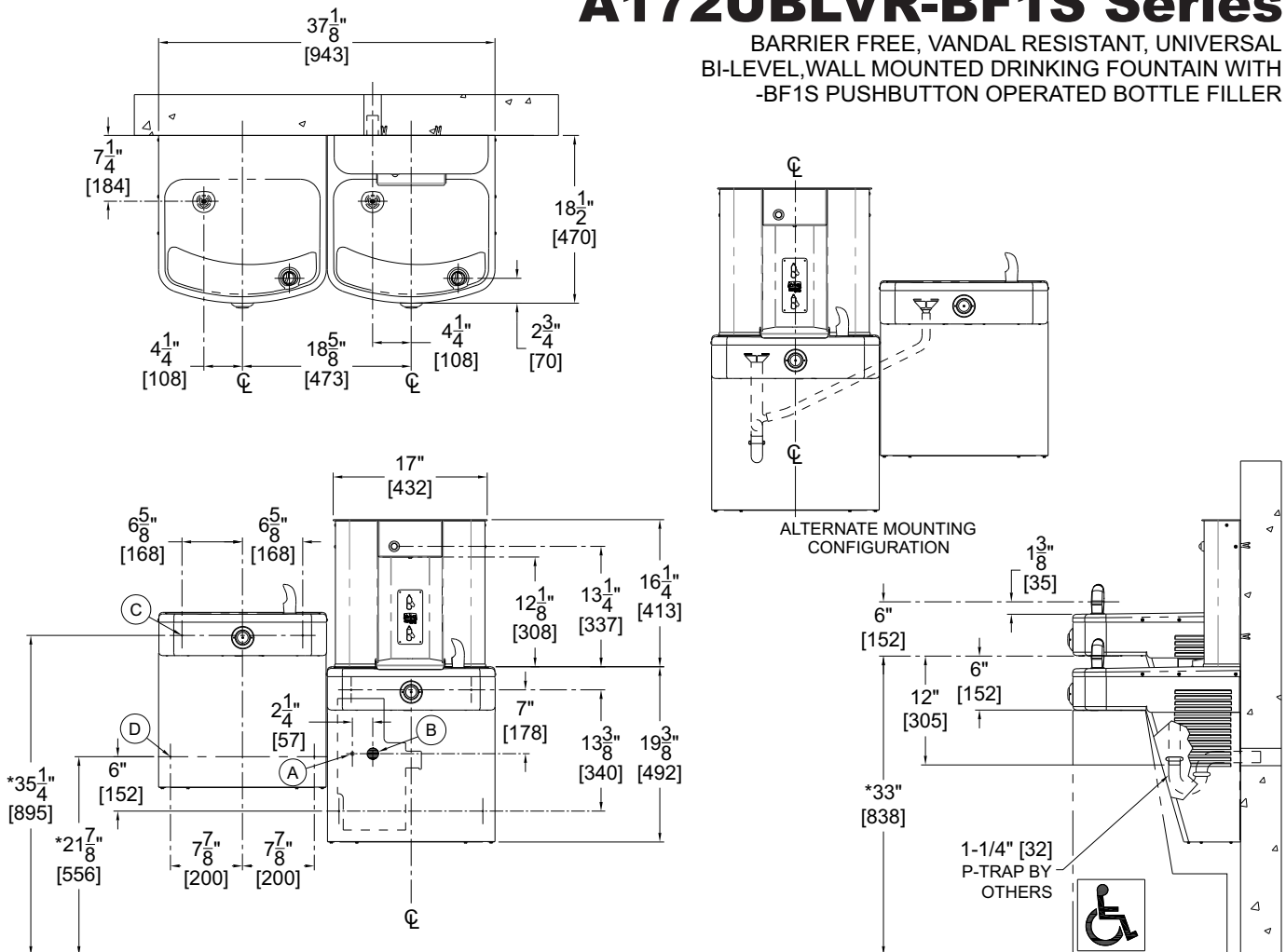
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# DRINKING FOUNTAIN

## A172UBLVR-BF1S Series

BARRIER FREE, VANDAL RESISTANT, UNIVERSAL BI-LEVEL, WALL MOUNTED DRINKING FOUNTAIN WITH -BF1S PUSHBUTTON OPERATED BOTTLE FILLER



### General Notes:

1. All dimensions are in inches [MM]
2. Allow 4 inches [102MM] minimum clearance per side for ventilation
- \*3. Dimensions shown are for ADA adult height. Adjust vertical dimensions as necessary to comply with Federal, State & Local Codes
4. Stop Valve, P-Trap & Electrical Outlet not supplied
5. Important: Coolers must be attached to wall with appropriate Anchor Screws

- A. 3/8" O.D. Supply Inlet
- B. Waste Outlet for 1-1/4" P-Trap, by others
- C. Ø3/8" Hanger Bracket Punching, 3 places for Anchoring Hardware by others
- D. Ø1/4" Punching, 2 places for Anchoring Hardware, by others

Murdock Mfg.™ warrants that its products are free from defects in material or workmanship under normal use and service for a period of one year from date of shipment. Murdock's liability under this warranty shall be discharged solely by replacement or repair of defective material, provided Murdock™ is notified in writing within one year from date of shipment, F.O.B. Industry, California.

<b>SELECTION SUMMARY &amp; APPROVAL FOR MANUFACTURING</b>	Model Number & Options _____	Quantity _____	<p>All dimensions are subject to manufactures tolerance of plus or minus 1/2" nominal and subject to change without notice. Murdock assumes no responsibility for use of void or superseded data. Dimensions may change with the addition of optional accessories. Murdock Mfg.™, Member of Morris Group International™. Please visit <a href="http://www.murdockmfg.com">www.murdockmfg.com</a> for most current specifications.</p>
	Company _____		
	Contact _____	Title _____	
	Signature (Approval for Manufacturing) _____		
	Date _____		

**MURDOCK MFG.** • 15125 Proctor Avenue • City of Industry, CA 91746 USA  
 Phone 800-453-7465 or 626-333-2543 • Fax 626-855-4860 • [www.murdockmfg.com](http://www.murdockmfg.com)

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SECTION 233723 - HVAC GRAVITY VENTILATORS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
  - 1. Louvered-penthouse ventilators.
  - 2. Roof hoods.
  - 3. Goosenecks.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Design ventilators, including comprehensive engineering analysis by a qualified professional engineer, using structural and seismic performance requirements and design criteria indicated.
- B. Structural Performance: Ventilators shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of ventilator components, noise or metal fatigue caused by ventilator blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
  - 1. Wind Loads: Determine loads based on pressures as indicated on Drawings.
  - 2. Wind Loads: Determine loads based on a uniform pressure of 30 lbf/sq. ft., acting inward or outward.
- C. Seismic Performance: Ventilators, including attachments to other construction, 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."
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes, without buckling, opening of joints, overstressing of components, failure of connections, or other detrimental effects.
  - 1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.
- E. Water Entrainment: Limit water penetration through unit to comply with ASHRAE 62.1.

**1.4 ACTION SUBMITTALS**

- A. Product Data: For each type of product indicated. For louvered-penthouse ventilators specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.
- B. Shop Drawings: For gravity ventilators. Include plans, elevations, sections, details, ventilator attachments to curbs, and curb attachments to roof structure.
  - 1. Show weep paths, gaskets, flashing, sealant, and other means of preventing water intrusion.
- C. Samples: For each exposed product and for each color and texture specified.
- D. Samples for Initial Selection: For units with factory-applied color finishes.
- E. Samples for Verification: For each type of louvered-penthouse ventilator indicated, in manufacturer's standard size.
- F. Delegated-Design Submittal: For shop-fabricated ventilators indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Detail fabrication and assembly of shop-fabricated ventilators.

**1.5 INFORMATIONAL SUBMITTALS**

- A. Coordination Drawings: Roof framing plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Structural members to which roof curbs and ventilators will be attached.
  - 2. Sizes and locations of roof openings.
- B. Seismic Qualification Certificates: For ventilators, 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. Welding certificates.

**1.6 QUALITY ASSURANCE**

- A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

**1.7 COORDINATION**

- A. Coordinate sizes and locations of roof curbs, equipment supports, and roof penetrations with actual equipment provided.

**PART 2 - PRODUCTS**

**2.1 MATERIALS**

- A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T5 or T-52.
- B. Aluminum Sheet: ASTM B 209, Alloy 3003 or 5005 with temper as required for forming or as otherwise recommended by metal producer for required finish.
- C. Galvanized-Steel Sheet: ASTM A 653/A 653M, G90 zinc coating, mill phosphatized.
- D. Stainless-Steel Sheet: ASTM A 666, Type 304, with No. 4 finish.
- E. Fasteners: Same basic metal and alloy as fastened metal or 300 Series stainless steel unless otherwise indicated. Do not use metals that are incompatible with joined materials.
  1. Use types and sizes to suit unit installation conditions.
  2. Use Phillips flat or hex-head or Phillips pan-head screws for exposed fasteners unless otherwise indicated.
- F. Post-Installed Fasteners for Concrete and Masonry: Torque-controlled expansion anchors made from stainless-steel components, with capability to sustain without failure a load equal to 4 times the loads imposed for concrete, or 6 times the load imposed for masonry, as determined by testing per ASTM E 488, conducted by a qualified independent testing agency.
- G. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

**2.2 FABRICATION, GENERAL**

- A. Factory or shop fabricate gravity ventilators to minimize field splicing and assembly. Disassemble units to the minimum extent as necessary for shipping and handling. Clearly mark units for reassembly and coordinated installation.
- B. Fabricate frames, including integral bases, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.
- C. Fabricate units with closely fitted joints and exposed connections accurately located and secured.

- D. Fabricate supports, anchorages, and accessories required for complete assembly.
- E. Perform shop welding by AWS-certified procedures and personnel.

## **2.3 LOUVERED-PENTHOUSE VENTILATORS**

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Carnes.
  - 2. Greenheck Fan Corporation.
  - 3. Loren Cook Company.
- B. Construction: All-welded assembly with 4-inch or 6-inch-deep louvers, mitered corners, and aluminum or galvanized-steel sheet roof with mineral-fiber insulation and vapor barrier.
- C. Frame and Blade Material and Nominal Thickness: Extruded aluminum, of thickness required to comply with structural performance requirements, but not less than 0.080 inch for frames and 0.080 inch for blades with condensate deflectors.
  - 1. AMCA Seal: Mark units with the AMCA Certified Ratings Seal.
  - 2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.
- D. Frame and Blade Material and Nominal Thickness: Galvanized-steel sheet, of thickness required to comply with structural performance requirements, but not less than 0.052 inch for frames and 0.064 inch for blades with condensate deflectors.
  - 1. AMCA Seal: Mark units with the AMCA Certified Ratings Seal.
  - 2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.
- E. Frame and Blade Material and Nominal Thickness: Stainless-steel sheet, of thickness required to comply with structural performance requirements, but not less than 0.062 inch, with grain running parallel or perpendicular to length of blades and frame members with condensate deflectors.
  - 1. AMCA Seal: Mark units with the AMCA Certified Ratings Seal.
  - 2. Exterior Corners: Prefabricated corner units with mitered and welded blades and with fully recessed mullions at corners.
- F. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch- thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base.
  - 1. Configuration: Self-flashing without a cant strip, with; Built-in cant and; or Built-in raised cant and mounting flange.
  - 2. Overall Height: 12 inches.



- G. Bird Screening: Galvanized-steel, 1/2-inch- square mesh, 0.041-inch wire; Aluminum, 1/2-inch- square mesh, 0.063-inch wire; Flattened, expanded aluminum, 3/4 by 0.050 inch thick; or Stainless-steel, 1/2-inch- square mesh, 0.047-inch wire.
- H. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch or Stainless-steel, 18-by-18 mesh, 0.009-inch wire.
- I. Galvanized-Steel Sheet Finish:
  - 1. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A 780. Apply a conversion coating suited to the organic coating to be applied over it.
  - 2. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.
  - 3. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat and an overall minimum dry film thickness of 2 mils.
    - a. Color and Gloss: As selected by Architect from manufacturer's full range.
- J. Accessories:
  - 1. Dampers:
    - a. Location: Penthouse neck or Inside louver face.
    - b. Control: Manual or Motorized.
- K. Capacities and Characteristics:
  - 1. Free Area: Not less than 7.0 sq. ft. for 48-inch- wide by 48-inch- high louver.
  - 2. Air Performance: Not more than 0.10-inch wg static pressure drop at 600-fpm free-area exhaust or intake velocity.
  - 3. Wind-Driven Rain Performance: Not less than 99 percent effectiveness when subjected to a rainfall rate of 3 inches per hour and a wind speed of 29 mph at a core-area intake velocity of 500 fpm.

## 2.4 ROOF HOODS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
  - 1. Carnes.
  - 2. Greenheck Fan Corporation.
  - 3. Loren Cook Company.
- B. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figures 6-6 and 6-7.

- C. Materials: Galvanized-steel sheet, minimum 0.064-inch- thick base and 0.040-inch- thick hood or Aluminum sheet, minimum 0.063-inch- thick base and 0.050-inch- thick hood; suitably reinforced.
- D. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch- thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base.
  - 1. Configuration: Self-flashing without a cant strip, with; Built-in cant and; or Built-in raised cant and mounting flange.
  - 2. Overall Height: 12 inches.
- E. Bird Screening: Galvanized-steel, 1/2-inch- square mesh, 0.041-inch wire, Aluminum, 1/2-inch- square mesh, 0.063-inch wire, Flattened, expanded aluminum, 3/4 by 0.050 inch thick or Stainless-steel, 1/2-inch- square mesh, 0.047-inch wire.
- F. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch or Stainless-steel, 18-by-18 mesh, 0.009-inch wire.
- G. Galvanized-Steel Sheet Finish:
  - 1. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A 780. Apply a conversion coating suited to the organic coating to be applied over it.
  - 2. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.
  - 3. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat and an overall minimum dry film thickness of 2 mils.
    - a. Color and Gloss: As selected by Architect from manufacturer's full range.
- H. Capacities and Characteristics:
  - 1. Free Area: Not less than 7.0 sq. ft. for 48-inch- wide by 48-inch- high louver.
  - 2. Air Performance: Not more than 0.10-inch wg static pressure drop at 600-fpm free-area exhaust or intake velocity.

## **2.5 GOOSENECKS**

- A. Factory or shop fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 6-5; with a minimum of 0.052-inch- thick, galvanized-steel sheet.
- B. Roof Curbs: Galvanized-steel sheet; with mitered and welded corners; 1-1/2-inch- thick, rigid fiberglass insulation adhered to inside walls; and 1-1/2-inch wood nailer. Size as required to fit roof opening and ventilator base.
  - 1. Configuration: Self-flashing without a cant strip, with; Built-in cant and; or Built-in raised cant and mounting flange.

2. Overall Height: 18 inches.
- C. Bird Screening: Galvanized-steel, 1/2-inch- square mesh, 0.041-inch wire; Aluminum, 1/2-inch- square mesh, 0.063-inch wire; Flattened, expanded aluminum, 3/4 by 0.050 inch thick; or Stainless-steel, 1/2-inch- square mesh, 0.047-inch wire.
- D. Insect Screening: Aluminum, 18-by-16 mesh, 0.012-inch or Stainless-steel, 18-by-18 mesh, 0.009-inch wire.
- E. Galvanized-Steel Sheet Finish:
  1. Surface Preparation: Clean surfaces of dirt, grease, and other contaminants. Clean welds, mechanical connections, and abraded areas and repair galvanizing according to ASTM A 780. Apply a conversion coating suited to the organic coating to be applied over it.
  2. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply an air-dried primer immediately after cleaning and pretreating.
  3. Baked-Enamel Finish: Immediately after cleaning and pretreating, apply manufacturer's standard finish consisting of prime coat and thermosetting topcoat, with a minimum dry film thickness of 1 mil for topcoat and an overall minimum dry film thickness of 2 mils.
    - a. Color and Gloss: As selected by Architect from manufacturer's full range.
- F. Capacities and Characteristics:
  1. Free Area: Not less than 7.0 sq. ft. for 48-inch- wide by 48-inch- high louver.
  2. Air Performance: Not more than 0.10-inch wg static pressure drop at 600-fpm free-area exhaust or intake velocity.

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install gravity ventilators level, plumb, and at indicated alignment with adjacent work.
- B. Install goosenecks on curb base where throat size exceeds 9 by 9 inches.
- C. Install gravity ventilators with clearances for service and maintenance.
- D. Install perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- E. Install concealed gaskets, flashings, joint fillers, and insulation as installation progresses. Comply with Section 079200 "Joint Sealants" for sealants applied during installation.
- F. Not used

- G. Protect galvanized and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with concrete, masonry, or dissimilar metals.
- H. Repair finishes damaged by cutting, welding, soldering, and grinding. Restore finishes so no evidence remains of corrective work. Return items that cannot be refinished in the field to the factory, make required alterations, and refinish entire unit or provide new units.

**3.2 ADJUSTING**

- A. Adjust damper linkages for proper damper operation.

**END OF SECTION 233723**

SECTION 26 00 00

**GENERAL ELECTRICAL REQUIREMENTS**

**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 this Section.

1.02 SUMMARY

- A. Provide a complete and operable installation, including all labor, supervision, materials, equipment, tools, apparatus, transportation, warehousing, rigging, scaffolding and other equipment and services necessary to accomplish the work in accordance with the intent and meaning of these drawings and specifications.

1.03 DEFINITIONS

- A. CEC: California Electrical Code (CCR Title 24, Part 3) based on the National Electrical Code.
- B. CalGreen: California Green Building Standards, CCR Title 24 Part 11, Chapter 5.
- C. "Codes" or "Code" means all codes, laws, statutes, rules, regulations, ordinances, orders, decrees, and other requirements of all legally constituted authorities and public utility franchise holders having jurisdiction.
- D. "Extend", "Submit", "Repair" and similar words mean that the Contractor shall accomplish the action described.
- E. "Products", "materials" and "equipment" are used interchangeably and mean materials, fixtures, equipment, accessories, etc.
- F. "Provide" means furnish, install and connect unless otherwise described in specific instances.

1.04 RELATED WORK

- A. Coordination: Refer to Architectural and Mechanical Drawings for the construction details and coordinate the work of this Division with that of other Divisions. Order and execute the work of this Division so that progress will coordinate with that of other Divisions and all work will proceed expeditiously. The work of this Division shall include direct responsibility for the correct placing and connection of electrical work in relation to the work of other Divisions. Examine other Divisions for work related to the work of this Division especially Division 23 – HVAC (Mechanical).

1.05 EXISTING CONDITIONS

- A. Visit the site prior to bidding and investigate the existing conditions which affect or will be affected by the work of this Division. Become thoroughly familiar with the working conditions and take into account any special or unusual features peculiar to this job. By the act of submitting a Bid, the Contractor will be deemed to have complied with the foregoing, to have accepted such conditions, and to have made allowance therefore in preparing his Bid.

**1.06 DRAWINGS AND SPECIFICATIONS**

- A. Drawings and specifications are intended to complement each other. Where a conflict exists between the requirements of the drawings and the specifications, request clarification.
- B. The District's representative shall interpret the drawings and the specifications, and his decision as to the true intent and meaning thereof and the quality, quantity, and sufficiency of the materials and workmanship furnished thereunder shall be accepted as final and conclusive.
- C. In case of conflicts not clarified prior to Bidding deadline, use the most costly alternative (better quality, greater quantity or larger size) in preparing the Bid. A clarification will be issued to the successful Bidder as soon as feasible after the Award and if appropriate a deductive change order will be issued.

**1.07 PERMITS AND INSPECTIONS**

- A. Obtain, schedule and pay for permits, licenses, approvals, tests, and inspections required by legally constituted authorities and public utility franchise holders having jurisdiction over the work.
- B. Afford the District's representative every facility for evaluating the skill and competence of the mechanics and to examine the materials. Concealed work shall be reopened when so directed during his periodic visits.

**1.08 ELECTRIC POWER, TELECOMMUNICATIONS AND CABLE TV SERVICES**

- A. Within 5 days after award of contract, notify the serving utilities that the project is under construction and apply for permanent service in the name of the District. Furnish pertinent information to them including the required dates for permanent service. Verify service locations and conform to utility company requirements. Contractor shall pay charges for permanent service connections levied by the utilities for which he will be reimbursed by the District. The reimbursement shall be limited to the actual amount of the utility service charges and a copy of the billing from the utility company shall accompany the Contractor's invoice. Arrange and pay for the Construction power and lighting including the utility service.

**1.09 CODES AND REGULATIONS**

- A. By submitting a Bid, Contractor is deemed to represent himself as competent to accomplish the work of this Division in conformance with applicable Codes. The Contract Documents may require installations which exceed Code requirements, but are not intended to allow installations which are below minimum Code requirements. In case of conflict where the Contract Documents are below the minimum requirements of applicable Codes, the Codes shall take precedence. Should such conflicts appear, cease work on the parts of the contract affected and immediately notify the Architect in writing. It shall be the Contractor's responsibility to correct, at no cost to the District, any work he executes in violation of Code requirements.

**1. Applicable Codes: (Current adopted editions except as noted):**

- a. California Electrical Code
- b. California Building Code
- c. California Fire Code
- d. Fire Marshal Regulations
- e. Regulations of all other authorities having jurisdiction.

2. Where conflict or variation exists amongst Codes, the most stringent shall govern.

#### 1.10 TESTS

- A. Demonstrate that all components of the work of this Division have been provided and that they operate in accordance with the Contract Documents.
- B. Provide instruments and personnel for tests and demonstrations. Submit signed test results.
- C. Notify the District's representative seven (7) days in advance of tests to allow presence of District's representative.
- D. Test wiring and connections for continuity, short circuits and improper grounds. Test each lighting panel with mains disconnected from feeders, branches connected, wall switches closed, and fixtures permanently connected and complete with lamps. Test each individual power circuit at panel with the power equipment connected for proper operation.

#### 1.11 RECORDS AND DOCUMENTATION

- A. Accumulate the following and deliver to the District's representative prior to final acceptance of the work.
- B. Record (As-Built) Drawings: Maintain in good order in the field office a complete set of electrical prints. Update the drawings daily with neat and legible annotation in red ink showing the work as actually installed.
- C. Permits and Certificates of Inspection: Furnish the originals.

#### 1.12 SUBMITTALS

- A. Within 15 days after award of Contract, submit for approval a complete list of materials proposed for use. Furnish names and addresses of manufacturers, catalog numbers (where applicable) types and trade names. For purposes of uniformity, only one manufacturer will be accepted for each class or type of material. This list is in addition to Shop Drawings.
- B. Submit shop drawings with such promptness as to cause no delay in the work. Do not commence fabrication of the equipment until the approved drawings are received from the District's representative. Shop Drawings and/or brochures are required for the panelboards, safety switches, motor control, and lighting fixtures.
- C. Product Data
  1. Material List: A material list with names of manufacturers, model numbers, and technical information on all equipment proposed.
  2. Product technical information sheets for each principal component in the proposed system. Identify by arrow, circle or similar means products being proposed. Submittals consisting of unmodified catalog pages with no markings will be rejected.
  3. Weight, dimensions and shipping splits.
  4. Equipment operating and service (maintenance) clearances required around the equipment.

- D. Test Procedures: A written document detailing the proposed test procedures of the system shall be supplied. These procedures shall include all tests required by the equipment manufacturer and by this specification.
- E. Test Results Report: The results of the execution of the testing procedure, including the items tested or inspected, the date, and by whom.
- F. Operating Sequences: Provide a complete written description of the Sequence of Operation of each of the systems including startup and recovery procedures
- G. Samples: when requested by Architect
- H. Operation and Maintenance (O&M) Manuals: Furnish composite "Systems Operation and Maintenance" manuals in indexed three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain, but not be limited to:
  - 1. Operational procedures for the overall systems including the "Sequence of Operation".
  - 2. Test procedures and test results.
  - 3. Instruction for the proper operation and maintenance of the system.
  - 4. Factory issued technical, installation, and maintenance manuals.
  - 5. Factory issued operations and programming (software) manuals.
  - 6. A replacement parts list complete with part numbers and name, address, and phone number of suppliers used by the Contractor. A spare parts list recommended for purchase by the District shall be included.
  - 7. All portions of the material list and shop drawings which are not included in the foregoing.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Materials shall be new, in accordance with the specification of the Institute of Electrical and Electronic Engineers, National Electrical Manufacturer's Association, National Fire Protection Association, and the California Electrical Code, and shall have an Underwriter's Laboratories listing and bear their label where such service is available.
- B. Materials for the same purpose shall be of the same make and shall be the manufacturer's latest standard design that complies with the specification requirements.
- C. Whenever on the plans, or in these specifications, products are identified by the name of one manufacturer, it is intended that equivalent products of other manufacturers are acceptable, unless otherwise indicated, if accepted in writing by the District's representative. However, where three or more manufacturers are mentioned, then the products furnished shall be the product of one of the manufacturers listed. In general, the following manufacturers are considered qualified bidders on the listed categories. Manufacturers listed shall meet quality and performance of a particular item specified by both name and number.
- D. Source Limitations: Obtain materials and accessories from single source from single manufacturer.



- E. Substitutions: Should the Contractor desire to substitute for specified products, he shall submit with the Material List a complete list of the requested substitutions. The request shall contain complete descriptive information of the products. Samples for evaluation shall also be submitted upon the District's representative request. If, in the District's representative opinion, the materials as presented in this first submittal is in variance with the specified material, or if the information submitted is not sufficiently complete to allow proper evaluation, the substitution will be disallowed from consideration and the specified materials shall be furnished.

**2.02 SYSTEM DESCRIPTION**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- B. Comply with CEC.

**PART 3 - EXECUTION**

**3.01 WORKMANSHIP AND INSTALLATION METHODS**

- A. Workmanship shall be in conformance with NECA 1 and the best standard practice of the trade except where indicated otherwise.
- B. Execute the work so as to contribute to ease of operation and maintenance, maximum accessibility and best appearance. Execute it so that the installation will conform and adjust itself to the building structure, its equipment and its usage. The work shall be symmetrical, plumb, uniform, properly aligned and firmly secured in place.
- C. Install equipment in accordance with the manufacturer's instructions and recommendations unless otherwise noted or specified.

**3.02 LOCATIONS, SIZES, ROUTINGS AND CLEARANCES**

- A. For the purpose of clearness and legibility, the drawings are essentially diagrammatic. The size and location of equipment is shown to scale wherever possible, but the Contractor shall make use of all the data in the Contract Documents, and shall verify such information. Contractor is responsible for the equipment provided by him fitting in the spaces available while maintaining required working, ventilation, and equipment maintenance access space. Exercise particular care that such space is not infringed by the work of other Divisions.
- B. Conduit and Cable Routing: The drawings show the points of termination, and may suggest a route, for the conduit and cables. However, it shall be the responsibility of the Contractor to install the conduits and cables with a minimum number of bends in such a manner as to conform to the structure, avoid obstructions, preserve headroom, keep openings and passageways clear, and meet all Code requirements with such offsets and special fittings as may be required.
- C. Any outlet, wall switch or wiring device may be relocated within a radius of six feet at no additional charge to the District if such request is made prior to installation of the item and its branch circuit.

**3.03 CUTTING AND PATCHING**

- A. Perform drilling, cutting, and patching of the general construction work, which may be required for the installation. Patch with the same materials, workmanship and finish as

the original work and accurately match all surrounding work. Such work shall be done by a craftsman accredited in the applicable trade and be acceptable to the Architect.

**3.04 GROUNDING AND BONDING**

- A. Ground and bond the electrical system and equipment in accordance with the most stringent of applicable codes but with the requirements herein and on drawings to be the minimum standards.
- B. System Grounding Electrode:
  - 1. Provide a grounding electrode consisting of a ground rod as indicated on the drawings, and bond to the service ground point in the main switchboard.
  - 2. Where available on the premises and in accordance with Code requirements, the water piping system shall be bonded to form a grounding electrode system as described in CEC Article 250.
- C. Bonding:
  - 1. Provide piping system bonding in accordance with Article 250.
- D. Grounding System Testing:
  - 1. All testing shall be performed using laboratory accuracy test instruments of suitable design for the tests to be performed. Such instruments shall show a valid calibration label.
  - 2. Test the continuity of and the proper connection of each ground conductor and system to assure that the grounding system is complete and proper. The following shall be tested:
    - a. New grounding electrodes.
    - b. Grounding conductors of all existing wiring which is reused.
    - c. Grounding conductors of new wiring for feeders and branch circuits larger than 20 amperes.
- E. All portions of the installations which fail to pass these tests shall be replaced, repaired or otherwise corrected to the satisfaction of the Architect at no cost to the District. It is recommended that Contractor perform grounding system quality assurance testing as the work progresses and prior to the work becoming inaccessible by drywall installation.
- F. The results of these tests shall be submitted by the Contractor as part of the project close-out submittal and shall show the date of test, instrument used, Contractor's name and name of person performing the tests, name of persons witnessing the test, test data, actual measured minimum value per Code/IEEE and a statement whether the measured values are within acceptable limits.

**3.05 DELIVERY, HANDLING, STORAGE OF MATERIALS AND PROTECTION OF WORK**

- A. Protect materials against dirt, water, chemical and mechanical damage both while in storage and during construction.
- B. Cover materials in such a manner that no finished surfaces will be damaged, marred or splattered with plaster or paint, and all moving parts will be kept clean and dry.

- C. Replace or refinish any damaged materials including fronts of panels and switchboard sections.
- D. Keep raceways, boxes, cabinets, and other openings closed to prevent entry of foreign matter.

**3.06 CLEANUP AND HOUSEKEEPING**

- A. Cleaning shall be done as the work proceeds. Periodically remove waste and debris to keep the site as clean as is practical.
- B. Leave exposed parts of the electrical work in a neat, clean and usable condition, with painted surfaces unblemished and plated metal surface polished. Clean lighting fixtures and wipe lamps clean.

**END OF SECTION**

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SECTION 26 05 19

**LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES**

**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 this Section.

1.02 SUMMARY

- A. Building wires and cables rated 600V and less.
- B. Connectors, splices and terminations rated 600V and less.

1.03 DEFINITIONS

- A. CEC: California Electrical Code (CCR Title 24, Part 3) based on the National Electrical Code.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member of NETA or an NRTL.

1.05 SUBMITTALS

- A. Product Data
  - 1. Material List: A material list with names of manufacturers, model numbers, and technical information on all equipment proposed.
  - 2. Product technical information sheets for each principal component in the proposed system. Identify by arrow, circle or similar means products being proposed. Submittals consisting of unmodified catalog pages with no markings will be rejected.
- B. Test Procedures: A written document detailing the proposed test procedures of the system shall be supplied. These procedures shall include all tests required by the equipment manufacturer and by this specification.
- C. Test Results Report: Test Results Report: The results of the execution of the testing procedure, including the items tested or inspected, the date, and by whom.
- D. Samples: when requested by Architect
- E. Operation and Maintenance (O&M) Manuals: Furnish composite "Systems Operation and Maintenance" manuals in indexed three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain, but not be limited to:
  - 1. Operational procedures for the overall systems including the "Sequence of Operation".
  - 2. Test procedures and test results.
  - 3. Instruction for the proper operation and maintenance of the system.
  - 4. Factory issued technical, installation, and maintenance manuals.

5. Factory issued operations and programming (software) manuals.
6. A replacement parts list complete with part numbers and name, address, and phone number of suppliers used by the Contractor. A spare parts list recommended for purchase by the District shall be included.
7. All portions of the material list and shop drawings which are not included in the foregoing.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Building Wire
  - a. Anaconda
  - b. BICC
  - c. General Cable
  - d. Okonite
  - e. Paranite Circle
  - f. Phelps-Dodge
  - g. Pirelli
  - h. Rome
  - i. Simplex
  - j. Triangle
  - k. Or equal
2. Multi-conductor Cable:
  - a. Alpha Wire
  - b. Belden
  - c. Encore
  - d. General Cable
  - e. Southwire
  - f. Or Equal
3. Wire Pulling Compound:
  - a. Minerallac
  - b. Wyrease
  - c. Ideal
  - d. Or equal

### **2.02 GENERAL**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- B. Comply with CEC.
- C. Deliver wire and cable to the site in their original unbroken packages, plainly marked or tagged with UL label, size and insulation type, and manufacturers name.

**2.03 CONDUCTORS**

- A. Soft drawn copper, solid for No. 12 AWG and smaller, stranded for No. 10 AWG and larger or for connections to vibrating equipment or control wiring. Minimum size No. 12 unless noted otherwise. Aluminum conductors shall not be permitted.

**2.04 INSULATION**

- A. Moisture resistant thermoset type XHHW-2 90°C for all underground feeders. Thermoplastic type THHN/THWN-2 90°C for feeders in dry locations and for all branch circuits, except provide high temperature insulations in abnormally high ambient temperatures as applicable.
- B. Equipment and electrode ground wires may be uninsulated in conformance with codes, and where indicated.
- C. Certain circuit breakers such as 100% rated circuit breakers may require the use of 90 degree C insulated wire (sized at the 75 degree C ampacity). If it is required it will be marked as such by the manufacturer.

**2.05 CONNECTIONS AND TERMINATIONS**

- A. Use Pressure indenter type or self-threading spring wire connectors for sizes up to the catalog capacity of the connector. 3M Scotchlok, Ideal Supernut or Buchanan B Cap. Push-In wire connectors may be used for the solid and stranded wire (including stranding patterns) for which they are UL listed. Ideal In-Sure.
- B. Use clamp type pressure connectors complete with clip held insulating cover for large sizes or capacities. As manufactured by Burndy, O.Z. or T & B.
- C. In above grade dry locations wrap joints with two layers of plastic tape, half lapped, Scotch No. 33. For splices involving conductors 4 AWG and larger, provide pre-insulated lug kits listed for the conductor size(s) and materials being joined. As manufactured by Illsco, Penn Union, or equal.
- D. Wiring in underground pullboxes shall be spliced using compression connectors and resin encapsulation kits, 3M Scotch-cast, or equal; or shrink tubing kits. Splices shall be completely waterproof.
- E. Bolted connections to equipment or busbars shall be made with approved solderless compression type or set screw type lugs for wires No. 8 AWG and larger. Special connections shall be as shown on the plans. Binding screws may be used for size No. 12 solid.

**2.06 PULLING COMPOUND**

- A. Minerallac #100, Wyrease, Ideal 77 Yellow or equal.

**2.07 COLOR CODING**

- A. Comply with identification requirements of Division 26 Section "Identification for Electrical Systems."

**PART 3 - EXECUTION**

**3.01 DEMOLITION**

- A. All existing wiring not being reused shall be removed back to the switchboard, panel or first active outlet box. Vacated conduit shall be removed unless removal would damage the structure. Place blank faceplates on all vacated boxes left in place.

**3.02 INSTALLATION**

- A. Install wiring in conduit unless noted or specified otherwise. Raceways shall be clean and dry before cable installation.
- B. Complete raceway and cable tray installation before installation of conductors.
- C. Do not exceed manufacturer's recommended pulling tension or minimum bending radius.
- D. Tighten connections in accordance with manufacturer's published torque.
- E. Provide a dedicated neutral for all 20 amp, 277V or 120V branch circuits. Multi-wire circuits shall not be provided for 277V or 120V loads. Exception: Multi-wire circuits shall be provided for systems furniture feeds in accordance with CEC 210.4 when indicated by the furniture manufacturer's installation instructions.
- F. Do not use mechanical devices for pulling No. 2 AWG and smaller wire. Torque limiting types may be used for No. 1 and larger sizes but tensions shall not exceed cable manufacturer's recommendations.
- G. Form wire into pigtail splices with 8 inch leads for connections to wiring devices and fixtures.
- H. Comply with identification requirements of Division 26 Section "Identification for Electrical Systems."
- I. Attach identification tags to wire and cable at every point where runs are broken or terminated. Exception: Branch circuits need only be tagged at their point of origin. Neutrals for all 120 volt, 2 wire branch circuits shall be tagged in the panelboard with the circuit number or shall be grouped as required by CEC 210.4(D).
- J. Provide a pullbox or wireway transition from conduit to MC Cable.
- K. Splices shall not be permitted in feeders unless noted otherwise.

**3.03 FIELD QUALITY CONTROL**

- A. All new or existing wire damaged as a result of installation or removal of wire under this Section, shall be pulled out and replaced with new at no additional charge. All existing wire found to be damaged or inadequate shall be called to the attention of the District's representative.

**END OF SECTION**



SECTION 26 05 26

**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**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 this Section.

1.02 SUMMARY

- A. Section includes grounding and bonding systems and equipment

1.03 DEFINITIONS

- A. CEC: California Electrical Code (CCR Title 24, Part 3) based on the National Electrical Code.
- B. NRTL: Nationally Recognized Testing Laboratory

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member of NETA or an NRTL.
  - 1. Testing Agency's Field Supervisor: Certified by NETA to supervise on-site testing.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- C. Comply with UL 467 for grounding and bonding materials and equipment.

1.05 SUBMITTALS

- A. Product Data
  - 1. Material List: A material list with names of manufacturers, model numbers, and technical information on all equipment proposed.
  - 2. Product technical information sheets for each principal component in the proposed system. Identify by arrow, circle or similar means products being proposed. Submittals consisting of unmodified catalog pages with no markings will be rejected.
  - 3. Weight, dimensions and shipping splits.
  - 4. Equipment operating and service (maintenance) clearances required around the equipment.
- B. Shop Drawings
- C. Test Procedures: A written document detailing the proposed test procedures of the system shall be supplied. These procedures shall include all tests required by the equipment manufacturer and by this specification.
- D. Test Results Report: The results of the execution of the testing procedure, including the items tested or inspected, the date, and by whom.

- E. Operating Sequences: Provide a complete written description of the Sequence of Operation of each of the systems including startup and recovery procedures
- F. Samples: when requested by Architect
- G. Operation and Maintenance (O&M) Manuals: Furnish composite "Systems Operation and Maintenance" manuals in indexed three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain, but not be limited to:
  - 1. Operational procedures for the overall systems including the "Sequence of Operation".
  - 2. Test procedures and test results.
  - 3. Instruction for the proper operation and maintenance of the system.
  - 4. Factory issued technical, installation, and maintenance manuals.
  - 5. Factory issued operations and programming (software) manuals.
  - 6. A replacement parts list complete with part numbers and name, address, and phone number of suppliers used by the Contractor. A spare parts list recommended for purchase by the District shall be included.
  - 7. All portions of the material list and shop drawings which are not included in the foregoing.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 1. Burndy
  - 2. ERICO
  - 3. ILSCO
  - 4. O-Z Gedney
- B. Source Limitations: Obtain materials and accessories from single source from single manufacturer.

### **2.02 SYSTEM DESCRIPTION**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- B. Comply with CEC.

### **2.03 GROUND RODS:**

- A. 3/4 inch diameter X 10 feet long copper clad steel.

**PART 3 - EXECUTION****3.01 INSTALLATION**

- A. System Grounding Electrode:
  - 1. Where available on the premises and in accordance with Code requirements, the water piping system and metal building frame shall be bonded together to form a grounding electrode system as described in CEC Article 250.
- B. Ground and bond the electrical system and equipment in accordance with the most stringent of applicable codes but with the requirements herein and on drawings to be the minimum standards.
- C. Provide copper THHN/THWN-2 insulated equipment grounding conductors in all raceways used for electrical power circuits, including conduit, wireway, etc.
- D. The grounding conductors shall be provided whether scheduled or shown on the drawings or not, and if necessary the conduit size shall be increased to accommodate them. These grounding conductors shall be connected to the ground terminals on the device or enclosure at each end of the installation and shall be interconnected with the other ground terminals and conductors to form a continuous wired grounding system throughout the electrical wiring system.
- E. Ground rods: Drive full length into earth with the top 3 inches minimum below grade or underside of slab. Where ground rods cannot be driven vertically to the desired depth below grade, they shall be driven at an angle away from or parallel to the exterior wall. When driven parallel to the wall, the angle shall not exceed 45 degrees. The rod shall penetrate to a depth of permanent ground moisture.
- F. When ground rods cannot be driven because of bedrock at less than 4 feet below grade level, a counterpoise grounding electrode shall be used in place of rods. The counterpoise system shall consist of not less than 50 feet of No. 2 AWG bare tinned copper wire, buried to a depth of at least 18 inches below grade, for each ground rod shown. The conductors shall be run in a straight line.
- G. Connections: Connection to ground rods shall be made using **exothermic welding devices**. Above ground and accessible connections **shall** be made using **exothermic devices**. Multiple bolt silicon bronze connectors, Burndy or O.Z. Electric; or exothermic welded, Burndy, Erico Cadweld products, or equal.
- H. Grounding electrode conductors shall be provided for service equipment and transformers by the Contractor. Utility Company transformer grounding shall be installed per Utility Company requirements. Ground conductor connections to transformer shall be by Utility Company
- I. Flush wall outlets shall have a bonding wire from device ground terminal, or approved mounting screw from strap, to metal box.

3.02 FIELD QUALITY CONTROL

- A. Test each grounding electrode for resistance at the connection point before connecting any wires. Resistance at the grounding electrode shall not exceed the following:

Service entrance equipment: **10 ohms**

Interior electrical systems: **25 ohms**

Exterior lighting standards: **25 ohms**

Computer isolated systems: **10 ohms**

If the above values are not achieved with the installed system notify the District's representative.

- B. Resistance to ground of the electrode shall be a maximum of 10 ohms. If the resistance is in excess of that specified above, provide one or more ground rods bonded to the electrode described herein until the required resistance is obtained. Space rods a minimum of 10 feet apart. Bonding conductor shall be the same size as the grounding electrode connector. Test the electrode using the "fall of potential" method (described in IEEE No. 142) using a Biddle Earth Megger or equal, calibrated within the previous 12 months. Perform test not less than 48 hours after rainfall. No conductive agents, chemicals, water, etc. shall be applied to lower ground resistance.
- C. Each grounding electrode shall be tested using a ground resistance Megger, or other suitable instrument, in conformance with the manufacturer's directions. Submit a report listing as a minimum the date of testing, name of tester, instrument used, location and type of ground electrode, and resistance in ohms. Submit within 5 days after testing is completed.

**END OF SECTION**

SECTION 26 05 33

**RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS**

**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 this Section.
- B. For underground raceways and structures refer to Section 26 05 43 "Underground Ducts and Raceways for Electrical Systems".

1.02 SUMMARY

- A. Section Includes:
  - 1. Metal conduits, tubing, and fittings.
  - 2. Nonmetal conduits, tubing, and fittings.
  - 3. Metal wireways and auxiliary gutters.
  - 4. Nonmetal wireways and auxiliary gutters.
  - 5. Surface raceways.
  - 6. Boxes, enclosures, and cabinets.

1.03 DEFINITIONS

- A. CEC: California Electrical Code (CCR Title 24, Part 3) based on the National Electrical Code.
- B. EMT: Electrical Metallic Tubing
- C. IMC: Intermediate Metal Conduit
- D. RAC: Rigid Aluminum Conduit
- E. RGS: Rigid Galvanized Steel
- F. RPC: Rigid Plastic Conduit

1.04 QUALITY ASSURANCE

- A. All materials shall be UL listed.

1.05 SUBMITTALS

- A. Product Data
  - 1. Material List: A material list with names of manufacturers, model numbers, and technical information on all equipment proposed.
  - 2. Product technical information sheets for each principal component in the proposed system. Identify by arrow, circle or similar means products being proposed. Submittals consisting of unmodified catalog pages with no markings will be rejected.
  - 3. Weight, dimensions and shipping splits.

4. Equipment operating and service (maintenance) clearances required around the equipment.
- B. Shop Drawings
- C. Test Procedures: A written document detailing the proposed test procedures of the system shall be supplied. These procedures shall include all tests required by the equipment manufacturer and by this specification.
- D. Test Results Report: The results of the execution of the testing procedure, including the items tested or inspected, the date, and by whom.
- E. Operating Sequences: Provide a complete written description of the Sequence of Operation of each of the systems including startup and recovery procedures
- F. Samples: when requested by Architect
- G. Operation and Maintenance (O&M) Manuals: Furnish composite "Systems Operation and Maintenance" manuals in indexed three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain, but not be limited to:
  1. Operational procedures for the overall systems including the "Sequence of Operation".
  2. Test procedures and test results.
  3. Instruction for the proper operation and maintenance of the system.
  4. Factory issued technical, installation, and maintenance manuals.
  5. Factory issued operations and programming (software) manuals.
  6. A replacement parts list complete with part numbers and name, address, and phone number of suppliers used by the Contractor. A spare parts list recommended for purchase by the District shall be included.
  7. All portions of the material list and shop drawings which are not included in the foregoing.

## PART 2 - PRODUCTS

### 2.01 ACCEPTABLE MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, **provide products by the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:**
- B. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
  1. Floor Boxes:
    - a. Hubbell
    - b. Lew
    - c. Steel City
    - d. Russel – Stoll
    - e. Thomas & Betts
    - f. Or equal

- 2. Wireways:
  - a. Hoffman
  - b. Nepco
  - c. Square D
  - d. Or equal

- C. Source Limitations: Obtain materials and accessories from single source from single manufacturer.

## 2.02 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- B. Comply with CEC.

## 2.03 CONDUITS

- A. Acceptable Manufacturers
  - 1. Metallic Conduit: Triangle, PWC, Wheeling Steel, Youngstown Sheet & Tube Co., Allied Tube & Conduit Co., Wheatland, or equal.
  - 2. Non-Metallic Conduit: Carlon, CertainTeed, Pacific Western, or equal.
  - 3. Liquidtight Flexible Conduit: American Brass Co., Columbia Cable and Electric Corp. International Metal Hose, Appleton, or equal.
  - 4. Conduit Bodies and Fittings: Appleton Electric, Crouse Hinds, Gedney Electric Mfg. Co., Thomas & Betts, Steel City, or equal.
- B. General:
  - 1. Types and applications shall be in conformance with Codes and with this specification
  - 2. Minimum sizes: 3/4" underground or in concrete except that 1/2" is permissible where such a run terminates in a box containing a single wiring device and when required elsewhere herein and on drawings.
- C. Types:
  - 1. RGS and IMC and fittings: Hot dip galvanized. Threaded type. Required for circuits operating at voltages above 600 volts and when required elsewhere herein and on drawings.
  - 2. EMT and fittings: Same finish requirements as for RGS. Use permitted only in dry, concealed locations (above suspended ceilings and inside stud walls) and interior exposed locations (10' minimum above floor) where not subject to mechanical damage. Exposed EMT may be used anywhere within electrical rooms regardless of height. Fittings: Liquid tight compression gland type, steel or malleable iron. Steel City #TC715 or T & B #5123 series. Exception: Cast fittings are permitted for 1-1/2" and larger conduits.

3. Flexible steel conduit and fittings: Flexible conduit shall be galvanized steel and shall be used where shown on the plans and to connect conduit systems to motors, direct wired and vibrating equipment, and as a final connection to lighting fixtures in accessible dropped grid type ceilings. Flex shall not be used as a wiring system instead of EMT. Flex shall be used instead of EMT only where EMT would be impossible to use in interior dry frame or stud construction in conformance with codes and ordinances [and where permission is granted upon request, by the District's representative].
4. Flexible conduit shall have a code sized grounding conductor run with it and shall have approved grounding fittings. Where used in damp or wet locations flexible conduit shall be of the liquid tight type with outer neoprene jacket and suitable liquid-tight fittings. Fittings: "Jake" or malleable iron squeeze type.
5. Liquid-tight flexible steel conduit and fittings: Same finish requirements as for rigid steel except PVC jacketed. Use in lieu of standard flexible conduit in damp or wet locations and for connections to motors. Fittings: Appleton "ST" series or American Brass "Sealtite" type U.A
6. RAC and fittings: May be used in lieu of EMT for sizes over 1" in interior, dry, above ground locations only. [RAC shall be used for all 400 Hz power circuits except where flexible conduit or other wireway are specified.] Fittings shall be suitable for aluminum and shall be of the threaded type.
7. RPC and fittings: PVC schedule 40. Use permitted only for underground runs and concealed in masonry walls. Final bends associated with conduit stub-ups to transition to above ground conduits shall be PVC coated rigid galvanized steel shall conform to NEMA TC 2 and shall be PVC equal to Carlon Type EPC 40. Conduit, fittings and solvent cement shall be produced by the same manufacturer and shall be chemically and mechanically compatible.

#### **2.04 WIREWAYS AND WIRING GUTTERS**

- A. Construct of galvanized sheet steel which has been primed and given a final coat of grey enamel. Covers shall be hinged and fastened with brass machine screws spaced not more than 12 inches apart. When covers are on the bottom, provide removable wire supports not more than 3 feet apart.

#### **2.05 OUTLET, JUNCTION AND PULL BOXES**

- A. Outlet boxes, junction boxes and covers shall be galvanized one-piece pressed steel knockout type. Exception: Exposed conduit boxes shall be cast metal if connected to rigid or intermediate conduit.
- B. The size of each box for light outlets shall be determined by the number of wires or conduits, or size of conduits, entering the box but shall be not less than 4" square and 2-1/8" deep, unless prohibited by structural conditions.
- C. Wall outlet boxes shall be of size and type to suit each individual location. Minimum box size shall be 4-4/16" square by 2-1/8" deep with single gang plaster rings (depth as necessary). Provide blank device plates
- D. All junction boxes on the drawings shall be minimum 4-11/16" square by 2-1/8" deep.



- E. Provide wall mounted boxes such as switch, receptacle, telephone, junction, etc., with manufactured "far side box supports", which shall be in contact with the gypsum board surface behind the box.
- F. Use approved factory-made knockout seals in all boxes where knockouts are not intact.
- G. Use offset bar hangers fitted with fixture studs to support outlet boxes in stud partitions and in furred or plastered ceilings.
- H. Outlets for wall mounted telephones shall be an outlet box which is securely fastened to structure.
- I. Nonmetallic Floor Boxes: Rectangular.
  - 1. Listing and Labeling: Nonmetallic floor boxes shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - 2. Nonmetallic floor boxes shall be gangable and adjustable.
  - 3. Metal threaded inserts shall be provided for attachment of devices and trim plates.
  - 4. Multi-gang floor box shall be used where indicated on the drawings.
  - 5. There shall be minimum of 1-1/4 inch external height adjustment and minimum 3/8 inch internal final adjustment. Top flange shall be rectangular and adjusted flush with the finished floor.
  - 6. Provide brass tile flanges. Cover shall be brass duplex flap type, equal to Hubbell #S3825 or equal for power, and brass 2-1/8 inch single type, equal to Hubbell #S2825 or equal, for telephone, signal and data systems, and Soundolier 'MRB' or equal series for projector and microphone jacks. Single and ganged floor boxes in carpeted areas shall be provided with clear polycarbonate carpet flange.

### PART 3 - EXECUTION

#### 3.01 DEMOLITION

- A. Where an outlet, device or item of electrical equipment is shown to be removed, the entire installation, including boxes and conduit, shall be removed unless otherwise indicated.
- B. Where the structure, finish, fixture, outlet, circuit or equipment is damaged or left incomplete or unworkable due to demolition work, it shall be patched, repaired, replaced, rerouted or relocated as conditions require and as directed by the Architect.

#### 3.02 INSTALLATION – GENERAL

- A. Continuously check the work of the other Divisions to prevent any interference between the various installations. Should structural difficulties or work of other Divisions prevent the routing of conduit as indicated on the drawings, make necessary deviations there from as directed by the District's representative.
- B. Provide the empty raceway rough-in and the power for the following systems as indicated on drawings and described herein.

1. Telephone/Voice/Data
  2. Fire Detection and Alarm
  3. Access Control
  4. Intercom
  5. Classroom audio/visual
- C. Installation of conduit, termination of conduit in terminal closets, and other work necessary for the system rough-in, shall comply with the requirements of communication system suppliers.

**3.03 CONDUIT INSTALLATION**

- A. Telephone/Voice/Data conduit bends shall be as follows:
1. 3/4" and 1" conduit: 12" minimum radius bends,
  2. 1-1/4" conduit, 18-in. minimum radius bend.
  3. Conduit sizes shown on the drawings are designed so that each separate run will not have more than two 90° bends. If more than two ninety degree bends are required, install long sweep bends. Cast conduit bodies or pull boxes, if required, will not be permitted until the type and location are submitted for approval.
- B. Conduit installed in concrete work shall be carefully laid and rigidly supported in the forms in such a manner as to provide proper clearance so that all boxes and outlets will be in exact locations after concrete has set and forms have been removed.
- C. Concrete slabs on grade: Conduit shall not be installed in slab on grade.
- D. Route conduit so as to clear beams, plates, footings and structural members, whether or not indicated on the plans. Do not run conduit through any structural member of the building, except as specifically directed by the Owner's representative.
- E. Where conduit penetrates a fire rated separation, any of the following packing methods may be used to restore the integrity of the separation if Code approved: cement, mineral fiber sprayed with a flame retardant coating, or Dow Corning 3 -6548 RTV silicon foam, 3M caulk #CP25, 3M putty #303, or equal. Seal shall be water tight and shall be accomplished prior to wire pulling.
- F. Where a conduit enters building through the concrete foundation wall or floor below ground level, provide a watertight seal assembly around the conduit. These seals shall be 0.Z. Type "FSK" or "WSK", or as approved.
- G. Do not run conduit closer than 6 inches to any uninsulated hot water or steam pipe, heater flue or vent. If pipe is insulated, the clearance may be reduced to 2 inches.
- H. Provide cast conduit bodies (condulets) for exposed runs of conduit where junction, bends or offset are required, whether such condulets are indicated on the plans or not. No bends are permitted around corners, beams, wall or equipment. No running threads are permitted. Run a die over factory threads to ensure that they are clean and free from all coating material and that good metallic contact with the fittings is obtained. Paint the exposed portion of field cut threads with a suitable zinc rich paint.
- I. Upon completion of each run of conduit, test the run and clear it of all obstructions. Plug each conduit end with conduit pennies and bushings or manufacturers seals until ready for pulling wire. Provide a 200 pound test nylon or polypropylene pull rope in each empty conduit. Tie off rope at each end and provide an identification tag on rope at each end

indicating the room and outlet designation of its destination (as directed by District's representative).

- J. Where panelboards and cabinets are installed flush in walls, extend empty conduits from panel to an accessible space above or as indicated on plans. Provide a minimum of one 3/4" conduit for each three single pole spare circuit breakers or spaces, or equivalent, but not less than three conduits.

### 3.04 CONDUIT INSTALLATION – ABOVE GRADE

- A. All conduit above grade or inside of a structure shall be metallic, except in masonry and concrete walls RPC may be used.
- B. Run conduit concealed, except as otherwise indicated.
- C. Run exposed conduit parallel with or at right angles to walls or as directed by the District's representative.
- D. Where conduits are placed in partitions necessitating cutting of any structural member, provide supports as directed by Owner's representative in accordance with applicable structural requirements.
- E. Locate conduit so as not to obstruct access or service to equipment.
- F. Conduit passing through the roof: Flash and counter-flash in accordance with architectural drawings and specifications. Method shall be compatible with roofing system and acceptable to the Owner's representative. Roof top conduits shall be rigid steel and shall be neatly grouped and installed parallel to the building lines. Support conduit on minimum 2" x 4" redwood or equal sleepers at maximum 5' spacing.
- G. Conduit 1" and smaller over metal channel for lath and plaster or acoustical ceilings shall be tied to the supporting channels with 12 gauge galvanized tie wire spaced at a maximum of 10 feet intervals. Conduits shall not obstruct accessibility of ceiling or removal of panels. Do not use ceiling wires for support. Support exposed conduit 1" and smaller from building with T & B, or equal, pipe straps spaced at a maximum of 10 feet intervals. Attach supports with machine screws, nuts and lock washers in metal; wood screws in wood; and expansion shields or inserts in masonry or concrete. Perforated strap iron and nail straps shall not be used. Conduits larger than 1" shall be suspended on pipe racks with Grinnell No. 107B, or equal, split ring hangers and rods from concrete inserts. Conduits supported by unistrut trapezes shall be attached with straps.
- H. RGS shall be installed in interior wet locations, exposed exterior locations, and wherever specifically shown. Where installed in exterior locations, RGS and fittings shall be PVC coated for corrosion protection. Conduit, from slab to bottom of surface mounted panelboards, distribution panels, and device outlet boxes, terminal cabinets, where exposed, shall be RGS. Conduit concealed in wall from slab to flush mounted panels, distribution panels, terminal cabinets, and all device outlet boxes for all systems shall be EMT except to devices mounted at 36" or less in which case flexible conduit may be used. Contractor shall be allowed a dimension of 3" above slab to make transition from PVC to EMT, flex or rigid steel as allowed above.
- I. Conduits which cross building expansion joints or seismic joints shall be provided with expansion/deflection couplings, Crouse Hinds "XD" Series, or equal where building movement exceeds the rating of expansion/deflection couplings, provide suitable flexible metallic conduit installation across joint.

- J. The ends of all underground conduits entering buildings shall be capped or sealed with acceptable compound, such as Crouse Hinds "Chico A", after installation of wire. Cap empty conduit stub-outs at both ends.

**3.05 WIREWAYS AND WIRING GUTTERS**

- A. Sections shall be securely attached to each other and to cabinets, boxes, or duct to insure ground continuity. Provide copper equipment grounding conductors throughout the wireway system. Securely attached or support the wireway or gutter from the building structure at points no more than 4 feet apart. Size shall be as indicated on drawings unless larger is required to conform to CEC. When suspended from roof or ceiling, the support spacing shall be not more than 4 feet and 3/8 inch diameter rods shall be used. When attached to wall, use expansion anchors in masonry and concrete, sheet metal screws supplemented with toggle bolts in drywall with metal studs, and wood screws supplemented with toggle bolts in drywall with wood studs.
- B. Power gutter assemblies: Mount gutter to a 3/4 inch plywood backboard. Gutter and backboard shall be sized to accommodate the equipment. Arrange equipment neatly and symmetrically on backboard.

**3.06 OUTLET, JUNCTION AND PULL BOXES**

- A. Boxes shall be labeled with a felt tipped pen indicating the designations of the circuits they contain (panel, circuit #, etc.). Locate the labeling text for easy reading if exposed or above ceiling or below access flooring.
- B. Provide pull boxes and junction boxes where indicated on plans or where required by Code. Size to properly accommodate conductors with Code requirements as minimum. When necessary pull and junction boxes are not indicated on drawings and are to be placed in a public space, coordinate the location with the Owner's representative. Boxes of outlet box size which are in public spaces shall be flush mounted and shall have single gang ring and blank device plate painted to match adjacent surface.
- C. In all conference rooms, audio labs, office walls common to printer bars, copy rooms, mechanical rooms and similar spaces and also where sound isolation walls are indicated on architectural drawings, provide sound pads (acoustical noise transfer reduction material) applied to all boxes, Dottie 68 type or equal.
- D. For local switch outlets, provide 4 inch pressed steel boxes with switch plaster rings for one or two gangs. Where 2 gang, 20 ampere or larger switches occur, provide 4-11/16 inch square boxes with switch plaster rings.
- E. For convenience outlets, etc., provide 4 inch square pressed steel boxes, or larger if necessary, with single gang plaster rings.
- F. In masonry or concrete construction waterproof boxes manufactured for that purpose shall be used.

**END OF SECTION**

**SECTION 26 05 43**

**UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS**

**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 this Section.

**1.02 SUMMARY**

- A. This Section includes the following:
  - 1. Direct-buried conduit, ducts, and duct accessories.
  - 2. Concrete-encased conduit, ducts, and duct accessories.
  - 3. Pullboxes
  - 4. Handholes

**1.03 DEFINITIONS**

- A. CEC: California Electrical Code (CCR Title 24, Part 3) based on the National Electrical Code.

**1.04 QUALITY ASSURANCE**

- A. Comply with CEC.

**1.05 SUBMITTALS**

- A. Product Data
  - 1. Material List: A material list with names of manufacturers, model numbers, and technical information on all equipment proposed.
  - 2. Product technical information sheets for each principal component in the proposed system. Identify by arrow, circle or similar means products being proposed. Submittals consisting of unmodified catalog pages with no markings will be rejected.
  - 3. Weight, dimensions and shipping splits.
  - 4. Equipment operating and service (maintenance) clearances required around the equipment.
- B. Shop Drawings
  - 1. Precast or Factory-Fabricated Underground Utility Structures:
    - a. Include plans, elevations, sections, details, attachments to other work, and accessories.
    - b. Include duct entry provisions, including locations and duct sizes.
    - c. Include reinforcement details.
    - d. Include frame and cover design.

- e. Include grounding details.
- f. Include dimensioned locations of cable rack inserts, pulling-in and lifting irons, and sumps.
- g. Include joint details.
- C. Test Procedures: A written document detailing the proposed test procedures of the system shall be supplied. These procedures shall include all tests required by the equipment manufacturer and by this specification.
- D. Test Results Report: The results of the execution of the testing procedure, including the items tested or inspected, the date, and by whom.
- E. Operating Sequences: Provide a complete written description of the Sequence of Operation of each of the systems including startup and recovery procedures
- F. Samples: when requested by Architect
- G. Operation and Maintenance (O&M) Manuals: Furnish composite "Systems Operation and Maintenance" manuals in indexed three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain, but not be limited to:
  - 1. Operational procedures for the overall systems including the "Sequence of Operation".
  - 2. Test procedures and test results.
  - 3. Instruction for the proper operation and maintenance of the system.
  - 4. Factory issued technical, installation, and maintenance manuals.
  - 5. Factory issued operations and programming (software) manuals.
  - 6. A replacement parts list complete with part numbers and name, address, and phone number of suppliers used by the Contractor. A spare parts list recommended for purchase by the District shall be included.
  - 7. All portions of the material list and shop drawings which are not included in the foregoing.

**1.06 EXTRA MATERIALS**

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Handhole cover bolts: Equal to 200 percent of quantity installed for each size and type, but no fewer than twelve of each size and type.
  - 2. Handhole bolt socket-wrench socket: Furnish two (2) for each bolt head size and type, 1/2 inch drive.

**PART 2 - PRODUCTS****2.01 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
1. Underground Pullboxes and Handholes
    - a. Newbasis
    - b. Jensen Precast
    - c. Utility Vault Co.
    - d. San Diego Precast
    - e. Or equal.
  2. Cable Supports:
    - a. OZ
    - b. PLM
    - c. Or equal
- B. Source Limitations: Obtain materials and accessories from single source from single manufacturer.

**2.02 SYSTEM DESCRIPTION**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.

**2.03 CONCRETE WORK**

- A. Concrete for work under this **Division** shall be as specified **In Division 31**.
- B. Concrete involving a serving Utility's equipment or systems shall conform to the requirements of the Utility.

**2.04 CONDUIT**

- A. RNC: NEMA TC 2, **Type EPC-40-PVC and Type EPC-80-PVC**, UL 651, with matching fittings by same manufacturer as the conduit, complying with NEMA TC 3 and UL 514B.

**2.05 UNDERGROUND PULLBOXES**

- A. Pullboxes (less than 24" X 36") for exterior underground use shall be reinforced, precast, concrete electrical type.
- B. Boxes shall consist of a body, cover, extension and base, with clear interior dimensions as shown on the drawings.
- C. Covers shall be concrete bolt down traffic type. Concrete covers shall fit flush and without rocking. Chipped, cracked, or badly fitting covers will not be acceptable. All bolts shall be tamper resistant Type 304 stainless steel.
- D. Mark all covers with permanent raised or depressed letters reading "Electrical", "Parking Lighting", "Ground Rod", "Signal" or applicable designation unless noted otherwise on drawings. No abbreviations.

2.06 UNDERGROUND HANDHOLES

- A. Pullboxes (24" x 36" or larger) for exterior underground use shall be reinforced, precast, concrete electrical type.
- B. Boxes shall consist of a body, cover, extensions, and base, with clear interior dimensions as shown on the drawings.
- C. Covers for 24" X 36" pull boxes shall be 1 piece, bolt-down type. Covers for 48" X 48" or larger pull boxes shall be two piece torsion hinged type. Covers shall be parkway or traffic as called for on drawings with heavy-duty galvanized steel checkered plate with angle frame. All exposed steel shall be galvanized. All bolts shall be tamper resistant Type 304 stainless steel. Mark all covers with permanent raised or depressed letters reading "Electrical", "Signal", or applicable designation unless otherwise noted. No abbreviations.

**PART 3 - EXECUTION**

3.01 INSTALLATION

- A. **Pullboxes** and ducts shall be assembled and installed in strict conformance with the manufacturer's instructions.
- B. Coordinate elevations of ducts and duct-bank entrances into handholes and pullboxes with final locations and profiles of ducts and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct runs drain to manholes and handholes, and as approved by Architect.
- C. Pullboxes with open bottoms shall be set on a minimum of 12 inches deep sand base to allow for drainage. Handhole base sections shall be set on a minimum of 6 inches compacted and leveled rock or sand to ensure even distribution of soil pressure on base. Top of covers shall be flush with final grade or paving and shall be perfectly level. All covers within pedestrian paths of travel shall be ADA compliant.
- D. A preformed joint sealing compound of non-hardening mastic furnished by the handhole manufacturer shall be placed in the grooves of the base and body sections to seal the sections together watertight. Joints shall be carefully cleaned before sealing.
- E. Concrete encased ducts connecting to handholes shall be constructed to have a tapered section adjacent to the handhole to provide shear strength. Vibrators shall be used when this portion of the envelope is poured to assure a seal between the envelope and the wall of the handhole.
- F. Provide end bells for all duct terminations in pullboxes and handholes.



- G. Backfilling around structures shall consist of earth, loam, sand clay, or sand and gravel, free from large clods of earth or stones over 1 inch in size. Backfill materials shall be placed symmetrically on all sides in loose layers not more than 9 inches deep. Each layer shall be moistened, if necessary, and compacted with mechanical or hand tampers to 90% compaction. Surfaces disturbed during the installation of **pullboxes** shall be replaced.
- H. Pullboxes and handholes shall be located away from pedestrian and vehicular paths of travel wherever possible.
- I. In locations where water will collect in the pullbox or handhole, provide a drain connected to the site storm drainage system.
- J. Under no circumstances shall the rim elevation of the pullbox or handhole nearest to the point of entry of conduits to a building or electrical switchboard, panel or other enclosure be above the floor level of the building or enclosure.
- K. Metallic covers of pullboxes and handholes shall be bonded to the equipment grounding conductor. Bonding conductor shall be minimum 6 AWG insulated copper with sufficient slack to allow removal of the cover.
- L. After installation, handholes and pullboxes shall be cleaned of dirt, sand, and debris and the covers sets in place. Pull ropes leaving ducts shall be suitably tagged to allow future identification and use. Location of duct entry shall be marked clearly on as built plans for pullboxes and handholes.

### 3.02 UNDERGROUND DUCT INSTALLATION

- A. Ducts for Electrical Cables More than 600 V: RNC, NEMA **Type EPC-80-PVC**, in concrete-encased duct bank unless otherwise indicated.
- B. Ducts for Electrical Feeders 600 V and Less: RNC, NEMA **Type EPC-80-PVC**, in concrete-encased duct bank unless otherwise indicated.
- C. Ducts for Electrical Branch Circuits: RNC, NEMA **Type EPC-80-PVC**, in direct-buried duct bank unless otherwise indicated.
- D. Underground Ducts Crossing **Driveways and Roadways**: RNC, NEMA Type EPC-80-PVC, encased in reinforced concrete.
- E. Install ducts according to NEMA TCB 2.
- F. Slope: Pitch ducts a minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope ducts from a high point in runs between two manholes, to drain in both directions.
- G. Curves and Bends: Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends with a minimum radius of **48 inches**, both horizontally and vertically, at other locations unless otherwise indicated.
- H. Joints: Use solvent-cemented joints in ducts and fittings and make watertight according to manufacturer's written instructions. Stagger couplings so those of adjacent ducts do not lie in same plane.
- I. Concrete-Encased Ducts: Support ducts on duct separators.

1. Excavate trench bottom to provide firm and uniform support for duct bank. Prepare trench bottoms as specified in Section 312000 "Earth Moving" for pipes less than 6 inches in nominal diameter.
2. Width: Excavate trench 12 inches wider than duct bank on each side.
3. Width: Excavate trench 3 inches wider than duct bank on each side.
4. Depth: Install top of duct bank at least 24 inches below finished grade in areas not subject to deliberate traffic, and at least 30 inches below finished grade in deliberate traffic paths for vehicles unless otherwise indicated.
5. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
6. Separator Installation: Space separators close enough to prevent sagging and deforming of ducts, with not less than four spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent floating during concreting. Stagger separators approximately 6 inches between tiers. Tie entire assembly together using fabric straps; do not use tie wires or reinforcing steel that may form conductive or magnetic loops around ducts or duct groups.
7. Minimum Space between Ducts: 3 inches between ducts and exterior envelope wall, 2 inches between ducts for like services, and 12 inches between power and signal ducts.
8. Elbows: Use manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Extend concrete encasement throughout length of elbow.
9. Elbows: Use manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
  - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
  - b. Stub-Ups to Equipment: For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of base. Install insulated grounding bushings on terminations at equipment.
10. Reinforcement: Reinforce concrete-encased duct banks where they cross disturbed earth and where indicated. Arrange reinforcing rods and ties without forming conductive or magnetic loops around ducts or duct groups.
11. Forms: Use walls of trench to form side walls of duct bank where soil is self-supporting and concrete envelope can be poured without soil inclusions; otherwise, use forms.
12. Concrete Cover: Install a minimum of 3 inches of concrete cover at top and bottom, and a minimum of 2 inches on each side of duct bank.
13. Concreting Sequence: Pour each run of envelope between manholes or other terminations in one continuous operation.

- a. Start at one end and finish at the other, allowing for expansion and contraction of ducts as their temperature changes during and after the pour. Use expansion fittings installed according to manufacturer's written recommendations, or use other specific measures to prevent expansion-contraction damage.
    - b. If more than one pour is necessary, terminate each pour in a vertical plane and install 3/4-inch reinforcing-rod dowels extending a minimum of 18 inches into concrete on both sides of joint near corners of envelope.
  14. Pouring Concrete: Comply with requirements in "Concrete Placement" Article in Section 033000 "Cast-in-Place Concrete." Place concrete carefully during pours to prevent voids under and between conduits and at exterior surface of envelope. Do not allow a heavy mass of concrete to fall directly onto ducts. Allow concrete to flow to center of bank and rise up in middle, uniformly filling all open spaces. Do not use power-driven agitating equipment unless specifically designed for duct-bank application.
- J. Direct-Buried Duct Banks:
1. Excavate trench bottom to provide firm and uniform support for duct bank.
  2. Support ducts on duct separators coordinated with duct size, duct spacing, and outdoor temperature.
  3. Space separators close enough to prevent sagging and deforming of ducts, with not less than five spacers per 20 feet of duct. Secure separators to earth and to ducts to prevent displacement during backfill and yet permit linear duct movement due to expansion and contraction as temperature changes. Stagger spacers approximately 6 inches between tiers.
  4. Depth: Install top of duct bank at least 36 inches below finished grade unless otherwise indicated.
  5. Set elevation of bottom of duct bank below frost line.
  6. Install ducts with a minimum of 3 inches between ducts for like services and 6 inches between power and signal ducts.
  7. Elbows: Install manufactured duct elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run unless otherwise indicated. Encase elbows for stub-up ducts throughout length of elbow.
  8. Install manufactured rigid steel conduit elbows for stub-ups at poles and equipment, at building entrances through floor, and at changes of direction in duct run.
    - a. Couple steel conduits to ducts with adapters designed for this purpose, and encase coupling with 3 inches of concrete.
    - b. For equipment mounted on outdoor concrete bases, extend steel conduit horizontally a minimum of 60 inches from edge of equipment pad or foundation. Install insulated grounding bushings on terminations at equipment.

9. After installing first tier of ducts, backfill and compact. Start at tie-in point and work toward end of duct run, leaving ducts at end of run free to move with expansion and contraction as temperature changes during this process. Repeat procedure after placing each tier. After placing last tier, hand place backfill to 4 inches over ducts and hand tamp. Firmly tamp backfill around ducts to provide maximum supporting strength. Use hand tamper only. After placing controlled backfill over final tier, make final duct connections at end of run and complete backfilling with normal compaction.
  - a. Place minimum 3 inches of sand as a bed for duct bank. Place sand to a minimum of 6 inches above top level of duct bank.
  - b. Place minimum 6 inches of engineered fill above concrete encasement of duct bank.
- K. Pulling Cord: Install 100-lbf- test nylon cord in empty ducts.
- L. Warning Tape: Bury warning tape approximately 12 inches above all concrete-encased ducts and duct banks. Align tape parallel to and within 3 inches of centerline of duct bank. Provide an additional warning tape for each 12-inch increment of duct-bank width over a nominal 18 inches. Space additional tapes 12 inches apart, horizontally.

Conduit Location Markers: Conduits stubbed or capped off underground shall have their location identified with a concrete marker 6" x 6" x 12" high with a flush brass plate set in the 6" face. Identification of the conduit shall be stamped or engraved into the plate and the marker set flush with finished grade. Show exact location of markers and identification markings on as built drawings. Submit data sheets as specified under "SUBMITTALS".

### **3.03 FIELD QUALITY CONTROL**

- A. Perform the following tests and inspections and prepare test reports:
  1. Demonstrate capability and compliance with requirements on completion of installation of underground ducts and utility structures.
  2. Pull aluminum or wood test mandrel through duct to prove joint integrity and test for out-of-round duct. Provide mandrel equal to 80 percent fill of duct. If obstructions are indicated, remove obstructions and retest.

### **END OF SECTION**

SECTION 26 05 48

**VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS**

**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 this Section.

1.02 SUMMARY

- A. Work in this section includes providing materials, and equipment for the installation of vibration isolation mounts, brackets, seismic restraints, flexible connectors, and conduit isolation hangers. The installation shall be complete in every respect, tested, and adjusted to be in first class working order.
- B. Related sections include the following:
  - 1. Section 26 05 33 "Raceways and Boxes for Electrical Systems."

1.03 DEFINITIONS

- A. CBC: California Building Code (CCR Title 24, Part 2)

1.04 GENERAL REQUIREMENTS

- A. Comply with CBC and details on the drawings.
- B. Comply with ASCE/SEI 7 where referenced by CBC.
- C. Seismic-Restraint Loading: ASCE/SEI 7 Seismic Design Category, Component Importance Factor and Occupancy Category as indicated on drawings.
- D. Consult vibration isolation schedule for types and static deflections of isolators.
- E. Specific items of equipment and accessories are listed in specifications and/or shown on drawings. Where specific manufacturer's model numbers are referenced, it shall be considered that the manufacturer's current and complete specifications are included herein in full.
- F. Provide vibration isolators of appropriate sizes and distribution to meet specified deflection requirements. For typical equipment units, provide not fewer than four isolators.
- G. Take equipment weight into account and assure that all isolators for any equipment unit deflect uniformly and without "short-circuiting" when the unit is operating. Uniformly means that the maximum and the minimum isolator deflection shall be within 5% of the specified average deflection.
- H. The static deflections specified are based on the anticipated equipment characteristics. In the event the equipment proposed by the Contractor has characteristics other than those indicated, the static deflection shall be re-evaluated and the proper mountings and other devices shall be provided.

- I. Provide seismic restraints on all vibration isolated equipment and components. Restraints shall resist a seismic acceleration in any direction of at least 0.5 G without damage to equipment, building or mounts. Restraints shall not short-circuit vibration isolators during normal operation. Generally, there shall be as many seismic restraints as there are vibration isolators on a piece of equipment and restraints and isolators shall be paired together.
- J. The Contractor shall rigorously avoid short-circuiting to the building any vibration isolated piece of equipment, conduit or other component. Short-circuits with or via rigid braces, rigid sleeves, framing, etc. all shall be avoided. The Contractor shall coordinate among trades so as to prevent the short-circuiting of any vibration isolation system and shall bring any unresolved conflicts to the Owner's representative and attention.
- K. Provide all incidental equipment or parts needed to meet the requirements stated, even if not specified or shown on drawings, without claim for additional payment.

**1.05 SUBMITTALS**

- A. Refer to related sections elsewhere for submittal procedural instructions.
- B. Submit and obtain approval of shop drawings before ordering components or materials.
- C. Submit shop drawings including the following:
  - 1. Location and type of vibration isolations.
  - 2. A complete tabulation showing for each vibration isolator:
  - 3. The design load.
  - 4. The static deflection expected under the design load.
  - 5. Specified minimum static deflection.
  - 6. The additional deflection to solid under design load.
  - 7. The ratio of spring height under design load to spring diameter.
- D. Details of seismic restraints, steel brackets, steel rails, steel base frames, and concrete inertia bases showing all steel work, reinforcing, and vibration isolator and seismic restraint mounting attachment methods.
- E. Special details at large scale and all other necessary information to convey complete understanding of the work to be provided.
- F. Calculations by a professional structural engineer licensed in the state of California, showing that all seismic restraints, bolts, cables, and associated components will conform with the requirements of California Building Code, will comply with other applicable local codes.
- G. Submission of samples may be requested for some or all vibration isolation devices. After approval, sample will be returned for installation at the job. All costs associated with submission and return (but not review) of sample shall be borne by the Contractor.
- H. Submit, at the time of shipment, a certified statement by the galvanizer indicating conformity of the galvanizing with ASTM specifications for vibration isolators that are located out of doors.
- I. At completion of installation, submit the following documents. Submission of these documents must be complete before final acceptance of vibration isolation systems is given.

- J. A complete tabulation showing for each vibration isolator:
    - 1. The actual static deflection measured at the project site and the specified minimum static deflection.
    - 2. A report certifying that each piece of isolated equipment or equipment component (conduit, etc.) is not short-circuited by any means
  - K. The actual static deflection measured at the project site and the specified minimum static deflection.
  - L. A report certifying that each piece of isolated equipment or equipment component (conduit, etc.) is not short-circuited by any means.
- 1.06 SUBSTITUTIONS
- A. Substitutions of equal equipment beyond the alternates listed will be permitted only with the written permission of the District's representative. Accompany each request for acceptance of substitute equipment with manufacturer's certified data providing the equivalence of the proposed substitute in quality and performance. The District's representative shall be the final judge of the validity of the data submitted.

## PART 2 - PRODUCTS

### 2.01 MATERIALS, COMPONENTS AND PARTS

- A. All materials, components, and parts shall be new.
- B. Vibration isolators, and seismic restraints shall be the products of an experienced and approved manufacturer. Insofar as possible, they shall be the product of a single manufacturer.
- C. All metal parts of vibration isolators installed out of doors shall be hot-dip galvanized after fabrication. Galvanizing shall comply with ASTM A 123, A 153, and A 386 as applicable.
- D. All elastomeric mounts, pads, bushings, sleeves, washers, etc., shall have a Shore-A hardness of 30 to 50 durometer after minimum aging of 20 days or corresponding oven-aging.

### 2.02 ACCEPTABLE MANUFACTURERS

- A. Amber/Booth Company, A/B, Houston, Texas
- B. Mason Industries Inc., Mason, Los Angeles, California
- C. Kinetics Noise Control Inc, Dublin, Ohio

### 2.03 VIBRATION ISOLATION MOUNTS

- A. Mount P1 - Single or Multiple Extra Thick Neoprene Pad(s) and Bearing Plate(s).
- B. Neoprene pad shall be waffled, ¾ inch thick, 30 to 40 or 50 durometer, as scheduled, with a minimum 1/16 inch thick steel bearing plate on top. Pad areas shall be selected so no more than 15% and no less than 10% deflection occurs due to the supported load.
- C. Provide single or multiple pads and plates in series as specified with 1/16" thick steel shim between layers.

- D. Mount P1 shall be the following or approval equal
  - 1. Mason Super W + Plate(s) or SWM
  - 2. Mount B1 - Neoprene-in-Shear Base Mount
- E. Neoprene isolators shall be double-deflection neoprene-in-shear type with steel-reinforced base. All metal surfaces shall be covered with neoprene. The top and bottom surfaces shall be ribbed. Bolt holes shall be supplied in the base and the top shall have a threaded fastener. Neoprene no harder than 50 durometer.
- F. Mount B1 shall be of the following or approved equal:
  - 1. A/B RVD
  - 2. Mason ND
  - 3. KineticsRD
- G. Mount B1EQ - Neoprene Mount with Seismic Restraint
- H. A neoprene isolator with concentric steel elements separated by neoprene no harder than 50 durometer. Mount capable of acting in tension, compression or shear.
- I. Mount B1EQ shall be the following or approved equal:
  - 1. Mason RAA, RBA or RCA

#### **2.04 EQUIPMENT BASES**

- A. Equipment shall have an integral casing or base frame that is adequately strong to be supported directly on vibration isolators without deforming the casing or frame or affecting equipment or isolator operation. Place vibration isolators directly under equipment or connect steel height-saving brackets to the sides of the equipment and place isolators under brackets. Equipment manufacturer shall approve such mounting.

#### **2.05 SEISMIC RESTRAINTS**

- A. EQR1 - Floor-Mounted Equipment on Isolation Mounts without Seismic Restraint Housing.
- B. Separate earthquake restraints shall be provided for all floor-mounted equipment on vibration isolation mounts that do not include seismic restraint housings. Provide a minimum of four all-directional earthquake restraints that are located as close to the vibration isolators as possible to facilitate attachment of both to the base and the structure. The restraints shall consist of interlocking steel members restrained by a shock-absorbent neoprene bushing. Bushing shall be a minimum of 1/4" thick. Restraints shall be manufactured with an air gap between hard and resilient material of 3/16 to 1/4". Snubbers shall be installed with factory-set clearances. Snubber end shall be removable to allow inspection of internal clearances. Snubber bushing shall be rotated during and after installation to insure no short circuits exist. Restraints shall comply with the CBC and shall resist a seismic acceleration in any direction of at least 0.5 G without damage to themselves, the building or the equipment.
- C. Earthquake restraints shall be the following or an approved equal:
  - 1. Mason Z-1011 or Z-1225



## 2.06 FLEXIBLE CONNECTIONS

- A. Make flexible electrical connections to all vibrating equipment so as to prevent any vibration transfer to the building.
- B. Alternate A
  - 1. Employ flexible metallic conduit installed grossly slack. Support flexible metallic conduit on both sides of slack portion per CEC.
- C. Alternate B
  - 1. Employ flexible expansion/deflection conduit couplings sized for the application (1" to 6" diameters available). Coupling to have flexible and watertight outer jacket, inner grounding strap, flexible plastic inner sleeve to maintain smooth wireway, and end hubs with threads to fit standard threaded metal conduit.
  - 2. Coupling shall be XD Xpansion/Deflection Coupling by Crouse-Hinds of Syracuse, New York, or Type DF Expansion and Deflection Fitting by Spring City Electrical Mfg. Co. of Spring City, Pennsylvania.

## 2.07 CUSTOM RESILIENT AND AIRTIGHT SLEEVE FOR CONDUITS AT CONSTRUCTION PENETRATIONS

- A. Sleeve shall be custom-fabricated. It shall be formed from pipe or sheet metal that is 1" larger in each cross-sectional dimension than the penetrating element and is 2" longer than the thickness of the construction penetrated.
  - 1. The annular space between the sleeve and the penetrating element shall be packed tightly with long-fiber glass fiber 2 - to 3-pcf density to within 2" of the ends of the sleeve.
  - 2. The remaining 2" space at each end shall be filled completely with acoustical sealant to form an airtight seal.
- B. Glass fiber packing by CertainTeed, Manville, or Owens-Corning.
- C. Acoustical Sealant by DAP, Tremco or U.S. Gypsum, choice depending on application and as approved by Owner's representative.

**PART 3 - EXECUTION**

## 3.01 GENERAL

- A. The Contractor shall provide the vibration isolation devices, seismic restraints, and related materials as specified herein.
- B. The Contractor shall not install any conduit that makes rigid contact with the "building" unless it is approved in this specification or by the Owner's representative. "Building" includes, but is not limited to, roofs, floors, beams, columns, walls, partitions, ceilings, studs, ceiling framing and suspension systems.
- C. Prior to installation, the Contractor shall bring to the Owner's representative attention any conflicts between trades that will result in unavoidable rigid contact of conduit with the building due to inadequate space or other unforeseen conditions. Corrective work after installation, necessitated by unresolved conflicts before installation, shall be at the Contractor's expense.

- D. Prior to installation, the Contractor shall bring to the Owner's representative attention any discrepancies between the specifications and field conditions or any charges required due to specific equipment selection. Corrective work after installation, necessitated by unreported discrepancies or changes, shall be at the Contractor's expense.
- E. The Contractor shall obtain written and/or instructions from the vibration isolation manufacturer as to the proper installation and adjustment of vibration isolation devices; alternatively, the equipment may be installed by the vibration isolation manufacturer.
- F. No equipment unit shall bear directly on or be suspended from vibration isolators or brackets unless its own frame or casing is suitable rigid to span between isolators without any significant or noticeable deformation and such support is approved by the manufacturer.
- G. Unless otherwise indicated, a minimum clearance of 1" shall be provided between the top of a housekeeping pad or floor or roof and the underside of an equipment unit or steel base frame or concrete inertia block that is vibration-isolated. This space shall be cleaned thoroughly of all dirt and debris.
- H. A written report shall be submitted to the Owner's representative covering all base-mounted equipment and stating that required floor-base clearances have been achieved and that the intervening spaces are clean and free of any material that could short-circuit vibration isolators.
- I. After each equipment unit installation is complete and under full operational load, vibration isolators shall be adjusted so that loads are transferred to them and away from temporary blocking washers and shims. Blocks and shims then shall be removed and used as gauges to judge required clearances. Washers shall be moved away.
- J. Inspect all vibration-isolated equipment, coordinate the work of all involved trades, and see the vibration isolators are not short-circuits. Also, ensure that for hanger isolators and their rods or wires do not touch any other hung building components especially ceiling systems.
- K. Where "conduit systems" are required to be vibration-isolated in a certain room or for a certain distance from an equipment unit, "conduit systems" shall include all conduit, and connected hardware.
- L. Space all vibration-isolated equipment and isolated components and all vibration isolators (including rods and wires) so as to be entirely free of any contact with any building element in any reasonable operating position.
- M. Size, select, and install all seismic restraints so as to resist seismic forces from the building in any direction without damage to equipment, isolators, restraints, or building. Restraints shall not short-circuit vibration isolators during normal operation. Restraints shall comply with the California Building Code and any local codes and shall resist an acceleration of at least 0.5 G.

### **3.02 SPECIFIC EQUIPMENT**

- A. Utility Transformer:
  - 1. These can be hard-mounted to a separate concrete pad provided.

- B. Large Main Building Transformer:
  - 1. Isolate main building transformer (over 200kVA) on Type B1 or B1EQ mounts providing a minimum static deflection of 0.35". Provide flexible bus connections or flexible conduit connections between these transformers and all switchboards. Rigid busses should be suspended via Type H2 hangers (0.35" m.s.d.).
- C. Remote and Smaller Building Transformers:
  - 1. UNDER 100kVA: Isolate on Type P-1 pads sized (with appropriate bearing areas) for 0.10" m.s.d. Provide Type EQR1 seismic restraint. Provide flexible conduit connections to all transformers.
  - 2. OVER 100kVA: Isolate on Type B1 or B1EQ mounts providing 0.35" m.s.d. Provide Type EQR1 seismic restraints. Provide flexible conduit connections to all transformers.
- D. Dimmer Banks:
  - 1. Treat the same as over 100kVA @ transformer (described above).
  - 2. Conduit Connections to All Isolated Equipment:
  - 3. Conduit connections to fans, pumps, etc., which are vibration isolated should be made flexible.
- E. Emergency or Standby Generators:
  - 1. Generator may be hard-mounted to its remote pad. Provide careful engineering of the generator mountings, fuel and exhaust lines for appropriate seismic restraint.

### 3.03 FLOOR-MOUNTED EQUIPMENT

- A. The equipment unit to be isolated shall be supported on vibration isolators as scheduled and as specified in Part 2 above.
- B. All general execution requirements shall be observed in accordance with Paragraph 3.01 above.

### 3.04 SEISMIC RESTRAINTS

- A. All rigidly or resiliently installed equipment, and conduits shall be capable of receiving a seismic input from the building in any direction on the equipment center of gravity without damaging the buildings, equipment or mounting system.
- B. All installations shall be inspected and approved by the Owner's representative for adequate seismic restraint and to assure that such does not short-circuit vibration isolators during normal operation. Adjustments, as reasonably required, shall be made by the Contractor at no expense to the Owner.
- C. All vibration isolators and seismic restraints shall be suitably secured to appropriate structure so that the fastenings and structure can handle the seismic load.

### 3.05 RESILIENT SUPPORT OF CONDUITS

- A. Unless otherwise specified, provide resilient support for all conduits throughout the building. No such conduit is to come into rigid contact with the building.

- B. Support all piping in mechanical equipment rooms on Type B3 or B4 or H3 springs sized for minimum 1 inch static deflection, unless otherwise noted.

**3.06 CONNECTIONS TO EQUIPMENT**

- A. Make flexible electrical connections to all vibrating equipment.
  - 1. Alternate A
    - a. Install flexible conduit in a grossly slack, shallow "U" form. Flexible conduit shall be at least 3 feet or 20 diameters long, whichever is longer.
  - 2. Alternate B
    - a. The flexible coupling shall be free of any nearby building construction and shall be installed slack and free of strain in any direction.

**3.07 RESILIENT AND AIRTIGHT SLEEVES**

- A. Custom sleeves
  - 1. Cut a clean opening in the penetrated construction very nearly the size of the sleeve for each penetrating element. Provide lintels above, relief structure below, and vertical framing between and to the sides as required. Provide the above, escutcheon plates, and anything else necessary to make the penetrated structure as solid and massive near the penetrations as away from the penetrations.
  - 2. Set the metal sleeve into the penetrated construction in an airtight manner around its outer periphery, using grout, dry packing, plaster, or drywall compound full depth and all around - but only to a maximum width of 1 inch - or the requirements of the above paragraph shall not have been satisfied.
  - 3. Pack the 2 inch wide annular opening with glass fiber between metal sleeve and penetrating element full depth all around to a firm degree of compaction. Leave a 2 inch deep annular opening free at each end of the metal sleeve; fill this fully with acoustical sealant.

**3.08 FIELD INSPECTIONS AND TESTS**

- A. Upon completion of the work, the District's representative will carry out an inspection of the project and of final project record documents and will inform the installing contractor of any further work that must be completed. Make all adjustments as directed by the District's representative that result from this inspection. This work shall be done before final acceptance of vibration isolation systems is given.

**END OF SECTION**

**SECTION 26 05 53**

**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**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 this Section.

1.02 SUMMARY

- A. Section includes:
  - 1. Identification of fire alarm raceways
  - 2. Identification of power and control cables
  - 3. Identification of conductors
  - 4. Identification of wiring device faceplates
  - 5. Underground line warning tape

1.03 DEFINITIONS

- A. CEC: California Electrical Code (CCR Title 24, Part 3) based on the National Electrical Code.

1.04 QUALITY ASSURANCE

- A. Comply with ANSI A13.1 "Scheme for the Identification of Piping Systems."
- B. Comply with CEC.
- C. Comply with 29 CFR 1910.144 "Safety color code for marking physical hazards" and 29 CFR 1910.145 "Specifications for accident prevention signs and tags."
- D. Comply with ANSI Z535.4 "Product Safety Signs and Labels"
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969 "Marking and Labeling Systems."

1.05 SUBMITTALS

- A. Product Data
  - 1. Material List and Manufacturer's Literature
- B. Samples: when requested by Architect.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS**

- A. Source Limitations: Obtain materials and accessories from single source from single manufacturer.

**2.02 IDENTIFICATION SYSTEMS**

A. Nameplates

1. Provide nameplates indicating the equipment designation for safety switches and individually mounted breakers, starters, remote control switches and similar items. For indoor locations provide tape nameplates (Kroy, Brother, Weber or equal). For outdoor locations provide laminated black-white-black Bakelite or phenolic plastic with 3/16" high lettering engraved through the outer covering. Affix with small self-tapping cadmium plated machine screws, or a durable, waterproof, heat and sun resistant adhesive appropriate to the purpose. The text shall be spaced away from each end so the screw heads do not overlap the text.
2. Provide nameplates as required by other Sections. Nameplates shall be laminated black-white-black bakelite or phenolic plastic with 3/16" high lettering engraved through the outer covering except where specifically described otherwise. Affix with small self-tapping cadmium plated machine screws appropriate to the purpose (no rivets or glue). The text shall be spaced away from each end so the screw heads do not overlap the text. The screws shall not project beyond the backside face of panelboard doors.
3. Engrave as indicated on drawings or herein. If not indicated, the engraving should describe the equipment served.

- B. Underground Warning Tape: Tape shall be polyethylene plastic manufactured specifically for warning and identification of all buried utility lines. Tape shall be of the type provided in rolls, 6" minimum width, color coded for electric lines (red), and communications (orange) with warning and identification imprinted in bold black letters continuously and repeatedly over entire tape length. Tape shall consist of top and bottom layers of B 721 polyethylene or polyester with a center metallic foil core suitable for locating by a conventional detector at the specified depth. Tape shall be by Thor Enterprises, Brady, Seton, or equal. Submit data sheets as specified under "SUBMITTALS".

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

A. Device Plates

1. Provide switch and device plates with engraved designations wherever called for by words, set off in quotation marks near a switch location, or by symbol. If inscription is not detailed on drawings request it from the Owner's representative. Engraving shall be in 1/8" high block type letters filled with black enamel.
2. Each switch, receptacle device, etc. which is installed in an outlet box with coverplate shall have the panel and circuit number engraved with 1/8" high black filled lettering at top of cover plate.

## B. Conduit

1. All Fire Alarm system conduits shall have a 2 inch wide band of red paint every 10 feet along the length.

## C. Wire Color Coding

1. Insulation for wires No. 6 and smaller shall be factory color coded and for larger sizes where available from the factory. When factory color is not available provide 1" band of colored pressure sensitive tape at each splice and termination point. Colors shall be consistent throughout the respective system and shall be identified as follows.

System	A - Phase	B - Phase	C - Phase	Neutral	Ground
120/240V 1Ø 3W	Black	Red	---	White	Green
120/240V 3Ø 4W	Black	Orange	Blue	White	Green
240V 3Ø 3W	Black	Red	Blue		Green
208Y/120V 3Ø 4W	Black	Red	Blue	White	Green
480Y/277V 3Ø 4W	Brown	Orange	Yellow	Grey	Green

2. Isolated ground for conductors system shall be green with a yellow stripe or green marked with yellow tape.
3. Control, low voltage, and other systems shall have distinctive coloring different from above.
4. Control Circuits:

Hot Lead (usually to stop pushbutton)	Red
Common return	Yellow
Main coil (usually to start pushbutton)	Brown
Reset coil	Blue
Trip coil	Orange

**D. Conductor Color Coding**

1. All branch circuit conductors shall have their circuit numbers identified with tape labels on each phase conductor. Identification shall be provided at each outlet box, junction box, panelboard, contactor cabinet, or similar location.

**E. Nameplates**

1. Engraved nameplates shall be provided on each power and communications system feeders in underground pull boxes. Nameplates shall be fastened to feeders with plastic tie wrap. Description shall indicate origin voltage and destination of feeder, i.e.: "From MSB to Panel HZA voltage, 480Y/277 volts". This same tagging method shall be applied to all pull ropes in empty spare conduits. Tags for pull ropes shall include origin and destination of each conduit.
2. All conductors or signal cables left unconnected shall be identified by labeling with their intended use, circuit number, or other suitable information. All power and communications conductors or cables shall tape identified denoting circuit or zone numbers with tape type labels on each conductor of circuit or cable.

**END OF SECTION**



**SECTION 26 09 23**

**LIGHTING CONTROL DEVICES**

**PART 1 - GENERAL**

**1.1 RELATED DOCUMENTS**

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

**1.2 SUMMARY**

A. Section Includes:

1. Time switches.
2. Photoelectric switches.
3. Daylight-harvesting controls.
4. Indoor occupancy sensors.
5. Outdoor motion sensors.
6. Room Controllers.
7. Lighting contactors.
8. Emergency shunt relays.
9. Modular dimming controls.

B. Related Requirements:

1. Section 26 27 26 "Wiring Devices" for manual toggle switches and occupancy-controlled receptacles.
2. CalGreen.

**1.3 ACTION SUBMITTALS**

- A. Product Data: For each type of product.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
  1. Interconnection diagrams showing field-installed wiring.
  2. Include diagrams for power, signal, and control wiring.

**1.4 INFORMATIONAL SUBMITTALS**

- A. Field quality-control reports.

**1.5 CLOSEOUT SUBMITTALS**

- A. Operation and Maintenance Data: For each type of lighting control device to include in Operation and Maintenance manuals.
- B. Acceptance Testing Certification: For each interior and exterior space as required by CCR Title 26 Part 6.

**PART 2 - PRODUCTS**

**2.1 TIME SWITCHES**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Intermatic, Inc.
  - 2. NSi Industries LLC; TORK Products.

Retain "Electronic Time Switches" or "Electromechanical-Dial Time Switches" Paragraph below.

- B. Electromechanical-Dial Astronomical Time Switches: Comply with UL 917.
  - 1. Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
  - 2. Contact Configuration: DPST.
  - 3. Contact Rating: 30A inductive or resistive, 120V, 208V, 240V or 277V AC as indicated.
  - 4. Circuitry: Allows connection of a photoelectric relay as a substitute for the on-off function of a program.
  - 5. Eight-Day Program: Uniquely programmable for each weekday and holidays.
  - 6. Skip-a-day mode.
  - 7. Wound-spring reserve carryover mechanism to keep time during power failures, minimum of 16 hours.

**2.2 INDOOR OCCUPANCY SENSORS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Cooper Industries, Inc. "Greengate"
  - 2. Acuity Brands "nLight"
  - 3. WattStopper "DLM"
  - 4. Douglas Lighting Controls
  - 5. Or Approved Equal
- B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.
  - 1. Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
  - 2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
  4. Power Pack: Dry contacts rated for 20-A ballast 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 CEC.
  5. 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.
  6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
  7. Bypass Switch: Override the "on" function in case of sensor failure.
  8. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc (21.5 to 2152 lux); turn lights off when selected lighting level is present.
- C. PIR Type: Ceiling mounted; detect occupants in coverage area by their heat and movement.
1. 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).
  2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. (93 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
  3. Detection Coverage (Corridor): Detect occupancy within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling.
- D. Ultrasonic Type: Ceiling mounted; detect occupants in coverage area through pattern changes of reflected ultrasonic energy.
1. Detector Sensitivity: 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).
  2. Detection Coverage (Small Room): Detect occupancy anywhere within a circular area of 600 sq. ft. (56 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
  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 (Large Room): Detect occupancy anywhere within a circular area of 2000 sq. ft. (186 sq. m) when mounted on a 96-inch- (2440-mm-) high ceiling.
  5. Detection Coverage (Corridor): Detect occupancy anywhere within 90 feet (27.4 m) when mounted on a 10-foot- (3-m-) high ceiling in a corridor not wider than 14 feet (4.3 m).
- E. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using both PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by selecting 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.

## **2.3 SWITCHBOX-MOUNTED OCCUPANCY SENSORS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Cooper Industries, Inc. "Greengate"
  2. Acuity Brands "nLight"
  3. WattStopper "DLM"
  4. Douglas Lighting Controls
  5. Or Approved Equal
- B. General Requirements for Sensors: Automatic-wall-switch occupancy sensor, suitable for mounting in a single gang switchbox.
  1. Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application, and shall comply with California Title 24.
  2. Operating Ambient Conditions: Dry interior conditions, 32 to 120 degrees F (0 to 49 degrees C).
  3. Switch Rating: Not less than 800-VA fluorescent at 120 V and 1200-VA fluorescent at 277 V.
  4. Switch Rating: Not less than 800-VA LED at 120 V and 1200-VA LED at 277 V.

"WS1" and "WS2" in "Wall-Switch Sensor Tag WS1" and "Wall-Switch Sensor Tag WS2" paragraphs below are a suggested marking system on Drawings when detectors with different sensor characteristics are required.

- C. Wall-Switch Sensors:
  1. Standard Range: 180-degree field of view, field adjustable from 180 to 40 degrees; with a minimum coverage area of 900 sq. ft. (84 sq. m).
  2. Sensing Technology: PIR.
  3. Switch Type: SP, manual "on," automatic "off."
  4. Voltage: 120/277 V; passive-infrared type.
  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, field-adjustable, "off" time-delay selector at up to 30 minutes.
  7. Adaptive Technology: Self-adjusting circuitry detects and memorizes usage patterns of the space to help eliminate false "off" switching.

## **2.4 LIGHTING CONTACTORS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  1. Allen-Bradley/Rockwell Automation.
  2. ASCO Power Technologies, LP.
  3. Eaton Corporation.
  4. Square D.

- B. Description: Electrically operated and mechanically held, combination-type lighting contactors, complying with NEMA ICS 2 and UL 508.
  - 1. Current Rating for Switching: Listing or rating consistent with type of load served, including tungsten filament, inductive, high-inrush ballast (ballast with 15 percent or less total harmonic distortion of normal load current) and LED.
  - 2. Fault Current Withstand Rating: Equal to or exceeding the available fault current at the point of installation.
  - 3. Enclosure: Comply with NEMA 250.
  - 4. Provide with control and pilot devices as indicated on Drawings, matching the NEMA type specified for the enclosure.
- C. BAS Interface: Provide hardware interface to enable the BAS to monitor and control lighting contactors.
  - 1. Monitoring: On-off status.
  - 2. Control: On-off operation.

## 2.5 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 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 24 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables."

## PART 3 - EXECUTION

### 3.1 SENSOR INSTALLATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. 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.

### 3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Section 26 05 19 "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch (13 mm).
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and non-power-limited conductors according to conductor manufacturer's written instructions.

- C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.
- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes, terminal cabinets, or equipment enclosures.

### **3.3 IDENTIFICATION**

- A. Identify components and power and control wiring according to Section 26 05 53 "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. Permanently Label time switches and contactors with a unique designation.

### **3.4 FIELD QUALITY CONTROL**

- A. Testing Agency: Engage a qualified testing agency to evaluate lighting control devices and perform tests and inspections.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- C. Perform the following tests and inspections with the assistance of a factory-authorized service representative:
  - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
    - a. Include testing of modular dimming control equipment under conditions that simulate actual operational conditions. Record control settings, operations, cues, and functional observations.
    - b. Remove and replace malfunctioning modular dimming control components and retest as specified above.
  - 2. Perform and document all acceptance tests required by California Title 24 Energy Code. Coordinate acceptance testing with commissioning agent when commissioning is applicable. Testing shall include, but not necessarily limited, to the following:
    - a. Automatic Daylighting Control Acceptance.
    - b. Occupant Sensor Acceptance.
    - c. Automatic Time Switch Control Acceptance.
    - d. Demand Response Controls.
    - e. Outdoor Motion Sensor Acceptance.
    - f. Outdoor Lighting Shut Off Controls.
  - 3. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment at no additional cost to the District.
- D. Lighting control devices will be considered defective if they do not pass tests and inspections.

- E. Reports: Provide written reports of tests and observations. Record defective materials and workmanship and unsatisfactory test results. Record repairs and adjustments. Reports shall be completed and signed by the certified technician and submitted to the District and to other entities as required by CCR Title 24 Part 6.

**3.5 ADJUSTING**

- A. Occupancy Adjustments: When requested within 12 months from date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose.
  - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit District's operations.
  - 2. For daylighting controls, adjust set points and dead band controls to suit District's operations.
  - 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

**3.6 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train District's maintenance personnel to adjust, operate, and maintain lighting control devices.

**END OF SECTION 26 09 23**

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SECTION 26 22 00

**LOW VOLTAGE TRANSFORMERS**

**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 this Section.

1.02 SUMMARY

- A. This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA.
  - 1. Dry-type distribution transformers
  - 2. Dry-type distribution transformers with integral panelboards.

1.03 DEFINITIONS

- A. CEC: California Electrical Code (CCR Title 24, Part 3) based on the National Electrical Code.
- B. CalGreen: California Green Building Standards, CCR Title 24, Part 11, Chapter 5.
- C. NRTL: Nationally Recognized Testing Laboratory.

1.04 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Member of NETA or an NRTL.

1.05 SUBMITTALS

- A. Product Data
  - 1. Material List: A material list with names of manufacturers, model numbers, and technical information on all equipment proposed.
  - 2. Product technical information sheets for each principal component in the proposed system. Identify by arrow, circle or similar means products being proposed. Submittals consisting of unmodified catalog pages with no markings will be rejected.
  - 3. Weight, dimensions and shipping splits.
  - 4. Equipment operating and service (maintenance) clearances required around the equipment.
- B. Shop Drawings
- C. Test Procedures: A written document detailing the proposed test procedures of the system shall be supplied. These procedures shall include all tests required by the equipment manufacturer and by this specification.
- D. Test Results Report: The results of the execution of the testing procedure, including the items tested or inspected, the date, and by whom.

- E. Operation and Maintenance (O&M) Manuals: Furnish composite "Systems Operation and Maintenance" manuals in indexed three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain, but not be limited to:
  - 1. Test procedures and test results.
  - 2. Instruction for the proper operation and maintenance of the system.
  - 3. Factory issued technical, installation, and maintenance manuals.
  - 4. Factory issued operation manuals.
  - 5. A replacement parts list complete with part numbers and name, address, and phone number of suppliers used by the Contractor. A spare parts list recommended for purchase by the District shall be included.
  - 6. All portions of the material list and shop drawings which are not included in the foregoing.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. Siemens Energy & Automation, Inc.
  - 3. Square D; a brand of Schneider Electric.
- B. Source Limitations: Obtain materials and accessories from single source from single manufacturer.

### **2.02 SYSTEM DESCRIPTION**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- B. Comply with CEC.

### **2.03 TRANSFORMERS INDIVIDUALLY MOUNTED**

- A. Dry, ventilated, self-cooled type with finish paint over a bonderized or equal rust inhibiting treatment and suitable for mounting methods indicated on drawings. 220°C. (Class H) insulation system with rated temperature rise of 150°C above a 40°C ambient and rated K-4 or higher. NEMA standard taps except not less than four full capacity 2 1/2% taps with two above and two below normal. Provide neutral busbar sized for at least 200% of the ampacity of the secondary phase conductors. Where mounted outdoors, transformers shall have rain tight enclosures.
- B. Impedance shall be approximately 4% for under 500 kVA and approximately 5.75% for 500 kVA and over.

- C. Transformers shall have front, bottom and/or side cooling.
- D. Assume responsibility for the proposed transformer unit fitting in the allocated space with required clearances, working space and access. Where mounted directly to wall, no ventilation louvers shall be located on the wall side of the transformer. Mounting bolts shall be adequate in size and properly secured to base, wall, or metal framework in conformance to Seismic Restraints subsection and shall not have metal to metal contact between the transformer unit and its supports. Provide flexible conduits for all conduits connected to transformers and with sufficient slack that they are easily movable by hand when installed.
- E. Where transformer is floor mounted, provide a base per Concrete Equipment Bases subsection. The transformer shall be mounted on 4 vibration isolating mounts with integral seismic restraint selected for a minimum static deflection of 1". Provide mounts by Mason Industries or equal by California Dynamics.
- F. Where transformer is suspended, use 4 spring hangers and a seismic restraint system. Refer to detail on drawings. The hangers shall be selected for a minimum static deflection of 1". Provide mounts by Mason Industries or equal by California Dynamics.
- G. Provide a nameplate engraved "TRANSF. X" (designation as indicated on drawings with 1/4" high letters), origin of primary feeder (such as "FED FROM SWBD MSB"), and secondary service (such as "SERVES DIST. PNL DP").

#### 2.04 MINI-POWER CENTERS

- A. Mini-power centers shall be three phase units 480 volt primary and 208Y/120volt, 3 phase secondary.
- B. All transformers shall have a minimum of 2-5% full capacity primary taps below normal and shall be rated 115°C temperature rise above 40°C maximum ambient. All insulating materials are to be in accordance with current NEMA ST20 standards for a 185°C UL component recognized insulation system.
- C. Transformers are to be encapsulated using a sand-epoxy resin mixture to provide maximum protection against moisture, dust and corrosive environments.
- D. Package power supplies shall include integrally mounted and wired primary and secondary circuit breakers in accordance with the CEC.
- E. Branch circuit breakers shall be plug-on type, Square D type "QO", or equal. Trip indication shall be clearly shown by the breaker handle taking a position between "ON" and "OFF".
- F. A hinged access door shall be provided which maintains itself in the open position when desired and which has padlock provisions.
- G. Mini-power centers shall be U.L. listed.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION OF POWER DISTRIBUTION EQUIPMENT

- A. Installation shall conform to the requirements of the CEC and to the manufacturer's shop drawings and mounting instructions. Equipment base for floor standing equipment shall have an adequate number of anchor bolt holes to put the base in direct contact shear and

tension with the mounting surface at all anchor bolt locations. Refer to Section 26 05 48 "VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS".

- B. Loosen or remove shipping bolts per manufacturer's installation instructions to allow proper function of factory vibration isolation system.

**3.02 FIELD QUALITY CONTROL**

- A. Equipment installed under this section shall be inspected for defects, and tested for proper operation.
- B. Enclosures shall be checked for cleanliness inside and out and for defective or damaged finish.
- C. Systems shall be tested for short circuits, open circuits and wrong connections and shall be free from mechanical and electrical defects.
- D. Bolted connections shall be torque tightened to manufacturer's specifications.
- E. Adjust taps as necessary for proper secondary voltage.
- F. Where required or directed, systems shall be tested in the presence of the Owner's representative to demonstrate that equipment furnished, installed or connected functions in the manner intended.
- G. The Contractor shall furnish all necessary instruments and equipment and all power sources and connections required for making required tests, and shall immediately correct any defective work at no additional charge.

**END OF SECTION**

**SECTION 26 24 16**

**PANELBOARDS**

**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 this Section.

**1.02 SUMMARY**

- A. Section Includes:
  - 1. Distribution Panelboards
  - 2. Lighting and Appliance Panelboards
  - 3. Loadcenters
  - 4. Circuit Breakers
  - 5. Fusible Switches
  - 6. Bolted-pressure Switches

**1.03 DEFINITIONS**

- A. CEC: California Electrical Code (CCR Title 24, Part 3) based on the National Electrical Code.

**1.04 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Member Company of NETA or an NRTL.
- B. Equipment shall be UL listed and labeled.
- C. Comply with NEMA PB 1.
- D. Comply with CEC.

**1.05 SUBMITTALS**

- A. Product Data
  - 1. Material List: A material list with names of manufacturers, model numbers, and technical information on all equipment proposed.
  - 2. Product technical information sheets for each principal component in the proposed system. Identify by arrow, circle or similar means products being proposed. Submittals consisting of unmodified catalog pages with no markings will be rejected.
  - 3. Weight, dimensions and shipping splits.
  - 4. Equipment operating and service (maintenance) clearances required around the equipment.
- B. Shop Drawings: Shop drawings for all equipment specified in this section shall be submitted for review and approval in accordance with Section 26 00 00, General Electrical Requirements.

- C. Test Procedures: A written document detailing the proposed test procedures of the system shall be supplied. These procedures shall include all tests required by the equipment manufacturer and by this specification.
- D. Test Results Report: The results of the execution of the testing procedure, including the items tested or inspected, the date, and by whom.
- E. Operating Sequences: Provide a complete written description of the Sequence of Operation of each of the systems including startup and recovery procedures.
- F. Samples: when requested by Architect.
- G. Operation and Maintenance (O&M) Manuals: Furnish composite "Systems Operation and Maintenance" manuals in indexed three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain, but not be limited to:
  - 1. Operational procedures for the overall systems including the "Sequence of Operation".
  - 2. Test procedures and test results.
  - 3. Instruction for the proper operation and maintenance of the system.
  - 4. Factory issued technical, installation, and maintenance manuals.
  - 5. A replacement parts list complete with part numbers and name, address, and phone number of suppliers used by the Contractor. A spare parts list recommended for purchase by the District shall be included.
  - 6. All portions of the material list and shop drawings which are not included in the foregoing.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. Siemens Energy & Automation, Inc.
  - 3. Square D; a brand of Schneider Electric.
- B. Source Limitations: Obtain materials and accessories from single source from single manufacturer.

### **2.02 DISTRIBUTION PANELBOARDS**

- A. Panelboards shall be metal enclosed, dead front type with sections joined together to form one assembly. Assembly shall consist of group mounted devices arranged so that they may be removed or interchanged from the front of the panel without disturbing the adjacent devices. Provide full capacity bus full height of panel with filler panels for unused portion of panel. Ties between sections shall be bussed. Busbars shall be braced for the available short circuit current indicated.

- B. Busbars shall be copper for bus ratings 600 amperes or less, aluminum for ratings greater than 600 amperes. Neutral busbar material shall match phase busbars. Provide copper equipment ground bus. When indicated on drawings, provide panel with neutral busbar sized for at least 100% 200% of phase busbars.
- C. Provide a nameplate for each panel indicating its designation (such as "DISTRIBUTION PANEL DP-1" in 1/4" high letters) as indicated on drawings, the voltage system (such as "208/120V-3PH-4W"), and origin of feeder (such as "FED FROM SWBD MSB"). Provide a nameplate for each circuit breaker unit indicating the load served (such as "PANEL A").

### 2.03 BRANCH CIRCUIT PANELBOARDS

- A. Panelboards for lighting and miscellaneous power shall be the dead front safety type equipped with bolt-on circuit breakers of the numbers and sizes shown on the drawing and herein. Multiple pole breakers shall have an internal common trip. Tie handles will not be permitted. Breakers serving multiwire branch circuits shall be multiple pole breakers per CEC, even if indicated as single pole on the drawings. Breakers shall have a SWD listing. Provide GFCI type breakers as indicated on drawings and when required by CEC.
- B. Busbars shall be copper, braced for the available short circuit current, and have the capacities required on the plans but not less than the ampere frame size of the protective device supplying the panelboard. Neutral busbar material shall match phase busbars. All panelboards shall be equipped with a copper equipment ground bus. When indicated in panel schedule, provide an oversized neutral comprised of split neutral busbars and each half shall have the same ampere rating as the phase busbars and be equipped with double lugs.
- C. Termination lugs shall be rated for 75°C.
- D. Each branch circuit shall have a permanently fixed number. Provide a typewritten directory mounted in a metal frame with clear plastic cover, on the inside of the cabinet door giving the circuit number and a complete description of all outlets controlled by each panel circuit breaker. Consult Owner's representative for correct room and/or furniture system module designation scheme (not necessarily those shown on drawings). Mark "spares" with pencil only and leave "spaces" blank.
- E. Provide a nameplate for each panelboard indicating the panel designation (such as "PANEL 3A") as indicated on drawings, the voltage system (such as 208Y/120V-3PH-4W), and origin of feeder (such as "FED FROM SWBD MSA").
- F. Doors shall be fastened to trim with concealed hinges and provided with flush type combination catch and lock. All locks shall be keyed alike and shall match the District's standard key. Mount floor standing panelboards on a base. Refer to Concrete Equipment Bases subsection. Where panelboards are shown mounted free standing, provide an angle iron or strut channel rack suitably braced to support these panels.
- G. Where panelboards are installed flush in walls, extend empty conduits from panel to an accessible space above or as indicated on plans. Provide a minimum of one 3/4" conduit for each three single pole spare circuit breakers or spaces, or equivalent, but not less than three conduits.
- H. 208Y/120V panelboard boxes shall have blank end plates (top and bottom). Concentric knockouts are not acceptable.
- I. Refer to Paint, Finishes and Colors subsection.

- J. Special panelboard construction or features shall be as shown on drawings. For circuit breakers, switches, contactors and other equipment to be included as an assembled part of the panelboard, refer to the paragraph where those items are specified. **Panels for exterior use shall have weatherproof enclosures.**

## 2.04 CIRCUIT BREAKERS

- A. General: **Thermal magnetic breakers rated 150 ampere and larger shall have adjustable instantaneous trip. Circuit breakers in outdoor locations shall be ambient compensated** Mounting height of breaker operating handles shall not exceed 6½' above floor (consider housekeeping pad for floor mounted equipment when determining the measurement).
- B. Certain circuit breakers such as 100% rated breakers may require the use of 90 degree C insulated wire (sized at the 75 degree C ampacity). If it is required it will be marked as such by the manufacturer.
- C. Short circuit interrupting capacity shall be as indicated on the drawings and shall in no case be less than **10,000 at 120/240 volts 14,000 RMS at 480 volts RMS** symmetrical amps at the applied voltage.
- D. Breakers shall be molded case **bolt-on** type, except where other types are shown. **Clamp on, push on, or plug in type are not acceptable.** Removable handle ties and dual, quad or tandem breakers are not acceptable. Mounting hardware, accessories, faceplates, and enclosures shall be provided as necessary for the intended use.
- E. Ground fault circuit interrupter (GFI) type circuit breakers shall occupy the same space in a panel as a conventional breaker of the same rating and shall have a push to test button on the front. A ground current of 5 milliamps (+) or more shall trip the breaker in less than 1/40 second, Each outlet on a GFI circuit shall be tested after installation and results of the test submitted in writing to the Architect.
- F. Special breakers, such as current limiter type, **and** motor circuit protectors (magnetic only) type, **and electronic type**, shall be provided as shown on the drawings. Circuit breakers for special applications, such as transfer switching, remote open (shunt trip) or close, or other purpose specified or shown elsewhere shall have all of the features and hardware necessary for the application.
- G. Submittal shall include interrupting capacities in RMS symmetrical amps at the applied voltage. Letter designations are not sufficient.
- H. Light duty commercial/residential type thermal magnetic breakers. Use only in Panels (not in Power Panels).
- I. Where "Bussed Space" or "Space Only" is indicated on a one-line diagram or in a panel schedule provide a complete busbar kit for the breaker frame size indicated.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Installation shall conform to the requirements of the CEC and to the manufacturer's shop drawings and mounting instructions. Equipment base for floor standing equipment shall have an adequate number of anchor bolt holes to put the base in direct contact shear and tension with the mounting surface at all anchor bolt locations. Refer to Section 26 05 48 "VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS" for seismic restraints requirements.



- B. Provide an identification nameplate as specified under 26 05 53 "IDENTIFICATION FOR ELECTRICAL SYSTEMS." Each circuit breaker pole shall be identified with a number designation. Circuits shall be arranged as shown on the schedules.

**3.02 EXISTING PANELBOARDS**

- A. Existing panelboards shall be modified as indicated on the drawings. The specifications for new switchboards and panelboards shall apply to work in existing except as otherwise indicated.
- B. New components such as circuit breakers, switches, relays, and contactors shall either be of the same manufacturer and type as existing in the board or shall comply with paragraphs where those items are specified.
- C. New bolted connections shall be torque tightened as recommended by the manufacturer of the equipment.
- D. Provide or replace nameplates, tags or labels as required.
- E. Finish on new faceplates and components shall match existing as closely as possible.
- F. Where new panel interiors or components are provided, submit shop drawings as required under "SUBMITTALS."
- G. For all existing panelboards to be modified, provide a typewritten directory mounted in a plastic frame on the inside of the cabinet door giving the circuit number and a complete description of all circuits controlled by each circuit breaker. Consult Owner's representative for correct room and/or furniture system module designation scheme (not necessarily those shown on drawings).

**3.03 CHECKING AND TESTING OF EQUIPMENT**

- A. Equipment installed under this section shall be inspected for defects, and tested for proper operation.
- B. Enclosures and cabinets shall be checked for cleanliness inside and out and for defective or damaged finish.
- C. Systems shall be tested for short circuits, open circuits and wrong connections and shall be free from mechanical and electrical defects.
- D. Bolted connections shall be torque tightened to manufacturer's specifications.
- E. Where required or directed, systems shall be tested in the presence of the Owner's representative to demonstrate that equipment furnished, installed or connected functions in the manner intended.
- F. Contractor shall furnish all necessary instruments and equipment and all power sources and connections required for making required tests, and shall immediately correct any defective work at no additional charge.

**END OF SECTION**

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**SECTION 26 27 26**

**WIRING DEVICES**

**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 this Section.

**1.02 SUMMARY**

- A. Section includes:
  - 1. Snap switches
  - 2. Keyed switches
  - 3. Duplex receptacles
  - 4. GFCI receptacles
  - 5. Special purpose receptacles
  - 6. Device plates

**1.03 DEFINITIONS**

- A. CEC: California Electrical Code (CCR Title 24, Part 3) based on the National Electrical Code.
- B. CBC: California Building Code (CCR Title 24, Part 2)
- C. GFCI: Ground-fault Circuit Interrupter
- D. NECA 1: Standard Practice of Good Workmanship in Electrical Contracting
- E. SPD: Surge Protective Device, formerly TVSS: Transient Voltage Surge Suppressor

**1.04 QUALITY ASSURANCE**

- A. Comply with CEC and NECA 1.

**1.05 SUBMITTALS**

- A. Product Data
  - 1. Material List: A material list with names of manufacturers, model numbers, and technical information on all equipment proposed.
  - 2. Product technical information sheets for each principal component in the proposed system. Identify by arrow, circle or similar means products being proposed. Submittals consisting of unmodified catalog pages with no markings will be rejected.
- B. Shop Drawings
- C. Samples: when requested by Architect
- D. Operation and Maintenance (O&M) Manuals: Furnish composite "Systems Operation and Maintenance" manuals in indexed three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain, but not be limited to:

1. Instruction for proper operation.
2. Factory issued technical, installation, and maintenance manuals.
3. Factory issued operations and programming (software) manuals.

## **PART 2 - PRODUCTS**

### **2.01 SYSTEM DESCRIPTION**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.

### **2.02 ACCEPTABLE MANUFACTURERS**

- A. Source Limitations: Obtain materials and accessories from single source from single manufacturer.

### **2.03 SWITCHES**

- A. AC general use snap switches shall be industrial grade toggle handle, quiet operating, UL 20 listed and verified to meet Federal Specification W S 896 and NEMA WD 1 heavy duty tests.
- B. Switches shall be rated 120/277V, 20A.
- C. Toggle handle color shall be white.
- D. Switches shall be constructed with oversized silver cadmium alloy contacts, permanent lubrication, and binding head screws suitable for #10 AWG wire, back & side wire. Connection shall be made by wrapping the wire around the screw or tightening a screw clamp. Push in type connections are not acceptable. Switches may have built in pigtail connection in lieu of screw connection. Switches shall be self-grounding.
- E. Acceptable Manufacturers:
  1. Cooper (Arrow Hart) 1221
  2. Hubbell HBL1221
  3. Leviton 1221-2
  4. Pass & Seymour #PS20AC1
- F. Keyed and momentary contact switches, required but not listed, shall be of the same manufacturers and identical quality as those listed above.
- G. Illuminated mushroom pushbuttons for cooktop, range and shop power shutdown shall be 2¼" diameter, red, equal to Square D 9001 series, mounted on stainless steel plate. Plate shall be fastened with four screws, one at each corner.

## 2.04 RECEPTACLES

- A. General receptacle outlets shall be premium industrial grade 20A, 125 volt, 2 pole, 3 wire NEMA 5-20R. The attachment screw shall have an automatic grounding clip. A green grounding screw shall be mounted on the bridge which shall run around the back of a break and impact resistant plastic body. The bridge shall be securely locked to the body. Outlets shall be UL 498 listed and verified to meet Federal Specification WC 596 and NEMA WD 1 heavy duty performance tests. Contacts shall be extra heavy duty copper alloy or bronze double wipe type. Outlets shall have binding head screws suitable for #10 AWG wire. Connection shall be made by wrapping the wire around the screw or tightening a clamp. Push in type connections are not acceptable. Outlets may have built in pigtail connection in lieu of screw connection.
- B. Receptacle outlet faces shall be white. Exception: receptacles that are controlled by occupancy sensors as switched plug loads shall be gray.
  - 1. Acceptable Manufacturers:
    - a. Cooper (Arrow Hart) AH5362
    - b. Hubbell HBL5362
    - c. Leviton 5362
    - d. Pass & Seymour 5362
- C. Receptacles installed outdoors or in other damp or wet locations shall be listed weather-resistant.
- D. Ground fault circuit interrupter (GFCI) outlets shall be specification grade UL 498 NEMA 5-20R 125V 20A duplex grounding non-feed-through type self-testing receptacle, designed to prevent normal operation when miswired, suitable for mounting in a standard outlet box. A ground current of 5 milliamps or higher shall trip the circuit open in less than 1/30 second. There shall be a test button and a reset button on the front. Each GFCI outlet shall be tested after installation and results of the test submitted in writing.
  - 1. Acceptable Manufacturers:
    - a. Cooper (Arrow Hart)
    - b. Hubbell GF20ST
    - c. Leviton S7899
    - d. Pass & Seymour 2094
- E. Industrial type outlets shall be by Crouse Hinds, Appleton, or Russell and Stoll, and shall be rated for the amps, volts, poles, and wires indicated on the drawings.
- F. Isolated ground receptacles shall be premium industrial grade NEMA 5-20R 20A, 125V, 2P, 3W grounding type. Provide each isolated ground duplex receptacle with an engraved faceplate to read: "ISOLATED GROUND", Pass & Seymour #S 8 IG or equal.
  - 1. Acceptable Manufacturers:
    - a. Cooper (Arrow Hart) IG5362
    - b. Hubbell IG5362
    - c. Leviton 5362-IG
    - d. Pass & Seymour IG6300

- G. SPD receptacles shall be hospital grade NEMA 5-20R 20A, 125V, 2P, 3W isolated grounding type, and shall absorb a minimum of 13kA per mode. Receptacles shall include an LED surge suppression status indicator.
1. Acceptable Manufacturers:
    - a. Cooper (Arrow Hart) IG8300HG
    - b. Hubbell IG8362\_SA
    - c. Leviton 8380-IG
    - d. Pass & Seymour IG8300-\_SP
- H. Special power outlets, not listed above, shall be standard NEMA configuration as noted on drawings and shall be of at least equal grade and quality to those listed above. Special receptacles not available in color may be silver or black finish.

## 2.05 DEVICE PLATES

- A. Acceptable Manufacturers:
1. Cooper (Arrow Hart)
  2. Hubbell
  3. Leviton
  4. Pass & Seymour
- B. Plates for flush wiring devices, including telephone outlets, shall be satin finish type 304 stainless steel. Wiring devices and device plates shall be the same manufacturer.
- C. Provide switch and device plates with engraved designations wherever called for by words, set off in quotation marks near a switch location, or by symbol. If inscription is not detailed on drawings request it from the Owner's representative. Engraving shall be in 1/8" high block type letters filled with black enamel.
- D. Finish plates for all surface mounted devices shall be pressed steel galvanized. Cover plates for flush mounted junction boxes in finished areas shall be selected by Owner's representative.
- E. For surface interior outlet and junction boxes of the pressed steel knockout type, use 1/2" raised galvanized steel plates for devices and flat galvanized steel for blank plates.
- F. Weatherproof faceplates shall consist of a hinged outlet cover/enclosure clearly marked "Suitable for Wet Locations While in Use" and "UL Listed". A gasket shall be provided between the enclosure and the mounting surface, and between the hinged cover and mounting plate/base. TayMac #10310 or equal.
- G. Locking faceplates shall be "Suitable for Wet Locations While in Use" and "UL Listed" **heavy cast aluminum with neoprene gasket. T.W. Cole TL310-WCS or equal. grey tumbler key lockable, vertical mount, specification grade hinged type, Taymac #10370 or equal.**

## PART 3 - EXECUTION

### 3.01 INSTALLATION OF OUTLETS AND EQUIPMENT

- A. All outlets, wall switches and wiring devices may be relocated within a radius of 12 feet at no additional charge to the Owner if such request is made prior to installation of the wiring-in for the item.

- B. Accurately place outlet boxes independently and securely fasten to the structure and, in concealed work, provide with plaster rings and set flush with finished surface of walls or ceilings.
- C. Coordinate the location and mounting heights of wall-mounted receptacles, fire alarm and signal devices switches with casework, shelving, furniture, and other equipment shown on Architectural and Interiors drawings and fabrication shop drawings and comply with the Americans with Disabilities Act (ADA), CBC, ANSI, and all other applicable codes governing the project. Conflicts shall immediately be brought to the attention of the District's representative for resolution before the installation of the rough-in for the devices.
- D. Outlet and junction boxes for interior use shall be galvanized, one piece pressed or welded steel, knockout type, except where other types of boxes are indicated or specified. In masonry or concrete construction waterproof boxes manufactured for that purpose shall be used. Plastic, fiber or composition boxes will not be permitted.
- E. Protectively cover all devices, outlet boxes, cabinets, etc., before plastering and painting.
- F. All receptacles for restrooms, toilet rooms, custodial closets, locker rooms, kitchens, electric water coolers, vending machines and on building exterior shall be GFCI type.

### 3.02 FACEPLATE INSTALLATION

- A. Provide a plate for each outlet, receptacle, switch, device and box.
- B. Each switch, receptacle device, etc. which is installed in an outlet box with coverplate shall have the panel and circuit number engraved with 1/8" high black filled lettering at top of coverplate.
- C. Plates for **roof outdoor exterior wall** locations shall be weatherproof, **key lockable**.
- D. Ganged devices shall have gang plates exactly matching the arrangement and quantity of devices. All plates shall fit the box perfectly with no field modification necessary. Plates on surface mounted boxes shall not overhang the box. All plates shall be manufactured specifically for the type of outlet, device and box to which they are applied.

### 3.03 FIELD QUALITY CONTROL

- A. GFCI receptacles and GFCI branch circuit breakers shall be tested by applying a ground current of 5 mA, + 1 mA, which shall trip the unit off. Each test shall be recorded and the record shall include the type of test equipment used, results of test, location of device tested, date of test, and name of test technician. "Test" button operation shall be successfully demonstrated but will not be acceptable as a substitute for the trip test described.
- B. Where required or directed, systems shall be tested in the presence of the District's representative to demonstrate that equipment furnished, installed or connected functions in the manner intended.
- C. Contractor shall furnish all necessary instruments and equipment and all power sources and connections required for making required tests, and shall immediately correct any defective work at no additional charge.

**END OF SECTION**

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**SECTION 26 51 10**

**LED INTERIOR LIGHTING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: LED lighting for the building, and accessories.
- B. Related Sections:
  - 1. Section 26 09 23 LIGHTING CONTROL DEVICES

**1.02 SUMMARY**

- A. Provide U.L. listed and labeled lighting fixtures complete with lamps at light outlets indicated on the drawings. Each fixture shall bear the U.L. Label, and shall comply with Code Requirements.
- B. Fixtures are listed and described in the Lighting Fixture Schedule and in the following paragraphs. Fixture catalog numbers are to be used as a guide only and shall be understood to be followed by the words "except as modified by the total fixture description both text and pictorial". Provide accessories, features and adaptations necessary to meet the requirements of the description.

**1.03 DEFINITIONS**

- A. CEC: California Electrical Code (CCR Title 24, Part 3) based on the National Electrical Code.
- B. CalGreen: California Green Building Standards, CCR Title 24 Part 11, Chapter 5.

**1.04 QUALITY ASSURANCE**

- A. Products shall be UL listed and labeled.
- B. Comply with CEC.

**1.05 SUBMITTALS**

- A. Product Data
  - 1. Material List: A material list with names of manufacturers, model numbers, and technical information on all equipment proposed.
  - 2. Catalog cuts for each fixture including complete photometric data.
  - 3. Weight and dimensions.
  - 4. Product technical information sheets for each principal component in the proposed system. Identify by arrow, circle or similar means products being proposed. Submittals consisting of unmodified catalog pages with no markings will be rejected.
- B. Samples: when requested by Architect.

- C. Operation and Maintenance (O&M) Manuals: Furnish composite "Systems Operation and Maintenance" manuals in indexed three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain, but not be limited to:
  - 1. Operational procedures for the overall systems including the "Sequence of Operation".
  - 2. Test procedures and test results.
  - 3. Instruction for the proper operation and maintenance of the system.
  - 4. Factory issued technical, installation, and maintenance manuals.
  - 5. A replacement parts list complete with part numbers and name, address, and phone number of suppliers used by the Contractor. A spare parts list recommended for purchase by the District shall be included.
  - 6. All portions of the material list and shop drawings which are not included in the foregoing.

**1.06 FIELD REPLACEMENT LIGHT ENGINE**

- A. Integrate LEDs, driver, power supply, thermal management, and optical mixing components.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by CREE, Inc., email: [www.cree.com](http://www.cree.com), Phone (800) 236-6800 or approved equal.

**2.02 SYSTEM DESCRIPTION**

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- B. Comply with CEC.

**2.03 CONSTRUCTION MATERIALS**

- A. 20 Gauge steel housing, field replaceable light engine, one-piece lower reflector, finishes are textured high reflectance white polyester powder coating.

**PART 3 - EXECUTION**

**3.01 ACCEPTANCE TESTING**

- A. Complete the testing and documentation requirements of Title 24 Energy Code Acceptance Testing procedures. Complete and sign the Acceptance Testing Forms and submit to District and DSA Inspector (IOR).

**3.02 UTILITY DESIGN INCENTIVE PROGRAM**

- A. Furnish the utility company representative with the itemized, paid proof of purchase/invoice for the purchase and installation of energy efficient equipment.

- B. Assist the utility in the verification by utility representative of both the purchase and installation of the energy efficient equipment, including providing the representative access to the Construction Project, at reasonable times, for verification of installation of the equipment.
- C. Provide the utility with a written request for payment of the Incentives calculated, when the Construction Project is completed and occupied.

**3.03 CLEANING**

- A. After construction of total project is completed:
  - 1. Remove all non-essential labels and other markings.
  - 2. Wash dirty luminaires inside and out with nonabrasive mild soap or cleaner.
  - 3. Clean luminaire plastic lenses with antistatic cleaners only.
  - 4. Touch up all painted surfaces of luminaires and poles with matching paint supplied by manufacturer.

**END OF SECTION**

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SECTION 26 56 00

**EXTERIOR LIGHTING**

**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 this Section.

1.02 SUMMARY

- A. Provide lighting fixtures complete with lamps at light outlets indicated on the drawings. Exterior fixtures shall be U.L. listed for damp locations in soffits and for wet locations elsewhere.
- B. Fixtures are listed and described in the Fixture Schedule and in the following paragraphs. Fixture catalog numbers are to be used as a guide only and shall be understood to be followed by the words "except as modified by the total fixture description, both text and pictorial". Provide accessories, features and adaptations necessary to meet the requirements of the description.

1.03 DEFINITIONS

- A. CEC: California Electrical Code (CCR Title 24, Part 3) based on the National Electrical Code.
- B. CalGreen: California Green Building Standards, CCR Title 24 Part 11, Chapter 5.
- C. HID: High-intensity discharge.
- D. IESNA: Illuminating Engineering Society of North America.

1.04 Spare Parts: Provide the following spare parts to the District upon the completion of the project.

- A. Twelve of each size and type lamp used.
- B. Two of each type of luminaire lens used.

1.05 QUALITY ASSURANCE

- A. Products shall be UL listed and labeled.
- B. Comply with CEC.

1.06 SUBMITTALS

- A. Product Data

1. Material List: A material list with names of manufacturers, model numbers, and technical information on all equipment proposed including each type of lamp and ballast.
  2. Catalog cuts for each fixture and pole including complete photometric data in IES format.
  3. Weight and dimensions.
  4. Product technical information sheets for each principal component in the proposed system. Identify by arrow, circle or similar means products being proposed. Submittals consisting of unmodified catalog pages with no markings will be rejected.
- B. Samples: when requested by Architect.
- C. Operation and Maintenance (O&M) Manuals: Furnish composite "Systems Operation and Maintenance" manuals in indexed three-ring binders, sized to hold the material below, plus 50% excess. Each manual shall contain, but not be limited to:
1. Operational procedures for the overall systems including the "Sequence of Operation".
  2. Test procedures and test results.
  3. Instruction for the proper operation and maintenance of the system.
  4. Factory issued technical, installation, and maintenance manuals.
  5. Factory issued operations and programming (software) manuals.
  6. A replacement parts list complete with part numbers and name, address, and phone number of suppliers used by the Contractor. A spare parts list recommended for purchase by the District shall be included.
  7. All portions of the material list and shop drawings which are not included in the foregoing.

**1.07 LAMP REPLACEMENT**

- A. Replace lamps which burn out after District's use or acceptance of the project (or of an area in the case of beneficial occupancy).
- B. Lamps which burn out within 120 days.

**PART 2 - PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following
  1. Ballasts
    - a. Advance
    - b. General Electric

- c. Magnetek
- d. Jefferson
- e. Sola
- f. Sylvania

- B. Source Limitations: Obtain materials and accessories from single source from single manufacturer.
- C. Luminaire shall comply with the following requirements:
  - 1. California Energy Code for Lighting Zones 1-4 as defined by Chapter 10 of the California Administrative Code.
  - 2. Backlight, Uplight and Glare (BUG) ratings as defined by IESNA TM-15-11.
  - 3. Allowable BUG ratings not to exceed those indicated in Table 5.106.8

## 2.02 SYSTEM DESCRIPTION

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- B. Comply with CEC.

## 2.03 LAMP HOLDERS

- A. High Intensity Discharge: Body: porcelain; Screw Shell: nickel-plated brass, pre-lubricated with silicone compound; Contacts: spring-loaded silver-plated phosphor bronze.

## 2.04 LENSES

- A. Light transmitting plastics:
  - 1. All plastic shall be 100% virgin acrylic. Pattern #12 lenses shall be minimum 0.125" thick overall with 0.08" prism depth.
- B. Glass:
  - 1. Glass used for lenses, refractors, and diffusers in incandescent lighting fixtures shall be tempered for high impact and heat resistance; the glass shall be crystal clear in quality with a transmittance of not less than 88%. For exterior fixtures use tempered Borosilicate glass, Corning #7740 or equal. For fixtures directly exposed to the elements and aimed above the horizontal, use Corning Vycor glass or equal.

## 2.05 SITE LIGHTING LUMINAIRES

- A. Luminaires shall be mounted on poles as shown on the drawings and shall be of the type and manufacturers shown in the schedule, **or approved equal**. Luminaires shall be mounted flat and level, with no tilt or cant.
- B. Luminaires of one type shall be of one manufacturer and of identical finish and appearance.
- C. Site lighting luminaires shall be metal halide or LED.

- D. LED lighting exterior lighting fixture shall meet the following requirements:
  - 1. CRI of minimum 80 and CCT of 4100 K
  - 2. L70 light engine life of 50,000 hours.
  - 3. Light engine dimmable from 100 percent to 10 percent of maximum light output.
  - 4. Internal driver.
- E. Flag pole lighting shall be flush mounted in-grade luminaires. Luminaire lens temperature when in operation shall not cause burns to bare skin.
- F. Provide all lamps, ballasts, and mounting hardware required for a complete installation. Mounting hardware shall be completely compatible with, and designed for use with, the proposed pole.
- G. **Finish shall be electrostatically applied baked on black enamel over a prime coat. Finish shall match poles with no detectable difference under normal viewing conditions. Any minor damages to paint after delivery shall be touched up with paint provided by the manufacturer. Any major paint damage shall be repaired in the factory by the original process.**
- H. **Provide bird spikes type L53 Nixalite Bird Control or equal (no known equal). Attach to top of luminaires using epoxy adhesive as recommended by bird spike manufacturer.**
- I. Submit a computer generated layout of the site showing the illumination levels in footcandles that will result using all proposed fixtures, luminaires, and poles.
- J. Submit catalog cuts and data sheets for each type and wattage proposed. Submittals shall be bound with the pole submittals and shall include complete information on all lamps, ballasts, lenses, and mounting hardware. **Submit a production run sample of a typical luminaire proposed. Sample will be returned.**

### PART 3 - EXECUTION

#### 3.01 ACCEPTANCE TESTING

- A. Complete the testing and documentation requirements of Title 24 Energy Code Acceptance Testing procedures. Complete and sign the Acceptance Testing Forms and submit to District and DSA Inspector (IOR).

#### 3.02 UTILITY DESIGN INCENTIVE PROGRAM

- A. Contractor shall furnish the utility company representative with the itemized, paid proof of purchase/invoice for the purchase and installation of energy efficient equipment.
- B. To assist the utility in the verification by utility representative of both the purchase and installation of the energy efficient equipment, including providing the representative access to the Construction Project, at reasonable times, for verification of installation of the equipment.
- C. To provide the utility with a written request for payment of the Incentives calculated, when the Construction Project is completed and occupied.

#### 3.03 CLEANING

- A. After construction of total project is completed:



**FEBRUARY 11, 2020**

**GROSSMONT UNION HIGH SCHOOL DISTRICT  
HELIX CHS RESTROOM AND STORAGE BLDGS**

1. Remove all non-essential labels and other markings.
2. Wash dirty luminaires inside and out with nonabrasive mild soap or cleaner.
3. Clean luminaire plastic lenses with antistatic cleaners only.
4. Touch up all painted surfaces of luminaires and poles with matching paint supplied by manufacturer.

**END OF SECTION**

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## SECTION 28 31 11

## FIRE DETECTION AND ALARM SYSTEM

## PART 1 - GENERAL

## 1.01 GENERAL REQUIREMENTS

- A. Provide a complete and operable system in accordance with the letter and intent of this specification section and with applicable Codes and Regulations as interpreted by the Authorities having jurisdiction. This Section is a performance specification and the detailed system design shall be done by the system manufacturer. The system shall comprise all necessary component parts to provide the functions and facilities described and to obtain the approvals requested. The system layout indicated on the drawings is only tentative and the types and quantities of system devices and raceways are minimums which shall be revised and augmented as required by the system to be provided.
- B. The entire system shall conform to applicable Codes. Equipment shall be U.L. listed, Factory Mutual listed and approved, approved, currently listed by the California State Fire Marshal, and shall conform to:
  - 1. California Code of Regulations,
    - a. Title 8 Industrial Relations
    - b. Title 19 Public Safety
    - c. Title 24 Building Standards Code
    - d. 2019 California Electrical Code (CEC)
    - e. 2019 California Fire Code (CFC)
    - f. California Building Code (CBC).
  - 2. Americans with Disabilities Act (ADA)
  - 3. NFPA 72-2019 National Fire Alarm Code
  - 4. Requirements of the local Fire Department.

## 1.02 ACCEPTABLE MANUFACTURERS

- A. **New fire alarm systems shall be furnished by the following manufacture only, no substitutions are allowed.**
  - 1. Gamewell – FCI

## 1.03 QUALIFICATIONS OF SYSTEM SUPPLIER

- A. Submit qualification of system supplier for approval based on the following minimum criteria:
  - 1. Successful experience in comparable installations which have been in operation for a period of not less than five years. Furnish a list of jobs and locations, with contact name and phone number, which fall in this category upon request.
  - 2. Ability to provide emergency restoration service within 12 hours by factory certified personnel.

3. Installing contractor must have an office within San Diego County. That office must include 7/24 service department and must maintain spare inventory of all equipment used on this project.

**1.04 DEFINITIONS**

- A. Alarm Initiating Device Types: Manual stations, smoke detectors, heat detectors and sprinkler monitor modules.
- B. Alarm Signal: Signals from an alarm initiating device that signifies a state of emergency requiring building evacuation.
- C. Supervisory Signal: Indicates need for action regarding fire suppression or other protective system.
- D. Trouble Signal: Indicates that a fault, such as an open circuit or ground, has occurred in the system.
- E. Alarm indicating device: Horn or visual alarm device (strobe).

**1.05 SUBMITTALS**

- A. Data sheets and shop drawings:
  1. Submittals shall include State Fire Marshal Listing Sheets, including listing number with annual update and expiration date, for all system components. Submit installation shop drawings including scaled floor plans, complete point-to-point wiring schematics, list of all equipment with manufacturer's data sheets, the locations of each piece and device, battery and voltage drop calculations, and proposed conduit layout diagram, if conduit is required.
  2. Data sheets are required for all system components, including but not limited to: control panels, batteries, battery chargers, signal initiating devices, audible alarms, visual alarms, annunciators, transponders, terminals, cabinets, wiring, and relays.
  3. Fire Marshal approval of submittals is for permission to proceed and does not authorize design, products or installation not conforming to referenced codes and standards and this specification.
  4. Fire Alarm system central equipment. All cabinets shall be surface mounted on the wall approximately where indicated on drawings. Submit a proposed wall elevation of the cabinet layouts, sketched to scale, with the shop drawing package. Owner's representative will review the shop drawings and provide the Contractor a drawing which will exactly locate the cabinets.
- B. Operation and Maintenance Manuals: Manuals shall include all instructions necessary for proper operation and maintenance of the system, complete circuit diagrams, wiring and termination schedule for each circuit entering and/or leaving each piece of equipment and schematic diagrams of each major component, including a replacement parts list with part numbers, name, and telephone number of local supplier. Include all portions of the material list and shop drawings which are not included in the foregoing.
- C. Certification: Furnish written certification from the fire alarm system manufacturer that the system is in compliance with all applicable Code requirements.

- D. Training Agenda.
- E. Testing Documentation.
- F. Sequence of Operation: A description of the operation of the system with appropriate operator responses.
- G. Record Drawings: Documents shall include installation wiring, schematics, operation and maintenance manuals, complete replacement parts list. Drawings shall be reproducible type and shall be complete to facilitate trouble shooting and repair of the system.
- H. Spare Parts List: A list of recommended spare parts.

#### 1.06 SYSTEM DESCRIPTION

- A. The system shall be a complete, electrically supervised proprietary style fire detection and evacuation system with microprocessor based local operating system having the following capabilities, features and capacities:
  - 1. Communication between the local panel and the central monitoring station.
  - 2. The local system shall provide status indicators the following functions:
    - a. Audible and visual evacuation alarm circuit zone control.

#### 1.07 SYSTEM ZONING

- A. The basic system shall be addressable.

#### 1.08 SYSTEM OPERATION

- A. Activation of any fire alarm initiating device shall cause the following actions and indications at the local control panel:
  - 1. An alarm received shall sound an Temporal Code 3 evacuation alarm throughout the facility, and;
    - a. Display the initiating device.
    - b. Perform all control functions as detailed elsewhere in this specification.
- B. Receipt of any trouble report, shall cause the following actions and indications:
  - 1. Display at the local fire alarm control panel LED display, the origin of the trouble condition report.
  - 2. Activate trouble audible and visual signals at the control panel and as indicated on the drawings.
    - a. Audible signals shall be able to be silenced from the fire alarm control panel by a trouble acknowledge switch.
  - 3. Record within system history, the occurrence of the event, the time of occurrence and the device initiating the event.

- C. Automatic Lockdown or Evacuation Voice Announcements:
  - 1. Provide 10 second continuous tone, followed by repeating prerecorded message, announcing either facility lockdown or evacuation as determined by activation of appropriate manual pull station in Administration area.
  - 2. Voice messages shall be submitted to and approved by the District.
- D. Manual Lockdown or Evacuation Voice Announcements:
  - 1. The control panel operator shall be able to make announcements via the push-to-talk announcement microphone over preselected speaker zones.
  - 2. Facility for total building announcement shall be accomplished by means of an "All Call" switch.
  - 3. A second backup microphone shall be located at the Administration office unless shown otherwise on drawings.

**1.09 TRAINING**

- A. Submit a proposed training agenda for review. The final, approved training agenda shall be submitted 14 days prior to the final system acceptance test.
- B. Train three operators with personal, on job instruction provided by competent personnel representing the manufacturer.
  - 1. Provide each operator with complete, printed operating instructions in manual or handbook form.
  - 2. Provide two distinct training sessions, with minimum training time of four hours each. Sessions shall be scheduled to suit the District. The first session shall be scheduled about the time of the final acceptance test and the second sometime during the first six months of operations. District will provide the conference room.
- C. Training shall include all system operational functions needed. This shall include, but will not be limited to:
  - 1. Alarm acknowledgment.
  - 2. Interpretation of the scheme used to provide identifiers.
  - 3. System operation.
  - 4. System reset.
  - 5. Basic troubleshooting.
  - 6. Demonstrate that the system address assigned to each smoke detector corresponds correctly to device's field location.

## 1.10 SPECIAL TOOLS

- A. The Contractor shall supply as a part of the contract, three complete sets of any special tools or keys necessary for normal operation and maintenance of the system.

**PART 2 - PRODUCTS**

## 2.01 FIRE ALARM SYSTEM DESCRIPTION

- A. Intelligent reporting, networked, fully peer-to-peer, microprocessor-controlled fire detection and emergency voice alarm communication system.
- B. Each Signal Line Circuit (SLC) and Appliance Notification Circuit (NAC): Limited to 75 percent of its total capacity during initial installation.
- C. Basic Performance:
  - 1. Network Communications Circuit Serving Network Nodes: Wired using single twisted non-shielded 2-conductor cable or connected using approved fiber optic cable between nodes in a modified Class B configuration with #16 AWG minimum conductors.
  - 2. Signal Line Circuits Serving Addressable Devices: Wired Class B with #16 AWG minimum conductors.
  - 3. Initiating Device Circuit Serving Non-addressable Devices Connected to Addressable Monitor Modules: Wired Class B with the EOL resistor at the last device. Conductors shall be #16 AWG minimum.
  - 4. Appliance Notification Circuits Serving Strobes and Speakers: Wired Class B with the EOL resistor at the last device. Conductors shall be #14 AWG minimum for Strobes and #18 AWG minimum for Speakers.
  - 5. Alarm Signals Arriving at FACP: Not be lost following primary power failure until alarm signal is processed and recorded.
  - 6. Network Communications, Audio Evacuation Channels and Fire Phone Communications:
    - a. Communicated between panels and transponders on single pair of copper wires or fiber optic cables.
  - 7. Signaling Line Circuits:
    - a. Reside in remote transponders with associated audio zones.
    - b. Signal Line Circuit modules shall operate in peer-to-peer fashion with all other panels and transponders in system.
    - c. On loss of FACP, each transponder shall continue to communicate with remainder of system, including all Signal Line Circuit functions and audio messages located in all transponders.
    - d. Systems that provide a "Degraded" mode of operation upon loss of FACP shall not be acceptable.
  - 8. Audio Amplifiers and Tone-Generating Equipment: Electrically supervised for normal and abnormal conditions.
  - 9. Amplifiers: Located in transponder cabinets or in main panel.
  - 10. Speaker Notification Circuits: Arranged such that there is a minimum of 1 speaker circuit per fire alarm zone.

11. Appliance Notification, Speaker Circuits, and Control Equipment: Arranged such that loss of any 1 speaker circuit will not cause loss of any other speaker circuit in system.
12. Speaker Circuits.
  - a. Electrically supervised for open and short circuit conditions.
  - b. If short circuit exists on speaker circuit, it shall not be possible to activate that circuit.
  - c. Arranged for 25 V RMS and shall be power limited in accordance with CEC.
  - d. Provide 25 percent spare capacity for future expansion or increased power output requirements.
13. Speaker Circuits and Control Equipment:
  - a. Arranged such that loss of any 1 speaker circuit will not cause loss of any other speaker circuit in system.
  - b. Systems utilizing "bulk" audio configurations shall not be acceptable.
- D. All components provided shall be listed for use with the selected system.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in CEC, by a qualified testing agency, and marked for intended location and application.
- F. All components shall be listed by the California State Fire Marshal (CSFM).

## 2.02 FIRE ALARM SYSTEM OPERATIONAL DESCRIPTION

- A. When fire alarm condition is detected and reported by one of the system alarm initiating devices, the following functions shall immediately occur:
  1. System Alarm LEDs: Flash.
  2. Local Piezoelectric Signal in Control Panel: Sound at a pulse rate.
  3. 80-Character LCD Display: Indicated all information associated with fire alarm condition, including type of alarm point and its location within protected premises.
  4. Historical Log: Record information associated with fire alarm control panel condition, along with time and date of occurrence.
  5. System output programs assigned via control-by-event equations to be activated by particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.
  6. Audio Portion of System: Sound tone (California Temporal Pattern) until system is reset.

## 2.03 FIRE ALARM CONTROL PANEL (FACP)

- A. School has existing FCI #E3 Fire Alarm supply user interface, including **touch-screen 1/4 VGA display**, Intelligent Loop Interface Control Panel:



## 2.04 MANUAL PULL STATIONS

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
1. Manual Fire Alarm Stations: Non-code, non-break glass type, equipped with key lock so they may be tested without operating handle.
  2. Operated Station: Visually apparent, as operated, at a minimum distance of 100 feet from front or side.
  3. Stations shall be designed so after actual activation, they cannot be restored to normal except by key reset.
  4. Manual stations shall be construction of Lexan with clearly visible operating instructions provided on cover. The word FIRE shall appear on front of stations in raised letter, 1.75 inches or larger.
  5. Addressable manual stations shall, on command from control panel, send data to panel representing state of manual switch and addressable communication module status.
  6. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.

## 2.05 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:
1. Comply with UL 268; operating at 24-V dc, nominal.
  2. Detectors shall be two-wire type.
  3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
  4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
  5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
  6. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
  7. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
- B. Photoelectric Smoke Detectors
1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
  2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    - a. Primary status.
    - b. Device type.
    - c. Present average value.
    - d. Present sensitivity selected.

- e. Sensor range (normal, dirty, etc.).

## 2.06 HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521.
  - 1. Temperature sensors shall test for and communicate the sensitivity range of the device.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 degree F or a rate of rise that exceeds 15 degree F per minute unless otherwise indicated.
  - 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
  - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

## 2.07 NOTIFICATION APPLIANCES

- A. Horn
  - 1. Compliance: UL 1480
  - 2. Operate on 24v.
  - 3. Speakers in Corridors and Public Spaces: Produce nominal sound output of 84 dBA at 10 feet.
  - 4. Frequency Response: Minimum of 400 Hz to 4,000 Hz.
  - 5. Audibility: NFPA 72.
- B. Strobes
  - 1. Compliance: ADA, CBC, and UL 1971.
  - 2. Maximum Pulse Duration: 0.2 second.
  - 3. Strobe Intensity: UL 1971.
  - 4. Flash Rate: UL 1971.
  - 5. Strobe Candela Rating: Determine by positioning selector switch on back of device.
- C. Horn/Strobes:
  - 1. Compliance: Horn – UL 1480.
  - 2. Operate on 24v.
  - 3. Horn in Corridors and Public Spaces: Produce nominal sound output of 84 dBA at 10 feet.
  - 4. Frequency Response: Minimum of 400 Hz to 4,000 Hz.
  - 5. Audibility: NFPA 72.
  - 6. Maximum Pulse Duration: 0.2 second.
  - 7. Strobe Intensity: UL 1971.
  - 8. Flash Rate: UL 1971.
  - 9. Strobe Candela Rating: Determine by positioning selector switch on back of device.

## 2.08 REMOTE ANNUNCIATOR

- A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
  - 1. Mounting: **Flush** cabinet, NEMA 250, Type 1.
- B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

## 2.09 ADDRESSABLE INTERFACE DEVICE

- A. Addressable Dry Contact Monitor Modules
  - 1. Provide to connect 1 supervised IDC zone of conventional alarm initiating devices (any N>O> dry contact device) to 1 of the fire alarm control panel SLCs.
  - 2. Mount in standard deep electrical box.
  - 3. IDC Zone: Suitable for Style B operation.
- B. Addressable Control Module:
  - 1. Provide to supervise and control operation of 1 conventional NAC of compatible, 24-VDC powered, polarized audio/visual notification appliances or UL-listed polarized relays for fan shutdown and other auxiliary control functions.
  - 2. Mount in standard 4-inch square, 2-1/8-inch deep electrical box or to surface-mounted back box.
  - 3. Control Module NAC: Wire for Style Z or Style Y (Class B/B) with up to 1 amp of inductive signal or 2 amps of resistive signal operation. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
  - 4. Audio/Visual Power: Provide by separate supervised power circuit from main fire alarm control panel or from supervised, UL-listed remote power supply.
- C. Addressable Relay Module:
  - 1. Available for HVAC control and other building functions. Relay shall have 2 Form C sets of contacts that operate in tandem and are rated for a minimum of 2.0 amps resistive or 1.0 amps inductive. Relay coil shall be magnetically latched to reduce wiring connection requirements and to ensure 100 percent of all auxiliary relay or NACs shall be energized at same time on same pair of wires.
  - 2. Mount in standard 4-inch square, 2-1/8-inch deep electrical box or to surface-mounted back box.

## 2.010 DEVICE GUARDS

- A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
  - 1. Factory fabricated and furnished by device manufacturer.
  - 2. Finish: Paint, color white.

**2.011 SPARE PARTS CABINET**

- A. NEMA 1 cabinet with hinged lockable door and painted to match FACP, sized to accommodate the Maintenance Materials specified herein. Provide an engraved nameplate to read "FIRE ALARM SYSTEM SPARE PARTS CABINET".

**2.012 NOTIFICATION DEVICES**

- A. Evacuation Signaling Devices shall be furnished and installed as shown on the drawings, including the following features and capabilities:
  - 1. Visual signals shall be installed in accordance with the requirements of U.L.1971 standard and NFPA 72. Where multiple visual signals are visible from any location, circuitry shall be incorporated for synchronization of the flash rate.
  - 2. UL 1971 Listed for Emergency Devices for the Hearing Impaired in all public mode installations.
    - a. Strobes shall meet UL 1971 and produce a flash rate of one (1) flash per second minimum over the listed input voltage of 24 VDC.
  - 3. All visual signals shall incorporate a Xenon flashtube enclosed in a rugged Lexan lens or equivalent with solid state circuitry.
  - 4. The strobe intensity shall be rated per UL 1971 for 15, 75 or 110 Candela.
  - 5. The strobes shall be available for semi-flush or surface mounting and in conjunction with audible signals as required.
  - 6. For outdoor application in the private mode, the strobe shall be UL 1638 Listed and be rated for a temperature range of minus 32°F to 120°F.
- B. Audible evacuation signals shall be furnished and installed as shown on the drawings meeting the following requirements:
  - 1. Notification appliance shall be electronic and use solid state components.
  - 2. Each electronic signal shall provide eight (8) field selectable alarm tones. The tones shall consist of: tone, horn, march-time horn, code-3 horn, code-3 tone, slow whoop, siren, and hi/lo. Tone selection shall be by durable dip switch assembly and not clips or jumpers.
  - 3. The device shall have provisions for standard reverse polarity type supervision and in/out field wiring using terminals that accept #12 to #18 AWG wiring.

**2.013 OFF SITE DIGITAL ALARM COMMUNICATIONS**

- A. The control panel shall contain integral facilities for off-site digital reporting via site telephone lines. Upon sensing an alarm condition within the panel, the communicator shall capture an operational telephone circuit and automatically dial the Central Receiving Station. Upon making contact with either the primary or secondary Central Receiving Station numbers using either the primary or secondary outgoing lines, the communicator shall establish its system identity and report the alarm condition. The communicator shall include the following features and capabilities:

- B. Integral fire alarm control panel mounting and listing under U.L. standard 864 with the control panel. All operating power shall be derived from the control panel primary and secondary power sources.
- C. Operating data base firmware stored in non-volatile memory and permanently installed on the system mother board. Entry into the programming mode shall be password protected to prevent unauthorized modification. The system shall be programmable by use of the software and passcode, on site or remotely using the data reporting telephone line connections.
  - 1. Changes in central station telephone numbers shall be programmable without the requirement for a site visit, from the central station.
  - 2. The communicator shall be capable of reporting up to four conditions present within the control panel, as follows:
    - a. Fire Alarm Condition.
    - b. System Trouble Condition.

### PART 3 - EXECUTION

#### 3.01 EQUIPMENT INSTALLATION

- A. Installation shall be in accordance with the CEC, NFPA 72, CFC, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
- B. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.
  - 1. Connect new equipment to existing control panel in existing part of the building.
  - 2. Connect new equipment to existing monitoring equipment at the supervising station.
  - 3. Expand, modify, and supplement existing **monitoring** equipment as necessary to extend existing **monitoring** functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- C. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.
- D. Manual Fire-Alarm Boxes:
  - 1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.
  - 2. Mount manual fire-alarm box on a background of a contrasting color.
  - 3. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.
- E. Smoke- or Heat-Detector Spacing:
  - 1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
  - 2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
  - 3. HVAC: Locate detectors not closer than **36 inches** from air-supply diffuser or return-air opening.

4. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.
- F. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.
- G. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.
  1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.
- H. Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location. Do not install smoke detectors in sprinklered elevator shafts.
- I. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- J. Signaling line circuit wiring installed in underground conduits shall be a shielded twisted pair cable of water-blocked construction sized as per Fire Alarm manufacturer's requirements. West Penn Aquaseal or equal.

### **3.02 PATHWAYS**

- A. Pathways shall be installed in EMT, minimum 1-inch conduit size.
- B. Exposed EMT shall be painted red enamel.

### **3.03 CONNECTIONS**

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Section 08 71 00 "Door Hardware." Connect hardware and devices to fire-alarm system.
  1. Verify that hardware and devices are listed for use with installed fire-alarm system before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 36 inches from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
  1. Smoke dampers in air ducts of designated HVAC duct systems.
  2. Magnetically held-open doors.
  3. Electronically locked doors and access gates.
  4. Alarm-initiating connection to elevator recall system and components.
  5. Supervisory connections at valve supervisory switches.
  6. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.

7. Supervisory connections at elevator shunt-trip breaker.
8. Data communication circuits for connection to building management system.
9. Data communication circuits for connection to mass notification system.
10. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
11. Supervisory connections at fire-pump engine control panel.

**3.04 IDENTIFICATION**

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Section 26 05 53 "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

**3.05 GROUNDING**

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.
- C. All grounding shall be in accordance with CEC Art. 250.

**3.06 TEST**

- A. Provide the service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72.

**3.07 FINAL INSPECTION/INSTRUCTION**

- A. At the final inspection a factory trained representative of the manufacturer shall demonstrate that the systems function properly in every respect.
- B. Provide instruction as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- C. Provide the NFPA Certificate to the owner, local fire official, architect, and DSA.

**END OF SECTION**

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**SECTION 31 22 19**

**FINISH GRADING**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Provide materials, labor and equipment necessary for the completion of finish grading as indicated on the Drawings and specified herein.
- B. Related Sections:
  - 1. Excavation and Fill, Section 31 23 00, for Utilities and Storm Drains.
  - 2. Water Utilities, Section 33 10 00.
  - 3. Sanitary Sewer and Storm Drainage Pipe, Section 33 41 00.

**PART 2 - PRODUCTS**

NOT USED

**PART 3 - EXECUTION**

**3.01 PREPARATION FOR FINISH GRADING**

- A. The entire area within the limits of grading as indicated on the Drawings shall be constructed to the lines, grades, elevations, slopes, and cross sections indicated on the Drawings. When the grading has been completed, the areas shall be rolled smooth with a steel tandem roller or equal.

Should low spots develop during the rolling operation, such spots shall be filled and re-rolled smooth. Slopes, banks, and drainage depressions shall present a neat, uniform appearance on completion of the work.
- B. Fine grade to bring areas to required lines and grades.
- C. Slope finish grades to drain surface water away from buildings, walks, paving, and other structures. Generally, grade with uniform slope between points where elevations are given, or between such points and existing grades. Excavate and grade swales to provide drainage away from and around buildings.
- D. Areas to Receive Paving or Surfacing: Review plans and details for each area. See plans for paving and base course thickness. Review Drawings for sitework details.
- E. Areas to Receive Topsoil and/or Planting: Where not otherwise indicated, areas outside of buildings shall be given uniform slopes between points for which finish grades are shown, or between such points and existing established grade, except that vertical curves or roundings shall be provided at abrupt changes in slope.
- F. Rocks or cobbles larger than 1 inch in diameter shall not be placed in the upper 12-inches of planting area fill, and rocks or cobbles larger than 3/4-inch shall not appear on the finish graded surface.

G. Surplus or Imported Material:

1. Surplus material not needed for filling shall be removed from the site in a legal manner.
2. Provide additional earth material per Section 31 20 00, Earth Moving.

H. Preparation for Fills:

1. Prior to placing fills, the existing surface shall be scarified and recompact to at least 95 percent maximum dry density per the ASTM D1557-12 procedure.

**3.02 FIELD QUALITY CONTROL**

- A. Compaction of soils performed on this project shall be at least 90 percent of the maximum dry density per the ASTM D1557-09 procedure. New turf and planted areas shall be compacted to 85 percent. Aggregate bases shall be compacted to 95 percent.
- B. All layout shall be performed by a qualified licensed civil engineer or surveyor.

**END OF SECTION**

**SECTION 31 23 00**

**EXCAVATION AND FILL FOR STORM DRAINS AND UTILITIES**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: Excavation and backfill for utilities and storm drains as indicated on the Drawings and specified herein, including off-site work.

**1.02 REFERENCE STANDARDS**

- A. Title 24, California Code of Regulations, California Building Code, 2019, and County of San Diego Grading Ordinances.
- B. CAL-OSHA requirements.
- C. Standard Drawings of the County of San Diego.
- D. The Standard Specifications for Public Works Construction, current edition.

**1.03 PERFORMANCE REQUIREMENTS**

- A. Be fully responsible to furnish and maintain temporary barricades, warning lights, and other types of protection and to prevent accidental injury to the general public and personnel employed on the project.
- B. Provide adequate cribbing, sheathing, and shoring as necessary to safely retain the earth sides of excavations and trenches from caving and other damage resulting from excavating, together with suitable forms of protection against property damage and bodily injury to personnel employed on the work and the general public. The Contractor shall be responsible for the design, for installation, and maintenance of required cribbing and shoring.
- C. Protect new and existing utilities from damage during the course of installation, and repair work so damaged at no additional cost to the Owner.

**1.04 PERMITS**

- A. Obtain permits, fees, or bonds required for the work performed under this section. Owner will pay the cost of permanent construction permits. Bonds and encroachment permits shall be paid by the Contractor.

**1.05 INSPECTION AND TESTING**

- A. A Testing Laboratory designated by the Owner and approved by the Division of the State Architect, will be engaged to perform tests and inspections of the placing and compacting of backfills. Work shall be done in accordance with these Specifications. Costs for inspection and conforming tests shall be paid by the Owner.
- B. Contractor shall be responsible for notifying the Testing Laboratory at least 48 hours in advance of the time where testing services are needed.
- C. The Testing Laboratory shall submit compaction reports to the Architect, and shall notify the Architect immediately of test failures.

- D. Refer to Section 01 45 23 - Testing and Inspecting Services for additional requirements.

**1.06 QUALITY ASSURANCE**

- A. Underground utility lines shall not be covered by backfill until "As-Built" elevations and dimensions have been recorded on Record Drawings, and until the utility lines have been inspected and satisfactorily tested. As-built elevations shall be provided by the contractor's licensed surveyor.
- B. Before commencing backfilling of utilities, take photo-graphs showing relationship of below ground utilities to structure(s) or other physical reference point. Provide three-ring binder containing 5" x 7" prints of photos, and negatives categorized by locations and indicating utilities shown.

Number each photograph and provide a site plan with a location shown for each photo. The location of the number shall correlate with the place the photo was taken and the direction the camera was pointed.

**PART 2 - PRODUCTS**

**2.01 MATERIALS**

- A. Bedding sand shall be as defined by Standard Specifications for Public Works Construction, current Edition (Green Book) Section 202.2, and shall be free of expansive material and organic matter. Bedding material for utility lines and storm drains outside the property lines shall be as required by the agency having jurisdiction.
- B. Backfill material shall be as recommended by geotechnical report.

**PART 3 - EXECUTION**

**3.01 PREPARATION**

- A. Underground Utilities: Carefully lay out the route of each underground utility prior to trenching. Coordinate the work of various trades to avoid conflicts.
- B. Clearances: Maintain required horizontal and vertical clearances from structural footings for utility trenches running parallel to footings. In the event of conflict the Architect shall be notified.
- C. Saw cut and remove any pavement necessary for installation of all utilities shown on the plans, including architectural, landscape, civil, plumbing, electrical and low voltage. Provide new pavement to match the existing pavement removed, if not specifically shown differently on the plans. In all cases, the worst case rules.

**3.02 TRENCHING**

- A. Excavate trenches for utilities to the required lines, grades and elevations indicated on the drawings and as specified. Hand trim changes in direction and bottoms of trenches. Accurately shape and thoroughly compact trench bottom to required grade. Keep trenches clean until installed work has been approved.
- B. Trench Dimensions: For adequate pipe clearances and dimensions provide the following minimum dimensions unless otherwise required by the drawings, specifications, utility

company regulations, codes, or manufacturers recommendations.

1. Pipe Depths:
  - a. Sewer: Minimum 30 inches plus pipe diameter plus 4 inch bedding.
  - b. Storm Drain: Minimum 24 inches plus pipe diameter plus 4 inch bedding.
  - c. Gas: 30 inches plus pipe diameter plus 4-inch bedding.
  - d. Domestic Water:  
PVC: 36 inches plus pipe diameter plus 4 inch bedding.  
Other: 36 inches plus pipe diameter plus 4 inch bedding.
  - e. Irrigation Water:
    - 1) 3 inch diameter or less: 18 inches plus pipe diameter plus 2 inch bedding.
    - 2) 4 inch diameter or more: Same as domestic water.
2. Trench Widths:
  - a. Sewer: 6 inches plus pipe diameter min.
  - b. Storm Drain: 6 inches plus pipe diameter, min..
  - c. Gas: 8 inches plus pipe diameter, min.
  - d. Domestic Water: 8 inches plus pipe diameter, min.
  - e. Joint Trench: Joint trenches are allowed in accordance with the current edition of the Greenbook, Standard Specifications for Public Works Construction and local jurisdiction standards. Contractor shall submit a trench plan to the project engineer for approval prior to proceeding with joint trenches not shown on the plans. Contractor cannot assume joint trenches are allowed during bidding, unless joint trenches are shown on the plans.

### 3.03 BEDDING

- A. Lay pipe in compacted bedding sand of thickness as specified above and backfill with bedding sand to a height of 12 inches above the top of the pipe. Place sand in 6 inch layers, compacting each lift to a minimum relative density of 90 percent. Compaction by flooding is prohibited.

### 3.04 BACKFILLING

- A. Backfill with approved native or import soils as specified in Article 2.01 herein.
- B. Spread, water, and mix backfill to obtain optimum moisture content. Compact by mechanical means in 6 inch lifts to a minimum relative density of ninety percent (95%) in accordance with ASTM D1557-12, after the first 12-inches.
- C. Continue backfilling as required to secure final grade elevations.

- D. Backfill existing utilities which may be uncovered during course of construction in the same manner as specified herein for new utilities.
- E. Coordinate backfilling with representative of Owner's Testing Laboratory.

**3.05 CLEANUP**

- A. Transport unsuitable material to a legal off-site disposal area.

**END OF SECTION**

SECTION 32 13 73

CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
  - 1. Expansion and contraction joints within cement concrete pavement.
  - 2. Joints between cement concrete and asphalt pavement.
- B. Related Sections include the following:
  - 1. Division 32 Section "Curbs, Gutters, Sidewalks and Driveways" for constructing joints in concrete pavement.

1.03 SUBMITTALS

- A. Comply with Section 01 33 00 Submittal Procedures.
- B. Product Data: For each joint-sealant product indicated.
- C. Samples for Verification: For each type and color of joint sealant required. Install joint-sealant samples in ~~1/2-inch-~~ (13-mm-) wide joints formed between two ~~6-inch-~~ (150-mm-) long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Product Certificates: For each type of joint sealant and accessory, signed by product manufacturer.
- E. Qualification Data: For Installer.
- F. Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
  - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
  - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for sealants.

1.04 QUALITY ASSURANCE

- A. Installer Qualifications: An employer of workers trained and approved by manufacturer.

- B. Source Limitations: Obtain each type of joint sealant through one source from a single manufacturer.
- C. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
  - 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  - 2. Submit not fewer than [eight] pieces of each type of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
  - 3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
  - 4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
  - 5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing of current sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
- D. Product Testing: Obtain test results for "Product Test Reports" Paragraph in "Submittals" Article from a qualified testing agency based on testing of current sealant products within a 36-month period preceding the [commencement of] the Work.
  - 1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 for testing indicated, as documented according to ASTM E 548.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver materials to Project site in original unopened containers or bundles with labels indicating manufacturer, product name and designation, color, expiration date, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials to comply with manufacturer's written instructions to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

**1.06 PROJECT CONDITIONS**

- A. Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer.
  - 2. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F (4.4 deg C).
  - 3. When joint substrates are wet or covered with frost.
  - 4. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.



5. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

## PART 2 - PRODUCTS

### 2.01 MANUFACTURERS

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products listed in other Part 2 articles.
- B. Products: Subject to compliance with requirements, provide one of the products listed in other Part 2 articles.

### 2.02 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer based on testing and field experience.
- B. Colors of Exposed Joint Sealants: As selected by Landscape Architect from manufacturer's full range.

### 2.03 COLD-APPLIED JOINT SEALANTS

- A. Single-Component Urethane Sealant for Concrete: Single-component, pourable, coal-tar-modified, urethane formulation complying with ASTM C 920 for Type S; Grade P; Class 25; Uses T, M, and, as applicable to joint substrates indicated, O.
- B. One part moisture curing polyurethane sealant designed for caulking applications of exterior horizontal joints. Self-leveling and compatible for uses with the expansion material.
  1. Products:
    - a. Sonneborn, Div. of ChemRex, Inc.; Sonomeric 1.
    - b. Polytite
    - c. Tremco

### 2.04 JOINT-SEALANT BACKER MATERIALS

- A. General: Provide joint-sealant backer materials that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by joint-sealant manufacturer based on field experience and laboratory testing.
- B. Round Backer Rods for Cold- and Hot-Applied Sealants: ASTM D 5249, Type 1, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.
- C. Retain first paragraph below for use of cold- and hot-applied sealants in joints, such as expansion joints, where it is desirable for backing material to fill remainder of joint opening under sealant and minimize intrusion of water and incompressible foreign objects.

- D. Backer Strips for Cold- and Hot-Applied Sealants: ASTM D 5249; Type 2; of thickness and width required to control sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.
- E. Round Backer Rods for Cold-Applied Sealants: ASTM D 5249, Type 3, of diameter and density required to control sealant depth and prevent bottom-side adhesion of sealant.

**2.05 PRIMERS**

- A. Primers: Product recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

**PART 3 - EXECUTION**

**3.01 EXAMINATION**

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.02 PREPARATION**

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions.
- B. Joint Priming: Prime joint substrates where indicated or where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

**3.03 INSTALLATION OF JOINT SEALANTS**

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install backer materials of type indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
  - 1. Do not leave gaps between ends of backer materials.
  - 2. Do not stretch, twist, puncture, or tear backer materials.
  - 3. Remove absorbent backer materials that have become wet before sealant application and replace them with dry materials.
- D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
  2. Completely fill recesses provided for each joint configuration.
  3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
1. Remove excess sealants from surfaces adjacent to joint.
  2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions, unless otherwise indicated.
- G. Provide recessed joint configuration for silicone sealants of recess depth and at locations indicated.
- 3.04 CLEANING
- A. Clean off excess sealants or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.
- 3.05 PROTECTION
- A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations with repaired areas are indistinguishable from the original work.

**END OF SECTION**

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SECTION 32 16 00

**CURBS, GUTTERS, SIDEWALKS, AND DRIVEWAYS**

**PART 1 - GENERAL**

1.01 SUMMARY

- A. Section includes: Concrete curbs, gutters, walks and pavements as indicated on the Drawings and specified herein.
- B. Related Sections:
  - 1. Preparation of Finish Grade, Section 31 22 19.
  - 2. For testing requirements refer to Section 01 45 23 - Testing and Inspecting Services.
  - 3. Reinforcing, Section 03 20 00.
  - 4. Concrete, Section 03 30 00.

1.02 QUALITY ASSURANCE

- A. The curbs and gutters shall be staked by a Land Surveyor licensed to practice in the State of California.

1.03 SUBMITTALS

- A. Reinforcing bars certification and concrete mix design.

**PART 2 - PRODUCTS**

2.01 MATERIALS

- A. Cement: ASTM C150, Type I; Type II, or Type V, in accordance with the geotechnical report.
- B. Aggregates: ASTM C33. 3/4-inch maximum for 4 inch thick slabs, conforming to CBC, 2019, Title 24, Part 2. Obtain from an approved source to insure uniform quality and grading; deliver so that moisture content variations will not decrease production of reasonably uniform concrete. Do not use aggregates that are reactive with alkalies.
  - 1. 3/4" for Curb and Gutter
  - 2. 3/4" for Broom Finish
  - 3. 3/8" for sandblasted on other exposed aggregates
- C. Reinforcing Steel: Bars, ASTM A615-09b, grade 60. Reinforcing steel shall be minimum of #3's at 18" o.c. each way. WWM is not acceptable. If plans are vague, or if rebar is shown at a lesser on-center or size, at a minimum the field reinforcing shall be #3's at 18" o.c. More stringent requirements may be shown on the plans and details, however, if no field rebar is specifically shown, then the contractor shall assume #3's at 18" o.c. **IN ALL CASES THE MINIMUM OR LARGER/CLOSER SPACED FIELD REBAR MUST BE**

PROVIDED.

- D. Dowels - "Speed Dowel" by Greenstreak 1/2" x 12" unless otherwise required by Architect. Use smooth steel dowels.
- E. Curb and Gutter Expansion Joint Filler: Celotex "Flexcell," 1/2-inch thick or Homex 300, 1/2-inch thick.
- F. Walk and Slab Expansion Joint Filler: ASTM D1751. Equal must be certified by the Green Building Council.
  - 1. Walks and Back of Curb: 1/4" Fiberboard, W.R. Meadows or 1/4" Polyethylene, closed cell expansion joint filler by Deck-O-Foam, or Equal.
- G. Backer Rod - Closed Cell Polyethylene.
- H. Expansion Joint Sealer: Refer to Section 07 92 00, Joint Sealants. Match color of pavement equal to Pecora Dyna Tred.
- I. Water: Clean, fresh and potable.
- J. Truncated Domes – Use Pre-cast Detectable Warning Pavers by Tectura Designs, Style ADA-03, or equal. CBC, 2019, Title 24, Part 2, Chapter 11B-705.1.2.5.
  - 1. Detectable Warnings, CBC, 2019, Title 24, Part 2, Chapter 11B-705.1.2.5, and the latest edition of California Code of Regulations / IR 11B-4: Detectable Warnings.
    - a. Square grid, in-line pattern:
    - b. Diameter of nominal 0.9 inch (22.9mm) at base tapering to 0.45 inch (11.4) at top.
    - c. Nominal height of 0.2 (5.08 mm) inch.
    - d. Nominal center to center spacing of 2.35 (59.7 mm).
    - e. Color "yellow" conforming to Federal Color No. 33538 per Standard No. 595C. CBC Chapter 11B-705.1.2.5 and 11B-810.5.2.
  - 2. Detectable warnings surfaces shall comply with **CBC Section 11B-705.1**.
    - a. Detectable warning surfaces shall be yellow conforming to FS 33538 of Federal Standard 595B, except for locations at curb ramps, islands, or cut-through medians where color used shall contrast visually with that of adjacent walking surfaces, either light-on-dark, or dark-on-light. **CBC Sections 11B-705.1.1.3 and 11B-705.1.1.5.**
    - b. Detectable warning surfaces shall differ from adjoining surfaces in resiliency or sound-on-cane contact. **CBC Section 11B-705.1.1.4.**
    - c. Provide minimum 5 year warranty per **DSA Bulletin 10/31/02, revised 04/09/08.**
  - 3. 2019 California Building Standards Codes; DSA Bulletin, October 31, 2002 (Revised 4/9/2008) Exception to the Independent Entity Evaluation and Product Approval of Detectable Warnings and Directional Surfaces: In the interim and until such time that the evaluation and approval program for detectable warning products and directional surfaces is fully developed, operational and product approvals can be issued, DSA will provisionally accept a written five (5) year product warranty provided by the manufacturer of detectable warnings and directional surface products as equivalent to the evaluation and product approval

program. Such warranty shall indicate compliance with architectural standards as published in the current edition of the California Building Standards Code, and also include durability criteria which indicates that the shape, color fastness, confirmation, sound-on-cane acoustic quality, resilience, and attachment will not degrade significantly for at least five (5) years after initial installation.

As used in this bulletin, "not degrade significantly" means that the product maintains at least 90 percent of its approved design characteristics, as determined by the enforcing agency.

## 2.02 DESIGN REQUIREMENTS

- A. Concrete Design Strength: Concrete for curbs, gutters, walks and pavement shall develop a minimum ultimate compressive strength of 3000 psi and have a water to cement ratio of 0.5 minimum, unless otherwise specified in the geotechnical report. Refer to Section 03 30 00 for all concrete requirements.

## 2.03 SEALING COMPOUNDS

- A. Sealing Compound: Sinak HLQ-125.

# PART 3 - EXECUTION

## 3.01 PREPARATION

- A. Base Course: Subgrade shall be smooth, true to line and grade, and shall be tested for required compaction prior to start of placing concrete. Dampen subgrade 24 hours before placing. Reroll as required to smooth, hard, even surface of 90 percent compaction. Wet forms to tighten cracks.

## 3.02 INSTALLATION

- A. Formwork:
  - 1. Stake rigidly at 4 feet on centers and secure against displacement. Formwork shall not deviate more than 1/2-inch from required vertical positions and 1 inch from required horizontal positions.
  - 2. Carefully set forms to alignment, grade, and required dimensions. Hold forms rigidly in place by stakes, clamps, spreaders, and braces where required to insure rigidity.
  - 3. Apply form release to form lumber in accordance with manufacturer's recommendations.
  - 4. Place joint filler on vertical surfaces in contact with concrete paving.
- B. Reinforcement: Upon completion of base course and formwork, install reinforcement where shown on the Contract Drawings.
  - 1. Clean reinforcement to remove loose rust and mill scale, earth, and other materials which reduce or destroy bond with concrete.
  - 2. Position, support, and secure reinforcement against displacement by concrete placement operations.

3. Place reinforcement to obtain the required coverages for concrete protection.

### **3.03 APPLICATION**

#### **A. Concrete:**

1. Mixing: Transit mix the concrete in accordance with provisions of ASTM C94.
2. Conveying and Placing: Place concrete in accordance with pertinent recommendations contained in ACI 304 and with the following;
  - a. Deposit concrete continuously in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause formation of seams or places of weakness within the section.
  - b. Deposit and consolidate concrete in a continuous operation within the limits of construction joints until the placing of a panel or section is completed.
    - 1) Bring surfaces to the correct level with a straight-edge, and then strike off.
    - 2) Use bullfloats or darbies to smooth the surface, leaving it free from bumps and hollows.
  - c. Do not sprinkle water on the plastic surface. Do not disturb the surfaces prior to start of finishing operations.
  - d. Do not use concrete which has become non-plastic and unworkable, which does not meet required quality control limits, or which has been contaminated by foreign materials.

### **3.04 CONTROL JOINTS**

- A. Tops of joint shall be installed flush with the concrete surface. Depth of joint shall be a minimum of 1/4 the thickness of slab. Use control joints on curbs, curbs and gutters, and cross gutters at maximum intervals of 20 feet on center. Sawed joints may be used in lieu of the above upon Architect's written approval providing they are at least 1-inch deep.

### **3.05 FINISHES**

- A. Paved areas between buildings will consist of various different finishes such as medium and heavy broom, steel trowel exposed aggregate and rock salt. See architectural drawings for specific type of finish for these areas.
- B. Walks, Pavements, Stairs and Ramps: Portland cement concrete paving and concrete finishes shall have the following broom finishes:
  1. Walks (Portland Cement Concrete paving and concrete finishes):
    - a. Slopes Less than 6%: Surfaces with a slope of less than 6 percent gradient shall be at least as slip-resistant as that described as medium broom finish, perpendicular to the direction of travel. (CBC Sections 11B-403.1, 11B-403.2, 11B-403.5.1 Exception 3, 11B-403.5.3, 11B-302.1.)



- b. Slopes 6% or Greater: Surfaces with a slope of 6 percent gradient shall be slip-resistant as that described as heavy broom finish, perpendicular to the direction of travel. (CBC Sections 11B-403.1, 11B-403.2, 11B-403.5.1 Exception 3, 11B-403.5.3, 11B-302.1.)
  - c. Surface slopes of accessible parking spaces and access aisles shall be the minimum possible and shall not exceed 2% slope in any direction. CBC 2019 11B-502.4
2. Pavement Markings per plans and as specified below:
- a. Accessible parking spaces shall be located as near as practical to a primary entrance and shall be marked according to CBC 2019 Sections 11B-502.3.3 and 11B-502.6.
  - b. Loading and unloading access aisle shall be marked by a border painted blue. Within the blue border, hatched lines a maximum of 36" on center shall be painted a color contrasting with the parking surface, preferably blue or white. CBC Figures 11B-502.2, 11B-502.3, 11B-502.3.3, and 11B-503.3.
  - c. When blue color is used, it shall conform to Color No. 15092 per Federal Standard 595B.
  - d. Painted lines and markings on pavement are recommended to be 3" wide minimum.
- C. Gutters: Light broom finish with 3 inch wide steel trowel finish at flowlines.
- D. Curbs: Steel trowel finish.
- E. Stair Treads and Nosings: Provide a 2 inch wide, scored and painted line of 70% minimum contrasting color, 1-inch maximum from the edge of the nosing and extending the entire width of each tread.
- F. On-Site Drive Aprons: Heavy broom finish.

### 3.06 CURING

- A. Comply with 2019, California Building Code, Title 24, Part 2, Section 1903A and ACI318-14 Section 26.5.3.
  - 1. Begin final curing procedures immediately following initial curing and before concrete has dried. Continue final curing for at least seven (7) days in accordance with ACI 301 procedures. Avoid rapid drying at end of final curing period.
- B. Curing Methods: Perform curing of concrete by curing as herein specified.
  - 1. Provide moisture-curing by the following methods:
    - a. Keep concrete surface continuously wet by covering with water.
    - b. Continuous water-fog spray.
    - c. Covering concrete surface with specified absorptive cover, thoroughly

saturation cover with water and keeping continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4 inch lap over adjacent absorptive covers.

2. Provide curing and sealing compound to exposed exterior slabs, walks, and curbs, as follows:
  - a. Apply specified curing and sealing compound to concrete slabs as soon as final finishing operations are complete (within 2 hours). Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Re-coat areas subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
  - b. Do not use membrane curing compounds on surfaces which are to be covered with coating material applied directly to concrete, liquid, floor hardener, waterproofing, dampproofing, membrane roofing, flooring (such as ceramic or quarry tile, glue-down carpet), painting, and other coatings and finish materials, unless otherwise acceptable to Architect.
- C. Concrete slabs and paving shall be properly cured and protected against damage and defacement of nature during construction operations. If weather is hot or surface has dried out, spray surface with fine mist of water starting not later than two hours after final troweling. Surface of finish shall be kept continuously wet for at least ten days. Wetting is considered emergency work and shall be performed on weekends and holidays if necessary.
- D. In lieu of water curing, within 24 hours after finishing, the concrete may be cured with a clear liquid curing compound such as "Sealtight 1100-Clear" by W.R. Meadows or equal applied in accordance with manufacturer's recommendations.

### **3.07 OFF-SITE CONCRETE WORK**

- A. Concrete driveway aprons, street sidewalks, curbs and gutters, etc., indicated to be constructed outside of property lines shall conform to the standards and specifications of the public agency having jurisdiction and shall be subject to inspection by its representative. Obtain and pay for necessary permits. The Owner will pay for inspection fees.

### **3.08 FIELD QUALITY CONTROL**

- B. Flood Tests: Concrete gutters and concrete pavement shall be given a flood test in the presence of the Inspector. Concrete work where water ponds and does not run off in a reasonable amount of time, shall be removed to the nearest score or joint line and replaced to provide proper drainage.

**END OF SECTION**

**SECTION 33 10 00**

**WATER UTILITIES**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section Includes: Site domestic water, and fire water service piping and appurtenances from the source of potable water to a point 5 feet outside the building.
- B. Related Work:
  - 1. Site drainage systems
  - 2. Sanitary sewer system
  - 3. Earthwork, trenching and backfilling
- C. Related Sections:
  - 1. Excavation and Fill, Section 31 23 00.
  - 2. Sanitary Sewer and Storm Drainage Piping, Section 33 41 00.

**1.02 REFERENCED STANDARDS**

- A. The editions and specifications and standards referenced herein, published by the following organizations apply to the construction only to the extent specified by the reference.
  - 1. Standard Specifications:
    - a. Standard Specifications for Public Works Construction, The Green Book, Current Edition.
    - b. Standard Special Provisions of the Regional Standards Committee.
  - 2. Standard Drawings:
    - a. Water Agencies Standard Drawings, Current Edition.
    - b. San Diego County Regional Standard Drawings.
  - 3. American Water Works Association (AWWA).
  - 4. UNI-BELL PVC Pipe Association (UNI).

**1.03 SUBMITTALS**

- A. Procedures: Comply with requirements of Section 01 33 00 – Submittal Procedures.
- B. Submittals: List of materials proposed for use accompanied by manufacturer's latest printed literature with technical data.
- C. Certificates: Submit manufacturer's certification that materials meet specified requirements.

**1.04 QUALITY ASSURANCE**

- A. Prior to final acceptance of the work obtain acceptance of the work from the serving utility and submit copies of the Certificates of Completion to the Inspector for forwarding to the Owner.

**1.05 SEQUENCING OF LAND SCHEDULING**

- A. Install utility mains as soon as conditions permit other facilities and improvements to follow.
- B. Make installation of fire hydrants and water service laterals for meters and after construction of Portland cement concrete curbs unless otherwise shown on the drawings. Install water gate valve boxes and covers, and adjust to finished grade following completion of the asphaltic concrete pavement.
- C. Install tops of manholes, junction chambers, vaults, boxes, and valve boxes unless otherwise indicated on Drawings, to an elevation 3 inches below rough grade and raise to final elevation after paving.

**PART 2 - PRODUCTS**

**2.01 WATER SYSTEMS COMPONENTS.**

GENERAL : All potable water system components and solder shall be lead free as defined by the State of California, Department of Toxic Substance Control law : "Requirements for Low Lead Plumbing Products in California"

"Lead free" means that the maximum allowed lead content is:

- 0.20 percent lead in solder and flux;
- 0.25 percent lead in wetted surfaces of pipes, pipe fittings, plumbing fittings and fixtures, as determined by a weighted average.

- A. Water pipe shall be polyvinylchloride (PVC) Class 305, ANSI/AWWA C900 or ANSI/AWWA C905, for 4" diameter or larger.
- B. Copper type "K" for underground pipes 3 ½" diameter or smaller.
- C. PVC Schedule 80, Type I Grade I, with a Cell Classification of 12454 as defined in ASTM D1784 for pipes 3 ½" diameter or smaller if specified on plans.
- D. Gate Valves:
1. Provide iron body, bronze mounted, parallel seat, double disc, non-rising stem, bottom or side wedging, and complying with AWWA C500-09 Specifications.
  2. Provide 12 inch and smaller with a working pressure of 200 p.s.i. The working pressure and the name of the manufacturer shall be cast in plain letters on the body of the valve.
  3. Open by turning counterclockwise.
  4. Entire wedging mechanism shall be solid bronze and allow the gates to function properly when water pressure is exerted from either or both directions.
  5. Equip valves with flanged or threaded ends.

- 6. Valve stems shall be solid bronze.
- 7. Stem nuts shall be solid bronze.
- 8. Cast or rolled bronze used in the manufacture of gate valves shall contain a zinc content of not in excess of 5 percent and an aluminum content not in excess of 2 percent.
- E. Meter and Detector Check Assemblies: In accordance with local Water District requirements. Detector check assemblies shall be reduced pressure principal backflows only.
- F. Fire Hydrants: Conform to local Water District requirements. Minimum requirements shall be a wet barrel style with a minimum of one 2 ½" and one 4" outlet. The 4" outlet shall face the fire department access road. All outlets shall be provided with National Standard Threads (NST).
- G. Post indicators shall be UL listed.
- K. The outlets of fire hydrants shall be inspected and approved by the Fire Department. A field coat of paint shall be applied to hydrants after installation.
- L. Check Valves: Swing type spring loaded for 200 p.s.i.g. working pressure, set readily and tightly with the face of the closure elements made of a non-corrodible material such as bronze composition conforming to ASTM B62.
- M. Valve Boxes: Cast iron, slip adjustment type of appropriate size for valve and shall be Alhambra, No. A-3009 or approved equal. Each valve box cover shall have "Water" cast in the top using sharp-faced letters of 1 inch minimum height.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify drawing dimensions with actual field conditions. Inspect related work and adjacent surfaces. Report to Architect conditions which prevent proper execution of this work.

#### **3.02 PREPARATION**

- A. Excavate and construct trenches and manholes or other structures forming a part of the pipeline. Trench excavation shall require the approval of the Soils Engineer.

#### **3.03 CONNECTIONS TO EXISTING MAINS**

- A. Where connections are made between new work and existing mains, the connections shall be made by using special couplings (such as Rockwell Clamp and Coupling-Tapping Sleeves, or approved equal), and other fittings to suit the actual conditions. Methods of connections to existing mains shall be as required by local codes.

#### **3.04 PIPE INSTALLATION**

- A. Survey Line and Grade: Provide grade controls and survey lines in accordance with Section 01 50 00, Temporary Facilities and Controls.

- B. Pipe Installation: Pipe will be inspected in the field by the Inspector before and after laying. Corrective work shall be approved by the Inspector at no cost to the Owner. Installation of pipe shall conform to the requirements of Section 306-1.2 of the Standard
- C. Backfill and Compaction: Perform in accordance with Section 306-1.3 of the Standard Specifications. In backfilling the trench take necessary precautions to protect the pipe from damage to shifting. Depth of cover minimum 36 inches.
- D. Install concrete thrust blocks against undisturbed soil at bends, tees, crosses, valves, pipe ends and where changes in pipe diameters occur at reducers or in fittings. Also, install thrust blocks at valves 12 inches or larger when installed with rubber gasket joints. Thrust blocks shall be class 420-C-2000 Portland cement concrete, per drawings.
- E. Underground mains and lead-in connections to system risers shall be completely flushed before connection is made to any overhead sprinkler piping. Where underground piping is flushed and not immediately connected to the overhead piping, the riser shall be capped or otherwise protected to prevent debris, dirt, or animals from entering into the underground piping. This must be witnessed by the project inspector.
- F. Contractor shall provide a completed signed copy of the "Contractor's Materials and Test Certificate for Underground Piping", per NFPA 13, Figure 10.10.1.
- G. All piping and attached appurtenances subjected to a system working pressure shall be hydrostatically tested at 200 psi, or 50 psi in excess of the system working pressure, whichever is greater, and shall maintain that pressure without loss for 2 hours. If a connection is being made to the an existing system, it is the contractor's responsibility to locate all shut off valves, PIV's and any other devise that will inhibit the correct execution of the test or potentially damage any existing systems.
- H. A waterflow alarm test shall be conducted and approved the Project Inspector in accordance with NFPA 13, Sec. 24.2.3.1. An alarm must sound within 5 minutes for local alarm bell.
- I. Inspections are required prior to pouring thrust blocks, hydrostatic testing and during flushing.
- J. Installation, inspection, and testing shall confirm to 2019 NFPA 13, and 2019 NFPA 24.
- K. Unless otherwise approved by DSA, all fire piping shall be a minimum of 6" in diameter. The lowest operating nut shall be a minimum of 18" above grade and the hydrant flange shall be a minimum of 2" above grade. Hydrant flange shall not be more than 4" above grade.
- L. Fire hydrants shall be a minimum of 40-feet from all structures. A keyed gate valve shall be provided for each hydrant.
- M. All ferrous pipe and fittings shall be protected with loose 8 mil polyethylene tube. The ends of the tube and any splices made for T's or other piping components shall be sealed with 2" tape, approved for underground use. All bolted joints shall be cleaned and thoroughly coated with asphalt or other corrosion retarding material after assembly and prior to poly-tube installation.
- N. A 12" bed of clean fill sand shall be provided below and above the pipe (24" total). Sand shall be compacted to 90% of ASTM 1557 modified.
- O. All bolts used for underground connections shall be stainless steel.

- P. Pipe sections between appurtenances and joints shall be backfilled during hydrostatic testing to prevent movement.
- Q. All private hydrants, sprinkler control valves, detector check assemblies, post indicating valves, and fire department connections shall be painted OSIIA Red.
- R. All control valves shall be locked in the open position. Valves shall be monitored if they serve 100 or more sprinkler heads.

**3.05 FIELD QUALITY CONTROL**

- A. Testing of Pipelines: Perform tests required by governing agencies. Testing shall be performed in accordance with Section 306-1.4 of Standard Specifications. Furnish water, materials and labor for making the required tests. Tests shall be made in the presence of the Inspector. Notify the Inspector at least 48 hours before performing the required tests.

**3.06 CLEANING**

- A. Upon completion of work, leave the site clean and clear of debris and construction materials.

**END OF SECTION**

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**SECTION 33 41 00**

**SANITARY SEWER AND STORM DRAINAGE PIPING (12" and below)**

**PART 1 - GENERAL**

1.01 DESCRIPTION:

- A. These specifications designate the requirements for the furnishing and installing underground PVC gravity pipe for storm drain and sewers.

1.02 REFERENCED STANDARDS:

- A. The editions and specifications and standards referenced herein, published by the following organizations apply to the construction only to the extent specified by the reference.
  - 1. Standard Specifications:
    - a. Standard Specifications for Public Works Construction, The Green Book, Current Edition.
    - b. Standard Special Provisions of the Regional Standards Committee.
  - 2. Standard Drawings:
    - a. Water Agencies Standard Drawings, Current Edition.
  - 3. American Water Works Association (AWWA).
  - 4. UNI-BELL PVC Pipe Association (UNI).

1.03 SUBMITTALS:

- A. Submit manufacturer's catalog data on pipe to be supplied.
- B. Contractor shall provide a video tape to Project Manager after installation.

**PART 2 - MATERIALS**

2.01 PIPE MATERIALS

A. POLYVINYL CHLORIDE PIPE (PVC) AND FITTINGS:

- 1. Pipe and Fittings: Shall conform to ASTM D3034, shall be SDR 35, with ends suitable for elastomeric gasket joints. Pipe shall meet requirements of UNI-B-15-10. Main Supply lines shall be 4" minimum. Service lines shall be sized for usage.
- 2. Joints and Jointing Material: Utilize an integral bell and spigot with a solid cross section rubber gasket. Joints shall conform to ASTM D3212. Gaskets shall conform to ASTM F477.
- 3. Clean outs: Same material as sewer pipe with a PVC threaded fitting and riser. Clean outs are to have concrete collar and be located in easily accessible locations. Clean outs shall be set flush.
- 4. Pipe Stiffness: Minimum pipe stiffness (@ 5% deflect) shall be 46 for all sizes when

tested in accordance with ASTM D2412.

5. Flattening: There shall be no evidence of splitting, cracking, or breaking when the pipe is tested as follows:
    - a. Flatten specimen of pipe, six inches long between parallel plates in a suitable press until the distance between the plates is forty percent of the outside diameter of the pipe. The rate of loading shall be uniform and such that the compression is completed within two to five minutes.
  6. Products: Ringtite greenbell PVC sewer pipe, Johns-Manville, Denver, Colorado; Fluidtite PVC sewer pipe, Certainteed Corporation, Anaheim, California; or equal.
- C. Bedding – Bedding shall be 12" of sand per the Green Book, current edition.
- D. Concrete Manholes – 48 inch or 60" diameter pre-cast concrete manhole with eccentric entrance cone and grade rings as specified in the Standard Specifications of the **Helix Water District**. Larger manholes may be required as indicated on the Plans. Seal all manholes and water test.

### PART 3 - INSTALLATION

#### 3.01 TRENCHING AND BACKFILLING

- A. Trenching and backfilling shall be per Section 31 23 00 – Excavation and Fill.

#### 3.02 STORAGE OF MATERIALS:

- A. Inspect all materials delivered to the site for damage. Store materials on site in enclosures or under protective covering out of direct sunlight. Do not store materials directly on ground. Keep inside of pipes and fittings free of dirt and debris.

#### 3.03 INSTALLING JOINTS:

- A. Apply the joint manufacturer's lubricant to the pipe spigot to assemble the joint. Follow the manufacturer's instructions. Make joints water tight and root tight.
- B. All connections to mainline shall be at a 45 degree angle, or greater.

#### 3.04 INSTALLING THE PIPE:

- A. Install pipe in accordance with ASTM D2321, UNI-B-5-89 and the following:
  1. Inspect each pipe and fitting before lowering the pipe or fitting into the trench. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.
  2. Use implements, tools, and facilities for the safe and proper protection of the pipe. Handle pipe in such a manner as to avoid any physical damage to the pipe. Do not drop or dump pipe into trenches under any circumstances.
  3. When installing piping in trenches, do not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.
  4. Grade the bottom of the trench to the line and grade to which the pipe is to be laid,

with allowance for pipe thickness. Remove hard spots that would prevent a uniform thickness of bedding. Before laying each section of the pipe, check the grade with a straightedge and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.

5. At the location of each joint, dig bell (joint) holes in the bottom of the trench and at the sides to permit visual inspection of the entire joint.
6. Provide and maintain means and devices at all times to remove and dispose of all water entering the trench during the process of pipelaying. The trench shall be kept dry until the pipelaying and jointing are completed.
7. When the pipelaying is not in progress, including the noon hours, close the open ends of pipe. Do not permit trench water, animals, or foreign material to enter the pipe.
8. Lay pipe without break, upgrade from structure to structure, with the bell ends of the pipe upgrade.
9. Do not use the pipe as a drain for removing water that has infiltrated into the trench.
10. After joint assembly, bring the bedding material up to 1 foot above the top of the pipe. Place and compact the imported sand as directed in Section 31 23 00. The remainder of the backfill shall be native earth backfill, installed per Section 31 23 00.

#### 3.05 TESTING FOR ALIGNMENT:

- A. After the pipe has been installed, tested for leakage, backfilled to existing grade, and manholes raised to grade and resurfaced, "ball" the pipe from manhole with a sewer scrubbing ball. After balling the pipe, perform the following.
- B. "Mirror" straight sewers and inlet/outlet ends of curvilinear sewers. Perform balling and mirroring in the presence of the School District's Representative to test for alignment, grade, damage or defective pipe in place, or any other type of faulty installation. Should balling and mirroring indicate any faulty installation of the pipe, repairs or replacements shall be made at the Contractor's expense.

#### 3.06 LEAKAGE TEST (SEWER ONLY):

- A. Test for leakage by means of a water test. Test each section of pipe between manholes, along with the manholes.
- B. Even though a section may have previously passed the leakage test, test each section of sewer subsequent to the last backfill compacting operation in which heavy compaction equipment may have damaged or affected the required watertight integrity of the pipe, structure, or appurtenance.

#### 3.07 WATER TEST (SEWER ONLY):

- A. Test each section of pipe between two successive structures by closing the lower end of the pipe to be tested and the inlet pipe of the upper structure with plugs or stoppers. Fill the pipe and structure with water to a point 4 feet above the invert of the open pipe in the upper structure, or to a height of 10 feet above the invert of the sewer in the lower structure, whichever gives the less hydrostatic pressure on the lower structure.

- B. The total leakage shall be the decrease in volume of water in the upper structure. The leakage shall not exceed 0.025 gpm per inch of nominal diameter of pipe per 1,000 feet of sewer pipe being tested. Do not use the length of lateral connections in computing the length of pipe being tested.
- C. If the leakage is greater than allowed, overhaul the pipe and, if necessary, replace and relay until the joints and pipe comply with this test. Complete tests before trench is paved.

**END OF SECTION**

**SECTION 33 46 13**

**FOUNDATION DRAINAGE**

**PART 1 - GENERAL**

**1.01 SUMMARY**

- A. Section includes: Prefabricated drainage membrane systems for below-grade vertical applications, as indicated on the Drawings and specified herein.
- B. Related Sections:
  - 1. Section 03 30 00 – Cast-in-Place Concrete.

**1.02 WARRANTY**

- A. Provide two year unconditional guarantee against defects of materials and workmanship which allows water or moisture into areas of the structure which were to be protected by this membrane. Pay for costs of repairing or replacing the defective membrane, as well as costs of exposing and recovering membrane, and consequential damages to persons and property resultant of defective materials or workmanship.

**PART 2 - PRODUCTS**

**2.01 FOUNDATION DRAINAGE SYSTEM:** Foundation drainage systems are to be a molded sheet drainage panel system.

- A. Acceptable Manufacturers:
  - 1. SiteDrain 180 Series by American Wick Drain Crop.
  - 2. Hydroduct by W.R. Grace & Co.
- B. Use a prefabricated, composite drainage system made with drainage core and filter fabric with a minimum flow rate of 15 gpm/foot at 1 hydraulic gradient and 3,600 psf normal pressure.

**PART 3 - EXECUTION**

**3.01 INSTALLATION**

- A. Install systems using waterproofing installers. Roofing trades will not be acceptable to perform this work.
- B. Install systems in strict accordance with manufacturer's specifications. Obtain manufacturer's approval of substrate conditions prior to installing materials.
- C. Provide reinforcing strips, and backer rods necessary for joints and cracks.

**END OF SECTION**

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