

**PROJECT MANUAL FOR**  
**SACRAMENTO CITY UNIFIED SCHOOL DISTRICT**  
**JOHN F KENNEDY HIGH SCHOOL**  
**SWIMMING POOL UPGRADE**

LIONAKIS NO. 023264

DSA Backcheck Specifications

April 30, 2024

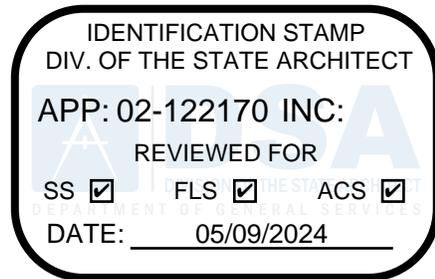
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LIONAKIS



PROJECT MANUAL  
FOR  
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT  
JOHN F KENNEDY HIGH SCHOOL SWIMMING POOL UPGRADE  
LIONAKIS JOB NO. 023264

OWNER:  
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT  
5735 47th Avenue  
Sacramento, CA 95824  
916-395-3970



ARCHITECT:  
LIONAKIS  
2025 19th Street  
Sacramento, CA 95818  
916-558-1900



Brian Bell

License # C28712

STRUCTURAL ENGINEER:  
LIONAKIS  
2025 19th Street  
Sacramento, CA 95818  
916-558-1900



Lucas Jolly

License # S5153

CIVIL ENGINEER:  
WARREN CONSULTING ENGINEERS, INC.  
1117 Windfield Way, Suite 110  
El Dorado Hills, CA 95762  
916-985-1870



---

Anthony J. Tassano

License # C74696

MECHANICAL ENGINEER:  
CAPITAL ENGINEERING  
11020 Sun Center Drive, Suite 100  
Rancho Cordova, CA 95670  
916-851-3500



---

Thomas Duval

License # M22836

ELECTRICAL ENGINEER:  
LP CONSULTING ENGINEERS, INC.  
1209 Pleasant Grove Blvd.  
Roseville, CA 95678  
916-771-0778

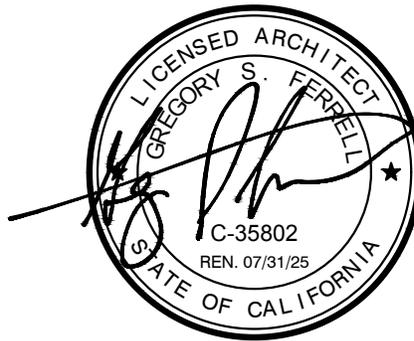


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Rami Zeidan

License # E16762

SWIMMING POOL ARCHITECT:  
AQUATIC DESIGN GROUP, INC.  
2226 Faraday Ave.  
Carlsbad, CA 92008  
760-438-8400



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Gregory S. Ferrell

License # C35802

Agency Approval:

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PROJECT MANUAL  
FOR  
SACRAMENTO CITY UNIFIED SCHOOL DISTRICT  
JOHN F KENNEDY HIGH SCHOOL SWIMMING POOL UPGRADE

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## SECTION 01 31 14

## ADDITIONAL REQUIREMENTS FOR DSA REVIEWED PROJECTS

**PART 1 - GENERAL**

## 1.01 SECTION INCLUDES

- A. Additional requirements for projects reviewed by the Division of the State Architect (DSA).

## 1.02 RELATED SECTIONS

- A. Section 01 45 00 – Quality Control: Testing and Inspection.
- B. Section 01 77 00 – Contract Closeout and Final Cleaning: Project closeout requirements.

## 1.03 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Section 01 42 16 for definitions and Section 01 42 13 for abbreviations and acronyms.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. California Code of Regulations (CCR).
  - 1. Title 8, Division 1, Chapter 3.2 – California Occupational Safety and Health Regulations (Cal/OSHA).
  - 2. Title 8, Division 1, Chapter 4, Sub-Chapter 4 – Construction Safety Orders.
  - 3. Title 8, Division 1, Chapter 4, Sub-Chapter 7 – General Industry Safety Orders.
  - 4. Title 19, Division 1 – State Fire Marshal (SFM).
  - 5. California Code of Regulations, Title 24, Part 1 - California Administrative Code.
- a. All Code Section numbers in this Section refer to Chapter 4 “Administrative Regulations for the Division of the State Architect – Structural Safety”, Group 1 “Safety of Construction of Public Schools”.
- D. Division of the State Architect Interpretation of Regulations Manual (DSA IR)
  - 1. DSA IR A-6 – Construction Change Document Submittal and Approval Process.
  - 2. DSA IR A-7 – Project Inspector Certification and Approval.
  - 3. DSA IR A-8 – Project Inspector and Assistant Inspector Duties and Performance.
  - 4. DSA IR A-12 – Assistant Inspector Approval.
- E. Division of the State Architect Website: [www.dsa.dgs.ca.gov](http://www.dsa.dgs.ca.gov).

1.04 GENERAL REQUIREMENTS

A. Contractor’s Duties:

1. Comply with California Administrative Code, Chapter 4, Article 6, Paragraph 4-343, “Duties of the Contractor” in addition to the duties described in the Contract Documents.
2. Comply with CCR Title 8, Division 1, Chapter 3.2, California Occupational Safety and Health Regulations (Cal/OSHA).
3. Comply with CCR Title 8, Division 1, Chapter 4, Sub-Chapter 4, Construction Safety Orders.
4. Comply with requirements of CCR Title 19, Division 1, State Fire Marshal (SFM).

B. Architect’s and Architect’s Consultants’ Duties: Comply with requirements of California Administrative Code, Chapter 4, Article 6, Paragraph 4-341, “Duties of the Architect, Structural Engineer or Professional Engineer” and Paragraph 4-344, “Duties of Mechanical and Electrical Engineers”, in addition to the duties described in the Contract Documents.

C. Arbitration: DSA is not subject to arbitration proceedings.

D. Should any existing conditions such as deterioration or non-complying construction be discovered which is not covered by the DSA approved documents wherein the finished work will not comply with Title 24, California Code of Regulations (CCR), a Construction Change Document (CCD), or a separate set of Drawings and Specifications, detailing and specifying the required repair work shall be submitted to and approved by DSA before proceeding with the repair work.

1.05 REGULATORY REQUIREMENTS

A. Perform all work in accordance with applicable laws, codes, ordinances, rules, and regulations including, without limitation, 2022 California Building Code (CBC) Parts 1 through 6, Part 9, Part 11, and Part 12 in accordance with Title 24, Part 1, 4-305. Maintain a copy of these documents at the project site at all times.

B. Codes adopted by the City, County, State, and Federal agencies govern minimum project requirements. Comply with the latest edition of applicable regulatory requirements and standards unless otherwise indicated or specified.

C. Work as described in Drawings and Specifications shall not be construed as to permit work not in accordance with applicable laws, codes, ordinances, rules, and regulations.

1.06 INSPECTION AND SUPERVISION

A. Supervision by DSA shall be in accordance with California Administrative Code, Chapter 4, Article 5, Paragraph 4-334.

B. Owner shall select and pay for the services of a Project Inspector, certified and approved by the Architect, the Structural Engineer (when applicable), and DSA in accordance with Title 24, Part 1, 4-333(b).

1. When required, Owner will select and pay for the services of additional full-time Assistant Project Inspector(s) certified and approved by DSA in accordance with DSA IR A-12.

- C. Project Inspector shall have and maintain on the job at all times, the edition of CCR Title 24, Part 1 through Part 6 referred to in the Drawings and Project Manual per Title 24, Part 1, 4-342(b)3.
- D. Project Inspector shall inspect construction in accordance with California Administrative Code, Chapter 4, Article 5, Paragraph 4-333(b), "Inspection by a Project Inspector", and Article 6, Paragraph 4-342, "Duties of the Project Inspector", and DSA IR A-8.
  - 1. Project Inspector performance rating by DSA shall be in accordance with DSA IR A-8, Section 3.1, "Project Inspector Performance Review".
- E. Reports: Project Inspector shall submit the following:
  - 1. Semi-Monthly Reports: Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-337.
  - 2. Verified Reports: Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-336.
- F. Special Inspection Requirements:
  - 1. Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-333(c), "Special Inspection".
  - 2. Special inspection costs to be paid by Owner.
  - 3. Conduct special inspection in accordance with DSA-103, Statement of Structural Tests and Inspections.

1.07 TESTING AGENCY REQUIREMENTS

- A. Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-335, "Structural Tests and Special Inspections".
- B. Owner will select and pay for the services of a Testing Lab, certified and approved by the Architect, the Structural Engineer (when applicable), and DSA in accordance with Title 24, Part 1, 4-333(b).
- C. Sampling and testing shall be performed by properly qualified persons in accordance with applicable American Society for Testing and Materials (ASTM) standards.
- D. Conduct tests in accordance with DSA-103, Statement of Structural Tests and Inspections.
- E. Submit one copy of test reports to DSA.

1.08 SUBSTITUTIONS AND REQUESTS FOR INFORMATION

- A. Substitutions and Requests for Information (RFIs) that affect structural safety, fire and life safety, access compliance, or energy (as applicable) are Construction Change Documents and shall be submitted to DSA for review and approval prior to fabrication and installation on the project.

1.09 ADDENDA AND CONSTRUCTION CHANGES

- A. Comply with California Administrative Code, Chapter 4, Article 5, Paragraph 4-338, "Addenda and Construction Changes".

1. Addenda and Construction Changes, including supplementary drawings when applicable, shall be signed and stamped by the Architect and approved by DSA in accordance with Title 24, Part 1, 4-338(b).
- B. Comply with DSA IR A-6.
- C. Obtain DSA approval for changes to DSA approved Drawings and Specifications which affect Code-regulated construction and inspection/testing functions prior to start of that Work. Code-regulated construction refers to Work that is regulated by Code provisions applicable to public school construction, including those adopted by Division of the State Architect-Structural Safety Section (DSA/SS), Division of the State Architect-Access Compliance Section (DSA/AC), and Division of the State Architect-Fire and Life Safety Section (DSA/FLS).
1. All changes, substitutions, and Requests for Information (RFIs) that affect Structural Safety, Fire and Life Safety, Access Compliance, or Energy, as applicable, shall be submitted to DSA for review and approval as a Construction Change Document (CCD) prior to fabrication and installation of the Work in accordance with DSA IR A-6 and Title 24, Part 1, 4-338(c). Substitutions shall be for any material, system, or product that would otherwise be regulated by DSA.
- D. Changes can be approved by DSA through the CCD Category A or the CCD Category B review process, as applicable. Comply with DSA IR A-6, Article 3, Section 3.1, "CCD Category A" and DSA IR A-6, Article 3, Section 3.2, "CCD Category B".
1. CCD Category A is defined as changes to or affecting the Structural, Access, or Fire-Life safety portions of the Project.
  2. CCD Category B is defined as changes not affecting the Structural, Access, or Fire-Life safety portions of the Project.
  3. Construction Change Documents (Section 4-338(c)) must be signed by all of the following: A/E of Record, Structural Engineer (when applicable), Delegated Professional Engineer (when applicable), and DSA.
- E. Do not begin any work under addendum or construction changes until required DSA written approval is obtained.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

Not Used

END OF SECTION

SECTION 02 41 00

SITE DEMOLITION

**PART 1 – GENERAL**

1.01 SUMMARY

A. RELATED SECTIONS

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.
2. Section 01 50 00 - Temporary Facilities and Controls.
3. Section 01 50 13 - Construction Waste Management and Disposal.
4. Section 31 00 00 - Earthwork.

1.02 REGULATORY REQUIREMENTS

- A. Conform to applicable jurisdictional authority regulations and codes for disposal of debris.
- B. Coordinate clearing Work with utility companies
- C. Maintain emergency access ways at all times.
- D. Contractor shall comply with all applicable laws and ordinances regarding hazardous materials, including contaminated soils, hazardous material transformers, and similar materials or components.

1.03 SUBMITTALS:

- A. Schedule: Submit a detailed sequence of demolition and removal work, including dates for shutoff, capping, and continuance of utility services.
- B. Procedures: Submit written procedures documenting the proposed methods to be used to control dust and noise.

1.04 EXISTING CONDITIONS

- A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.
- B. Conduct demolition to minimize interference with adjacent structures or items to remain. Maintain protected egress and access at all times.

1.05 PROTECTION

- A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.
- B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.
- C. Safety Precautions Prevent damage to existing elements identified to remain or to be salvaged, and prevent injury to the public and workmen engaged on site. Demolish roofs, walls and other building elements in such manner that demolished materials fall within foundation lines of building. Do not allow demolition debris to accumulate on site. Pull down hazardous work at end of each day; do not leave standing or hanging overnight, or over weekends.
  - 1. Protect existing items which are not indicated to be altered. Protect utilities designated to remain from damage.
  - 2. Protect trees, plant growth, and features designated to remain as final landscaping as shown on drawings.
  - 3. Protect benchmarks from damage or displacement.
- D. Trees: Carefully protect existing trees that are to remain. Provide temporary irrigation as necessary to maintain health of trees.
- E. Fire Safety: The contractor shall conform to chapter 33 of the California Fire Code (CFC), "Fire Safety During Construction and Demolition", at all times during the construction process. A copy of this chapter can be provided.
- F. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- G. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.
- H. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- I. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.

## **PART 2 - PRODUCTS**

Not Used

### PART 3 – EXECUTION

#### 3.01 EXAMINATION

- A. Examine conditions of work in place before beginning work, report defects.
- B. Report existence of hazardous materials or unsafe structural conditions.

#### 3.02 PREPARATION

##### A. Scheduling:

- 1. General: Coordinate and schedule demolition work as required by the Owner and as necessary to facilitate construction progress.

##### B. Hazardous Materials:

- 1. General: Identify chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with demolition operations, and notify such jurisdictional agencies as may be required. Collect and legally dispose of such materials at official disposal locations away from the site.
- 2. Asbestos: If asbestos or materials containing asbestos are encountered, stop work immediately and contact the Owner. Do not proceed with demolition until directed by Owner.

##### C. Utility and Service Termination

- 1. Locate and identify existing utility, service and irrigation system components affected by work of this contract. Review existing record drawings, conduct site investigations, contact Underground Service Alert and other qualified cable/pipe/line locator services, and implement all other means necessary to define the location of underground systems.
- 2. Prior to beginning any demolition, properly disconnect all water, gas and electrical power supply at appropriate disconnect locations. Obtain all necessary releases and approvals from serving utility companies.
- 3. Prior to demolition or disconnect, obtain Owner's approval that such system does not impact facilities or systems beyond the extent of this contract.
- 4. Mark location of disconnected systems. Identify and indicate stub-out locations on Project Record Documents.

##### D. Verify that existing plant life and features designated to remain are tagged or identified.

- 1. The Architect will mark the features, trees, and shrubs to remain within the construction area. Contractor shall not commence clearing and grubbing operations until authorized by the Owner and all protective measures are in place.

- E. Coordinate the time and duration of all system disconnects with Owner.

### 3.03 DEMOLITION

#### A. General Requirements

1. Clear areas required for access to site and execution of Work, including pavements, structures, foundations, vegetation, trash and debris.
2. Coordinate with Owner the time of day and route to remove demolished materials from premises.
3. Remove demolished materials from site as work progresses. Upon completion of work, leave areas of work in clean condition.
4. Remove all buried debris, rubble, trash, or other material not deemed suitable by the Geotechnical Engineer.
5. Fill all voids or excavations resulting from clearing, demolition, or removal of vegetation with specified fill material.

#### B. Fixture and Equipment Removal:

1. Remove existing fixtures and equipment as identified and shown on drawings and required by Architect.
2. Verify all service connections to fixtures and equipment designated for removal have been properly disconnected.
3. Remove all conductors from conduit at all abandoned circuits.

### 3.04 UTILITY AND BUILDING SERVICES REMOVAL AND RE-INSTALLATION

- A. Where crossing paths and potential points of interference with existing utility services are shown or can be reasonably inferred from surface conditions or evidence of subsurface systems, such as meter boxes, vaults, relief vents, cleanouts and similar components.
  1. Review all contract documents showing crossing paths and potential points of interference.
  2. Pothole or determine by other means the accurate depth and location of such utilities.
  3. Incorporate all costs required to complete work under this contract, including additional trenching, re-routing of existing and new utilities, and all means necessary to construct work under this contract.
  4. No additional cost to the Owner will be allowed for work necessary to accommodate utility conflicts where such crossing paths are shown on contract drawings or can be reasonably inferred from surface conditions or components.
- B. Remove all conductors from conduit at all abandoned electrical circuits.
- C. Seal off ends of all piping, drains and other components as directed by Architect and serving utility.
- D. Where necessary to maintain service to existing utility and building systems, relocate or redirect all conduit and conductors, piping, drains, and associated system components.
  1. Re-circuit all electrical as required.

2. Re-circuit all landscape irrigation valving and control systems as required.
3. Temporarily terminate landscape system components in approved boxes or with approved caps, suitable for re-connection or extension.
4. Extend or otherwise modify all site drainage systems, including catch basins, drain inlets and piping. Fine grade to maintain proper drainage flow pattern to drains.

E. Demolish structure in an orderly and careful manner.

1. Use of explosives prohibited.

### 3.05 SITE PAVEMENT REMOVAL

A. Remove sidewalk and curb where required for new construction as specified and as indicated on the Drawings.

1. Remove all paving by saw-cutting.
2. Remove concrete paving and curbing at locations shown on drawings. Locate closest adjacent expansion or weakened plane joint to define start of removal or saw-cutting.

B. Remove asphalt concrete paving areas where required for new construction as specified and as indicated on the Drawings.

1. Remove all paving by saw-cutting.
2. Remove paving assembly as required to expose subgrade.

### 3.06 DISPOSAL

Demolished materials become property of the Contractor and shall be removed from premises, except those items specifically listed to be retained by Owner.

A. Dispose of all demolished material, trash, debris, and other materials not used in the work in accordance with the regulations of jurisdictional authority.

B. It is recommended that all materials that are of a recyclable nature, be transported to a suitable legal recycling facility instead of a dump or refuse facility (unless they are one-in-the same).

C. Burning and Burying of Materials: NOT ALLOWED.

D. Haul Routes:

1. Obtain permits as required by jurisdictional agencies. Establish haul routes in advance, post flagmen for the safety of the public and workmen.
2. Keep streets free of mud, rubbish, etc.; assume responsibility for damage resulting from hauling operations; hold Owner free of liability in connection therewith.

E. Remove demolished materials and debris from site on a daily basis.

### 3.07 CLEANING

- A. Upon completion of work of this Section promptly remove from the working area all scraps, debris.
- B. Clean excess material from surface of all remaining paved surfaces and utility structures.
- C. Power wash all concrete surfaces to remove stains, dried mud, tire marks, and rust spots.

END OF SECTION

SECTION 02 41 00.13

DEMOLITION

**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. Removal of designated construction.
- B. Identification of utilities.
- C. Demolition requirements.

1.02 RELATED SECTIONS

- A. Division 01 Sections, as applicable.

1.03 PROJECT RECORD DOCUMENTS

- A. Submit under provisions of Division 01.
- B. Accurately record actual locations of capped utilities and subsurface obstructions.

1.04 REGULATORY REQUIREMENTS

- A. Perform work of this Section under provisions of CBC Chapter 33, CFC Chapter 33, and NFPA 241 for demolition work, safety of structure, dust control and safety of occupants.
- B. Obtain required permits from authorities.
- C. Do not close or obstruct egress width to exits.
- D. Do not disable or disrupt building fire or life safety systems without three-day prior written notice to Owner.
- E. Conform to procedures applicable when discovering hazardous or contaminated materials.

1.05 SCHEDULING

- A. Schedule work under the provisions of Division 01.
- B. Describe demolition removal procedures and schedule.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

3.01 PREPARATION

- A. Provide, erect and maintain temporary barriers as required.
- B. Erect and maintain temporary partitions to prevent spread of dust, odors and noise to adjoining facilities.
- C. Protect existing materials and finishes that are not scheduled or otherwise required to be demolished.
- D. Mark location of utilities.

3.02 DEMOLITION REQUIREMENTS

- A. Conduct demolition to minimize interference with adjacent and occupied buildings.
- B. Maintain protected egress and access to the Work.

3.03 DEMOLITION

- A. Refer to Drawings for specific items to be demolished.
- B. Disconnect, remove, cap, and identify designated utilities within demolition areas.
- C. Demolish in an orderly and careful manner. Protect existing supporting structural members and materials.
- D. Except where noted otherwise, remove demolished materials from site. Do not bury or burn materials on site.
- E. Remove demolished materials from site as Work progresses. Upon completion of Work, leave areas in clean condition.
- F. Remove temporary Work.

END OF SECTION

## SECTION 03 30 53

## MISCELLANEOUS CAST-IN-PLACE CONCRETE

**PART 1 - GENERAL**

## 1.01 SECTION INCLUDES

A. Interior cast-in-place concrete work including, but not limited to, the following:

1. Concrete materials and mixture design.
2. Formwork.
3. Reinforcement.
4. Placement procedures and finishes.

B. Accessories:

1. Underslab vapor retarder.
2. Expansion joints.

## 1.02 RELATED SECTIONS

A. Divisions 21-23 – Mechanical Sections, as applicable to the Project.

B. Divisions 26-28 – Electrical Sections, as applicable to the Project.

C. Section 31 00 00 – Earthwork.

## 1.03 REFERENCES

A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.

B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.

C. ACI publications PRC-221, PRC-302.1, PRC-302.2, PRC-304, PRC-305, PRC-306, and PRC-309 contain recommended practices for concrete work. Submit any proposed deviations from these recommendations to Architect for review prior to commencing concrete work.

D. Referenced Standards:

1. AASHTO M182 – Standard Specification for Burlap Cloth Made from Jute or Kenaf and Cotton Mats.
2. ACI SPEC-117 – Specification for Tolerances for Concrete Construction and Materials.
3. ACI PRC-221 – Guide for Use of Normal Weight and Heavyweight Aggregates in Concrete.
4. ACI SPEC-301 – Specifications for Structural Concrete.

5. ACI PRC-302.1 – Guide for Concrete Floor and Slab Construction.
6. ACI PRC-302.2 – Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
7. ACI PRC-304 – Guide for Measuring, Mixing, Transporting, and Placing Concrete.
8. ACI PRC-305 – Guide to Hot Weather Concreting.
9. ACI SPEC-305.1 – Standard Specification for Hot Weather Concreting.
10. ACI PRC-306 – Guide to Cold Weather Concreting.
11. ACI SPEC-306.1 – Standard Specification for Cold Weather Concreting.
12. ACI PRC-309 – Guide for Consolidation of Concrete.
13. ACI CODE-318 – Building Code Requirements for Structural Concrete and Commentary.
14. ACI PRC-347 – Guide to Formwork for Concrete.
15. ACI SP-66 – ACI Detailing Manual.
16. ASTM A615/A615M – Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
17. ASTM A706/A706M – Standard Specification for Low Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
18. ASTM C31/C31M – Standard Practice for Making and Curing Concrete Test Specimens in the Field.
19. ASTM C33/C33M – Standard Specification for Concrete Aggregates.
20. ASTM C39/C39M – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
21. ASTM C94/C94M – Standard Specification for Ready-Mixed Concrete.
22. ASTM C109/C109M – Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
23. ASTM C114 – Standard Test Methods for Chemical Analysis of Hydraulic Cement.
24. ASTM C138/C138M – Standard Test Method for Density (Unit Weight), Yield, and Air Content (Gravimetric) of Concrete.
25. ASTM C143/C143M – Standard Test Method for Slump of Hydraulic Cement Concrete.
26. ASTM C150/C150M – Standard Specification for Portland Cement.
27. ASTM C157/C157M – Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.
28. ASTM C171 – Standard Specification for Sheet Materials for Curing Concrete.
29. ASTM C172/C172M – Standard Practice for Sampling Freshly Mixed Concrete.
30. ASTM C309 – Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
31. ASTM C348 – Standard Test Method for Flexural Strength of Hydraulic Cement Mortars.
32. ASTM C494/C494M – Standard Specification for Chemical Admixtures for Concrete.
33. ASTM C595/C595M – Standard Specification for Blended Hydraulic Cements.
34. ASTM C618 – Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
35. ASTM C881/C881M – Standard Specification for Epoxy Resin Base Bonding Systems for Concrete.
36. ASTM C928/C928M – Standard Specification for Packaged, Dry, Rapid Hardening Cementitious Materials for Concrete Repairs.
37. ASTM C939/C939M – Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).

- 38. ASTM C989/C989M – Standard Specification for Slag Cement for Use in Concrete and Mortars.
- 39. ASTM C1017/C1017M – Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
- 40. ASTM C1059/C1059M – Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete.
- 41. ASTM C1064/C1064M – Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete.
- 42. ASTM C1077 – Standard Practice for Agencies Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Testing Agency Evaluation.
- 43. ASTM C1107/C1107M – Standard Specification for Packaged Dry, Hydraulic Cement Grout (Nonshrink).
- 44. ASTM C1315 – Standard Specification for Liquid Membrane Forming Compounds Having Special Properties for Curing and Sealing Concrete.
- 45. ASTM D882 – Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
- 46. ASTM D1709 – Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
- 47. ASTM D1751 – Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- 48. ASTM D2240 – Standard Test Method for Rubber Property – Durometer Hardness.
- 49. ASTM D4397 – Standard Specification for Polyethylene Sheeting for Construction, Industrial, and Agricultural Applications.
- 50. ASTM E96/E96M – Standard Test Methods for Water Vapor Transmission of Materials.
- 51. ASTM E154/E154M – Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
- 52. ASTM E303 – Standard Test Method for Measuring Surface Frictional Properties Using the British Pendulum Tester.
- 53. ASTM E329 – Standard Specification for Agencies Engaged in Construction Inspection, Testing, or Special Inspection.
- 54. ASTM E1155/E1155M – Standard Test Method for Determining  $F_F$  Floor Flatness and  $F_L$  Floor Levelness Numbers.
- 55. ASTM E1643 – Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- 56. ASTM E1745 – Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
- 57. Concrete Reinforcing Steel Institute (CRSI) – Manual of Standard Practice. 27th edition.
- 58. ISO/IEC 17025 – General Requirements for the Competence of Testing and Calibration Laboratories (formerly ISO/IEC Guide 25-1990 and ASTM E548).
- 59. NRMCA Quality Control Manual – Section 3, “Plant Certification Checklist.”

#### 1.04 SUBMITTALS

- A. General: Submit in accordance with Division 01.

- B. Product Data: Submit manufacturer's descriptive literature and product specification for each product. Include manufacturer's written instructions and installation procedures.
- C. Drawings: Submit concrete pouring plan showing proposed locations of construction and control joints for Architect's review and acceptance, prior to concrete placement.
- D. Design Mixtures: For each concrete mixture.
- E. Certificates:
  - 1. Manufacturer's certification that materials (cementitious materials, aggregates, and admixtures) conform to Specifications.
- F. Concrete Placement Record: Keep a record on site including time and date of concrete placing for each portion of the structure for the duration of the project. Record additional information not included in batch ticket such as admixtures added at the job site. Make records available to Architect and DSA for review. Submit record to Architect at project completion.

#### 1.05 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Concrete Supplier: Firm specializing in products specified in this Section with a minimum five years documented experience; successfully supplying similar materials (design, content, and performance) as specified in this Section.
  - 2. Concrete Batch Plant: Complies with requirements of ASTM C94 and is currently certified per NRMCA Plant Certification Checklist – Section 3 or other certification acceptable to Architect and DSA.
  - 3. Contractor's Design Laboratory: Under the direction of civil engineer licensed by the State of California; conforming to ASTM E329 and ASTM C1077.
  - 4. Independent Testing Laboratory: Conforming to ASTM E329, ASTM C1077, and ISO/IEC 17025, acceptable to Architect and DSA.
- B. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.
- C. Product Substitutions: Comply with requirements of Division 01.

#### 1.06 REGULATORY REQUIREMENTS

- A. Structural Tests and Inspections: Refer to DSA Structural Tests and Inspection Sheet (Form DSA-103).
- B. Regulatory Requirements: Conform to requirements of 2022 California Building Code (CBC), Chapter 19A, "Concrete", Chapter 17A "Special Inspections and Tests", and as follows:
  - 1. Materials:
    - a. Cementitious Materials: CBC Chapter 19A, Section 1903A "Specifications for Tests and Materials" and Section 1910A.1 "Cementitious Material".

- b. Batch Plant Inspection: CBC Section 1705A, Paragraph 1705A.3.3 "Batch Plant Inspection".
2. Inspection: CBC Chapter 17A, Section 1705A "Required Special Inspections and Tests" Article 1705A.3 "Concrete Construction", as applicable.
  - a. Batch Plant Weighmaster Inspection: CBC Section 1705A, Paragraph 1705A.3.3 "Batch Plant Inspection".
3. Formwork: Conform to ACI PRC-347 for design, fabrication, erection, and removal of forms.
4. Steel Reinforcement:
  - a. Perform work in accordance with CRSI Manual of Standard Practice; ACI SPEC-301; and 2022 California Building Code (CBC) Chapter 17A "Special Inspections and Tests", and Chapter 19A "Concrete", and as follows:
    - 1) Steel Reinforcement, Tests and Materials: CBC Section 1903A "Specifications for Tests and Materials".
    - 2) Anchorage: CBC Section 1905A.1.8.
    - 3) Reinforcing Bar Welding: Per Section 1705A, Table 1705A.3 "Required Special Inspections and Tests of Concrete Construction" and Table 1705A.2.1 "Required Verification and Inspection of Steel Construction", Item 5b.
  - b. Structural Testing for Seismic Resistance: Perform tests for seismic resistance as required by CBC Chapter 17A, Section 1705A.14 "Testing for Seismic Resistance" and Paragraph 1705A.14.1 "Structural Steel".
- C. Comply with ACI SPEC-301, "Specification for Structural Concrete", including the following sections, unless modified by requirements in the Contract Documents.
  1. "General Requirements."
  2. "Formwork and Formwork Accessories."
  3. "Reinforcement and Reinforcement Supports."
  4. "Concrete Mixtures."
  5. "Handling, Placing, and Constructing."

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 01.
- B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- C. Store cement and other cementitious materials in weathertight buildings, bins, or silos which exclude moisture and contaminants and keep building materials completely separated.
- D. Arrange and use aggregate stockpiles in a manner to avoid excessive segregation and to prevent contamination with other materials or with other sizes of aggregates. Do not store aggregates directly on ground unless a sacrificial layer is left undisturbed.

- E. Refer to manufacturers' product data sheets for recommended shelf life and storage conditions for admixtures.
- F. Clearly and accurately label materials after containers have been opened.

## **PART 2 - PRODUCTS**

### **2.01 PRODUCTS AND MANUFACTURERS**

- A. Manufacturers and products specified in this Section are listed to establish minimum quality and performance requirements.
- B. Substitutions: Comply with requirements of Division 01.

### **2.02 FORMWORK**

- A. Furnish formwork and formwork accessories according to ACI PRC-347.

### **2.03 STEEL REINFORCEMENT**

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60, low-alloy deformed steel bars.
- B. Reinforcing Steel Indicated to be Welded: ASTM A706/A706M, Grade 60, low-alloy deformed steel bars.
- C. Tie Wire: Black annealed steel wire; No. 16 gauge.

### **2.04 CONCRETE MATERIALS**

- A. Cementitious Materials:
  - 1. Cement: ASTM C150, Type II, low alkali (equivalent alkalis (Na<sub>2</sub>O + 0.658K<sub>2</sub>O) no more than 0.6 percent per ASTM C114), gray.
  - 2. Supplementary Cementitious Materials (SCM):
    - a. Fly Ash: ASTM C618, Class F. Class C is not permitted.
    - b. Slag Cement: ASTM C989, Grade 100 or Grade 120.
- B. Aggregates: Aggregates used in concrete shall have a combined aggregate distribution similar to the aggregates used in the concrete represented by field test data or used in trial mixtures. Fine and coarse aggregates: ASTM C33. Low-shrinkage producing coarse aggregates per ACI 221R; manufactured from 100 percent crushed aggregates and uniformly graded as follows:

Sieve Number or Size in Inches	Percent Retained by Weight		
	1-1/2 inch Max.	1 inch Max.	3/4 inch Max.
2 inch	0-5	–	–
1-1/2 inch	0-8	0-5	–
1 inch	8-18	0-8	0-5
3/4 inch	8-18	8-18	0-8
1/2 inch	8-18	8-18	8-18
3/8 inch	8-18	8-18	8-18
No. 4	8-18	8-18	8-18
No. 8	8-18	8-18	8-18
No. 16	8-18	8-18	8-18
No. 30	8-18	8-18	8-18
No. 50	0-18	0-18	0-18
No. 100	0-8	0-8	0-8
No. 200	0-8	0-8	0-8

1. Maximum Nominal Size of Coarse Aggregate: CBC Section 1903A “Specifications for Tests and Materials,” and as follows:
  - a. 1/5 the narrowest dimension between sides of forms,
  - b. 1/3 depth of slab, or
  - c. 3/4 the minimum clear spacing between individual reinforcing bars or bundles of bars.
2. Aggregate sources shall not contain any alkali-silica reactive material in accordance with ASTM C33, Appendix XI.

C. Water: Potable and complying with ASTM C94/C94M.

## 2.05 ADMIXTURES

### A. General:

1. Manufacturer certified to contain chlorides.
2. Compatible with other admixtures and cementitious materials in the concrete mix.
3. Obtain Architect’s and DSA’s written acceptance prior to use of admixtures. Use admixtures according to manufacturer's written instructions.

### B. Acceptable Manufacturers:

1. Master Builders Solutions, Cleveland, OH; 800-228-3318 or 800-433-9517, [www.master-builders-solutions.com](http://www.master-builders-solutions.com).
2. Grace Construction Products, Cambridge, MA; 866-333-3726, [www.na.graceconstruction.com](http://www.na.graceconstruction.com).
3. The Euclid Chemical Co., Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
4. Sika Corp., Lyndhurst, NJ; 800-933-7452, [www.sikaUSA.com](http://www.sikaUSA.com).
5. Or accepted equal.

## C. Chemical Admixtures:

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Set Accelerating: ASTM C494/C494M, Type C or Type E.
4. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
5. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
6. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
7. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
8. Shrinkage Reducing: ASTM C157/C157M.

## 2.06 CURING MATERIALS

## A. General:

1. Comply with regulations of the California Air Resources Board and the local Air Pollution Control/Air Quality Management District. VOC limit: 350 g/L.
2. Verify compatibility with subsequent adhesives and coatings before application; furnish Manufacturer's certificate of compatibility. Coordinate with related Sections.

## B. Evaporation Retarder: Waterborne, monomolecular film forming; manufactured for application to fresh concrete.

## C. Absorptive Cover: AASHTO M182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 ounces per square yard when dry.

## D. Waterproof Sheet Materials for Curing: ASTM C171 and as follows:

1. Curing paper consisting of two sheets of kraft paper adhered together with a bituminous material with embedded cords or strands of fiber running in both directions not more than 1-1/4 inches apart.
  - a. Tensile strength in machine direction: Thirty foot-pounds per inch of width minimum.
  - b. Tensile strength in cross direction: Fifteen foot-pounds per inch of width minimum.
2. Polyethylene film: ASTM D4397; minimum six mil thickness.
3. White burlap-polyethylene sheeting: Consisting of burlap weighing not less than nine ounces per square yard extrusion coated on one side with at least four mil white opaque polyethylene sheet.

## E. Water: Potable.

## F. Curing Compound:

1. Water-emulsion, dissipating resin based; meets or exceed ASTM C309, Type 1, Class B.
  - a. Acceptable Products:
    - 1) Kurez DR-100 by The Euclid Chemical Co.
    - 2) 1100 by W. R. Meadows, Inc.

- 3) US SPEC Maxcure Resin Clear by US Mix Products Co.
- 4) Or accepted equal.

G. Surface Retarder: Water soluble liquid, formulated to retard wet surface of mortar in concrete.

1. Acceptable Products:

- a. MasterFinish EA by Master Builders Solutions.
- b. Sure Etch Series by The Euclid Chemical Co., Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
- c. Rugasol-S by Sika Corp., Lyndhurst, NJ; 800-933-7452, [www.sikaUSA.com](http://www.sikaUSA.com).
- d. Or accepted equal.

## 2.07 GROUTING, BONDING, AND PATCHING MATERIALS

### A. Grout:

1. Non-shrink Grout: ASTM C1107, non-metallic aggregate grout; 7000 psi minimum 28-day compressive strength at fluid water ratio per ASTM C939.

a. Acceptable Products:

- 1) Masterflow 928 by Master Builders Solutions, Cleveland, OH; 800-228-3318 or 800-433-9517, [www.master-builders-solutions.com](http://www.master-builders-solutions.com).
- 2) NS Grout, Hi-Flow Grout, or Euco Pre-Cast Grout by The Euclid Chemical Co., Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
- 3) US SPEC MP Grout by US Mix Products Co., Denver, CO; 800-397-9903, [www.usmix.com](http://www.usmix.com).
- 4) Or accepted equal.

2. Non-shrink Drypack Grout: Non-shrink, natural aggregates, 7000 psi minimum 28-day compressive strength.

a. Acceptable Products:

- 1) MasterFlow 100 by Master Builders Solutions, Cleveland, OH; 800-228-3318 or 800-433-9517, [www.master-builders-solutions.com](http://www.master-builders-solutions.com).
- 2) Dry Pack Grout by The Euclid Chemical Co., Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
- 3) Sealtight Pac-it by W.R. Meadows, Inc., Hampshire, IL; 800-342-5976, [www.wrmeadows.com](http://www.wrmeadows.com).
- 4) Or accepted equal.

### B. Bonding Materials:

1. Bonding Agent/Admixture:

a. Interior or exterior applications: Acrylic or SBR, latex cement bonding agent/admixture; non-re-emulsifiable; meets or exceeds ASTM C1059, Type II.

1) Acceptable Products:

- a) Akkro-7T, Flex-Con or SBR Latex by The Euclid Chemical Co., Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
  - b) US SPEC Acrylcoat by US Mix Products Co., Denver, CO; 800-397-9903, [www.usmix.com](http://www.usmix.com).
  - c) Sealtight Acry-Lok by W. R. Meadows, Inc., Hampshire, IL; 800-342-5976, [www.wrmeadows.com](http://www.wrmeadows.com).
  - d) Or accepted equal.
- b. Interior applications or exterior applications not subject to constant water immersions: Ethyl-vinyl acetate (EVA) copolymer liquid bonding agent and admixture; re-emulsifies once and will not re-wet; meets or exceeds ASTM C1059.
- 1) Acceptable Products:
    - a) Tammsweld by The Euclid Chemical Co., Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
    - b) US SPEC Multicoat by US Mix Products Co., Denver, CO; 800-397-9903, [www.usmix.com](http://www.usmix.com).
    - c) Or accepted equal.
2. Structural Bonding Epoxy Adhesive: Two component, 100 percent solids, 100 percent reactive; meets or exceeds ASTM C881/C881M, Type V, Grade 2, Class B or Class C as appropriate.
- a. Acceptable Products:
    - 1) MasterEmaco ADH 1090RS, MasterEmaco ADH 1420, or MasterEmaco ADH 327RS by Master Builders Solutions, Cleveland, OH; 800-228-3318 or 800-433-9517, [www.master-builders-solutions.com](http://www.master-builders-solutions.com).
    - 2) Dural 452 MV by The Euclid Chemical Co., Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
    - 3) Sealtight Rezi-Weld 1000 by W. R. Meadows, Inc., Hampshire, IL; 800-342-5976, [www.wrmeadows.com](http://www.wrmeadows.com).
    - 4) Or accepted equal.
- C. Repair Mortar: Exceeds ASTM C928, R1 and R2; rapid setting – minimum 1300 psi at three hours; 5500 psi at seven days per ASTM C109.
1. Acceptable Products:
    - a. MasterEmaco T 415/430 or MasterEmaco T 1060/1061 Repair Mortars by Master Builders Solutions, Cleveland, OH; 800-228-3318 or 800-433-9517, [www.master-builders-solutions.com](http://www.master-builders-solutions.com).
    - b. Euco-Speed, Versaspeed, or Speedcrete 2028 by The Euclid Chemical Co., Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
    - c. US SPEC Transpatch by US Mix Products Co., Denver, CO; 800-397-9903, [www.usmix.com](http://www.usmix.com).
    - d. Or accepted equal.

D. Repair Mortar (for patching over steel): Liquid polymer modified, containing and integral corrosion inhibitor, exceeds C928, R2; rapid setting – minimum 2500 psi at one day; 5000 psi at seven days per ASTM C109.

1. Acceptable Products:

- a. MasterEmaco N 420CI with Acrylic Additive or MasterEmaco T 310CI by Master Builders Solutions, Cleveland, OH; 800-228-3318 or 800-433-9517, [www.master-builders-solutions.com](http://www.master-builders-solutions.com).
- b. Concrete-Top Supreme by The Euclid Chemical Co., Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
- c. US SPEC H2 by US Mix Product Co., Denver, CO; 800-397-9903, [www.usmix.com](http://www.usmix.com).
- d. Sikatop 122 Plus by Sika Corp., Lyndhurst, NJ; 800-933-7452, [www.sikaUSA.com](http://www.sikaUSA.com).
- e. Or accepted equal.

E. Epoxy Joint Filler: Two component, 100 percent solids, semi-rigid epoxy; hardness: minimum 75 Shore A (ASTM D2240).

1. Acceptable Products:

- a. MasterSeal CR 190 by Master Builders Solutions, Cleveland, OH; 800-228-3318 or 800-433-9517, [www.master-builders-solutions.com](http://www.master-builders-solutions.com).
- b. Euco 700 by The Euclid Chemical Co., Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
- c. Sikadur 51 NS by Sika Corp., Lyndhurst, NJ; 800-933-7452, [www.sikaUSA.com](http://www.sikaUSA.com).
- d. Or accepted equal.

F. Polyurea Joint Filler: Two component, 100 percent solids, UV resistant, semi-rigid polyurea; hardness: minimum 80 Shore A per ASTM D2240. Color as selected by Architect from manufacturer's full range of standard colors.

1. Acceptable Products:

- a. Euco QWIKjoint UVR by The Euclid Chemical Co., Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
- b. MasterSeal CR 100 by Master Builders Solutions, Cleveland, OH; 800-228-3318 or 800-433-9517, [www.master-builders-solutions.com](http://www.master-builders-solutions.com).
- c. Or accepted equal.

## 2.08 ACCESSORIES

A. Form Release Agent: Commercially formulated form release agents that will not bond with, stain or adversely affect concrete surface, and will not impair subsequent treatment of concrete surfaces, nor impede the wetting of surfaces to be cured with water or curing compounds. Product shall meet the VOC requirements at the location of use.

1. Product: Duogard as manufactured by W.R. Meadows or accepted equal.

B. Underslab Vapor Retarder, Plastic: Performance shall exceed ASTM E1745, Class A requirements, as modified below. Material properties shall match one of the acceptable products listed below.

1. Properties:

- a. Thickness: Minimum 15 mils (ACI PRC-302.2, as applicable).
- b. Water Vapor Permeance (as tested before and after ASTM E1745 mandatory conditioning): Maximum 0.01 Perms (based on Test Method ASTM E1745).
- c. Tensile Strength: Minimum 60 lbf/in (ASTM D882).
- d. Puncture Resistance: Minimum 3000 g (ASTM D1709, Method B).

2. Acceptable Products:

- a. VaporBlock VB15 by Raven Industries.
- b. Griffolyn® 15 Mil Green by Reef Industries, Inc.
- c. 15 Mil Vapor Barrier by Stego Industries, LLC.
- d. Perminator 15 Mil by W.R. Meadows, Inc.
- e. Substitutions: Under provisions of Division 01.

C. Vapor Retarder Accessories:

1. Seam Tape: Water vapor transmission rate 0.03 perms or lower, per ASTM E96. Provide seam tape as standard with vapor retarder manufacturer.
2. Vapor Proofing Mastic: Water vapor transmission rate 0.03 perms or lower per ASTM E96 as recommended by manufacturer.
3. Boots for Pipe Penetrations: Provide prefabricated pipe boots as standard with vapor retarder manufacturer.

D. Capillary Barrier: Clean crushed rock; 3/4 inch nominal maximum size with no material passing a No. 4 sieve.

E. Expansion Joints:

1. Joint-Filler Strips: ASTM D1751; bituminous type; preformed, resilient, flexible, and non-extruding.

a. Acceptable Product:

- 1) Sealtight Fiber Expansion Joint by W.R. Meadows, Inc., Hampshire, IL; 800-342-5976, [www.wrmeadows.com](http://www.wrmeadows.com).
- 2) Or accepted equal.

2. Joint Sealant: Refer to Section 07 92 00.

## 2.09 CONCRETE MIX

A. General:

1. Proportion concrete design mixes per ACI SP-301 Section 4.2.3 and ACI CODE-318 Section 26.4.3.

2. Proportion concrete design mixes per ACI, prepared and tested by an independent testing laboratory acceptable to Architect and DSA prior to design mix approval. For each mix design, prepare and perform tests as follows:
    - a. Drying shrinkage test per modified ASTM C157/C157M as specified in this Section; provide at least three test specimens. Drying shrinkage test not required for below grade concrete or slab areas less than 100 square feet.
  3. Proportioning without field experience or trial mixtures may be permitted with written approval from Architect and DSA, where concrete manufacturer can establish the uniformity of its production for concrete of similar type and strength based on recent test data in accordance with ACI CODE-318, Chapter 26, Article 26.4.4, "Documentation of Concrete Mixture Characteristics".
  4. Proportion concrete design mix to attain compressive strength as specified below and as needed, with early strength to meet Contractor's work program.
- B. Mix Design: Refer to Drawings.
1. Maximum Water Content: 300 pounds per cubic yard.
  2. Maximum Drying Shrinkage: 0.048 percent as tested per modified ASTM C157/C157M as specified in this Section after 7 days moist curing plus 21 days drying. This requirement does not apply to below grade concrete or slab areas less than 100 square feet.
- C. Admixtures: Use specified admixtures as acceptable to Architect and DSA. Verify compatibility of concrete admixtures when using multiple admixtures.

## 2.10 CONCRETE MIXING

- A. Concrete shall be mixed per ACI PRC-304.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine and verify the following prior to concrete placement.
1. Forms are erected, adequately braced, sealed, lubricated (if required), and bulkhead provided where placing is to stop.
  2. Thoroughly water soak wood forms other than plywood at least twelve hours before concrete placement.
  3. Steel reinforcement are accurately positioned, securely tied and braced. Verify concrete cover requirements.
  4. Coordination with related work is completed.
  5. Anchors and embedded items are in position, securely held and braced.
  6. Construction joints and previously placed concrete are prepared as specified.
  7. Compliance with cold-weather or hot-weather requirements.
  8. Compliance with cleaning and preparation requirements.

- B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.
- C. Concrete formwork, reinforcement, inserts, and embedded items are subject to Architect's acceptance. Notify Architect at least 48 hours prior to concrete placement.

### 3.02 PREPARATION

- A. Capillary barrier below interior slabs shall be compacted using one pass of a smooth drum roller, vibratory roller, or vibratory plate. Compaction shall be verified by Geotechnical Engineer.
- B. Underslab Vapor Retarder: Install in accordance with manufacturer's written instructions, ASTM E1643, and as specified in this Section.
  - 1. Lay underslab vapor retarder at interior on-ground concrete work.
  - 2. Apply underslab vapor retarder directly on underlying subgrade, base course, or capillary water barrier. This layer shall be rolled or compacted before placing the underslab vapor retarder.
  - 3. Unroll vapor retarder with longest dimension parallel with direction of concrete placement.
  - 4. Lay vapor retarder using the greatest widths and lengths practicable to eliminate joints wherever possible. Lap over footings and seal to foundation walls.
  - 5. Overlap joints 6 inches and seal with compatible seal tape per manufacturer's written recommendations.
  - 6. Seal all penetrations per manufacturer's written instructions using mastic and seal tape. No penetration of underslab vapor retarder is permitted except for reinforcing steel and permanent utilities.
  - 7. Replace torn, punctured, and damaged underslab vapor retarder material prior to placing concrete.
  - 8. Minor repairs may be made by patches of underslab vapor retarder overlapping edges 6 inches and sealing all four sides with tape.
  - 9. Cover underslab vapor retarder with a cushion/protection course of fine-graded material, thickness as indicated on the Structural Drawings.
  - 10. Control concrete placement so as to prevent damage to underslab vapor retarder. Screed pins and similar implements that will puncture underslab vapor retarder are not permissible.
- C. Cleaning: Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt and other debris before placing concrete.

### 3.03 FORMWORK

- A. Design, construct, erect, brace, and maintain formwork according to ACI PRC-347.
- B. Apply form release agent on formwork in accordance with manufacturer's recommendations.

### 3.04 STEEL REINFORCEMENT

- A. Fabricate to shapes, dimensions, and tolerances in accordance with accepted placement drawings conforming to CRSI Manual of Standard Practice, ACI MNL-66, ACI CODE-318, ACI SPEC-117, and CBC Chapter 19A.

- B. Standard Hooks and Bends: Conform to ACI 318/318R.
- C. Bending: Cold bend steel reinforcement in the field or at the mill. Heating for bending is not permitted unless otherwise specifically allowed by Architect and DSA.
- D. Reinforcement must not be straightened or re-bent without approval of Structural Engineer of Record (SEOR) and DSA.
- E. Weld steel reinforcement in accordance with AWS D1.4.
- F. Place steel reinforcement in accordance with accepted placement drawings in conformance with tolerances specified in ACI SPEC-117.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- G. Install steel reinforcement in largest practical lengths. Accurately position, support, and secure reinforcement against displacement. Locate support reinforcement with bar supports to maintain minimum concrete cover.
- H. Tie all splices and crossing points. Point wire tie ends away from the form.
- I. Offset laps in adjacent bars.

### 3.05 CONCRETE PLACEMENT

- A. Place concrete in accordance with ACI SPEC-301 and as specified in this Section.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Consolidation: Consolidate placed concrete with mechanical vibrating equipment per ACI SPEC-301.
  - 1. Concrete Floors and Slabs: Deposit and consolidate concrete for floors and slabs in a continuous operation within limits of construction joints until placement of a panel or section is complete.
  - 2. Consolidate concrete during placement so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 3. Limit vibration duration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.
  - 4. Maintain reinforcement in position on chairs during concrete placement.
- D. Hot Weather Concreting: Place concrete according to ACI SPEC-305.1.
- E. Cold Weather Concreting: Place concrete according to ACI SPEC-306.1.

### 3.06 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete, unless otherwise indicated on Drawings.

- B. Construction Joints: Locate and install joints as indicated on Drawings or as accepted by Architect, and in a manner that strength and appearance of concrete are not impaired.
1. Comply with ACI CODE-318, Chapter 26.
  2. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated.
  3. Expose concrete aggregates, a minimum of 1/4 inch depth, creating a rough surface using a surface retardant. Within 24 hours after placing concrete, remove retarded surface mortar using either high pressure water jetting or stiff brushing or a combination of both to expose coarse aggregate. A rough surface of exposed aggregate may also be produced by sandblasting followed by high pressure water jetting.
  4. Where new concrete joins existing concrete (concrete more than sixty days old), clean and roughen existing concrete to expose coarse aggregate. Coat with epoxy bonding compound prior to placing new concrete.
- C. Slab-on-Ground Control Joints: Tool or saw-cut weakened plane joints at a depth of at least 1/4 slab thickness where shown on Drawings. Where not indicated in Drawings, provide at distances (in feet) every two times to three times of slab thickness (in inches).
1. Tooled Joint: Form control joints after initial floating by grooving and finishing each joint edge to a 1/8-inch radius. Repeat grooving after applying surface finish.
  2. Sawed Joint: Saw cut 1/8-inch width as soon as the concrete has hardened sufficiently to prevent raveling (dislodging of the aggregates) of the edges of the saw cut and completed before shrinkage stresses become sufficient to produce cracking.
  3. Fill control joint with epoxy joint filler in accordance with manufacturer's written instructions.
- D. Slab-on-Ground Expansion Joints and Isolation Joints: Provide expansion joints and isolation joints where shown on Drawings, where slab abuts vertical surfaces, at curbs, gutters, and sidewalks.
1. Extend joint-filler strips full width and extend to full depth of joint, terminating not less than 1/2 inch and not more than 1 inch from finish surface. Apply a removable capping flush to slab finish.
  2. Install strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.
  3. Remove capping when concrete has cured and apply joint sealant.
- E. Dowel Joints: Install dowel sleeves and dowels or dowel bar and support assemblies at joints where shown on Drawings.

### 3.07 FORMED SURFACES FINISHING

- A. Leave texture imparted on formed concrete surface, unless otherwise specified, except that defective surfaces shall be repaired. Repair defective concrete as specified in this Section.
- B. Maintain uniform color of the concrete, unless painting of surfaces is required, by using only one mixture without changes in material or proportions for any structure or portion of structure exposed to public view.

### 3.08 CONCRETE FLOORS AND SLABS FINISHING

- A. Comply with ACI PRC-302.2 and as specified in this Section. Comply with flatness and levelness tolerance requirements of this Section.
- B. Float Finish:
1. Immediately following placing and consolidating concrete, begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface.
  2. When concrete has sufficiently stiffened, begin floating to a true and even plane free of ridges. Perform floating using power-driven equipment or hand floats if area is small or inaccessible to power-driven floats.
  3. If bleedwater is present prior to finishing, carefully drag-off or remove by absorption with porous materials such as burlap. Dusting of surfaces with dry cement or other materials or the addition of any water during finishing is not permitted.
  4. Check slab surfaces with a ten-foot straightedge at regular intervals while concrete is still plastic, to detect high or low areas.
  5. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighten until surface is left with a uniform, smooth, granular texture.
  6. Take extreme care during finishing operations to prevent over finishing or to prevent working water into the surface; this can cause crazing (surface shrinkage cracks which appear after hardening) of the surface. Slabs with surfaces exhibiting significant crazing as determined by Architect shall be removed and replaced.
- C. Trowel Finish:
1. After floating is complete and after surface moisture has disappeared, apply trowel finish using a power-driven trowel or hand trowel if area is small or inaccessible to power-driven trowel.
  2. Steel trowel to a smooth, even, dense finish, free of blemishes including trowel marks.
  3. Apply final steel troweling by hand.
- D. Broom Finish:
1. After floating, lightly trowel surface and then carefully score by pulling a broom across the surface. Use appropriate type of broom to achieve texture specified.
  2. Broom as indicated or as directed by Architect. Where not specifically indicated, broom transverse to traffic or at right angles to the slope of the slab.
  3. Adding of water to facilitate broom finishing is not permitted.
  4. Exterior ramps, walks, and slabs: Apply a slip-resistant finish as follows:
    - a. Where slope is six percent or greater, provide heavy broom finish with a minimum 0.8 coefficient of friction per ASTM E303.
    - b. Where slope is less than six percent, provide medium broom finish with a minimum 0.6 coefficient of friction per ASTM E303.
- E. Floor and Slab Flatness and Levelness Tolerance: Determine flatness and levelness of floor slabs using the F-Number System in accordance with ASTM E1155 using the inch-pound system of units. Calculate F-Numbers as follows:

1. Definitions:
  - a. Face Flatness Number ( $F_F$ ): The maximum slab curvature allowed over 24 inches computed on the basis of successive 12 inch elevation differentials.
  - b. Face Levelness Number ( $F_L$ ): The relative conformity of the slab surface to a horizontal plane as measured over a ten foot distance.
2. Sampling Requirements: As described in ACI SPEC-117.
3. Calculations:

$$F_F = \frac{4.57}{\text{Maximum difference in elevation (in decimals of inches) between successive 12 inch elevation differences.}}$$

$$F_L = \frac{12.5}{\text{Maximum difference in elevation (in decimals of inches) between two points 10 feet apart.}}$$

4. Flatness and Levelness Tolerances:
  - a. Trowel finish surfaces: FF 25; FL 20 (overall tolerance values).
  - b. Float finish surfaces: FF 20; FL 17 (overall tolerance values).
  - c. Minimum local tolerance (1/2 bay or as designated by Architect): 2/3 of specified tolerance values.
5. Refer to Article 3.11 of this Section for remedial work required for out-of-tolerance concrete.

### 3.09 CURING AND PROTECTION

- A. Protect freshly placed concrete from premature drying, rapid temperature change, mechanical injury, and injury from flowing water for a curing period not less than seven days. Comply with ACI SPEC-306.1 for cold-weather protection and ACI SPEC-305.1 for hot-weather protection during curing.
- B. Curing Methods:
  1. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - a. If curing compound is applied using a hand held, pump-up sprayer, it shall be back-rolled using a short nap roller.
  2. Moist Curing: Keep surfaces in a moist condition for not less than seven days using water saturated absorptive cover (burlap-polyethylene sheeting) kept wet continuously. Cover concrete completely in widest practicable width, with sides and ends lapped at least 12 inches, and sealed with waterproof tape or adhesive. Immediately repair and maintain rips and tears and keep traffic away from surface during curing period.

3. Ponding or Immersion: Continuously immerse concrete throughout the curing period in water not more than twenty degrees below the temperature of the concrete.
- C. Concrete in Forms: Keep forms and exposed concrete surfaces covered and continuously moist. Provide soaker hoses at top of walls or other accepted means of keeping concrete and forms wet while forms remain in place. If forms are removed before end of curing period, continue curing by methods described in this Section.
- D. Floors and Slabs:
1. Evaporation Retarder: Apply evaporation retarder to floors and slabs if hot, dry, or windy conditions cause moisture loss of 0.1 pounds per square foot per hour before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
  2. Cure by application of curing and sealing compound or by moist curing.
  3. Begin curing as soon as free water has disappeared from the concrete surface after placing and final finishing.
- E. Protection:
1. Protect concrete surfaces from damage by tools, equipment, materials, and construction activity.
  2. Traffic, shoring, or loading will not be permitted on concrete surface until it has sufficiently hardened to prevent injury to finish and strength.
  3. Protect all flat work and other surfaces as required with full board of plywood coverings as necessary.

### 3.10 REMOVAL OF FORMS

- A. Formwork for sides of curbs and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 degrees F for 48 hours after placing concrete provided concrete is hard enough not to be damaged by form-removal operations and provided curing and protection operations are maintained.

### 3.11 CONCRETE REPAIRS

- A. General: Comply with ACI SPEC-301, as follows:
1. Completed concrete work shall conform to applicable requirements of this Section and Contract Documents.
  2. Concrete work that fails to meet one or more requirements of the Contract Documents but subsequently is repaired to bring the concrete into compliance will be acceptable.
  3. Concrete work that fails to meet one or more requirements of the Contract Documents and cannot be brought into compliance with the Contract Documents is subject to rejection.
  4. Repair rejected concrete work by removing and replacing or by additional construction to strengthen or otherwise satisfy project requirements as directed by Architect. To bring rejected Work into compliance, use repair methods that meet applicable requirements for function, durability, dimensional tolerances, and appearance as determined by Architect.

5. Submit proposed repair methods, materials, and modifications needed to repair concrete work to meet the requirements of the Contract Documents.
  6. Contractor shall be responsible to bring concrete work into compliance with requirements of Contract Documents.
- B. Defective Concrete: Repair and patch defective concrete work and concrete not conforming to required lines, details, and elevations. Use materials and methods specified in this Section as accepted by Architect. Serious defects, defects affecting structural strength, or unsatisfactory patching may be cause for complete removal and replacement of concrete.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface stains and other discolorations that cannot be removed by cleaning.
1. Immediately after form removal, cut out honeycomb, rock pockets, and voids more than 1/2 inch in any direction in solid concrete. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with drypack grout before bonding agent has dried.
  2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, repair mortar will match surrounding color. Patch a test area 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.
  3. Repair defects on concealed, formed surfaces that affect concrete's durability and structural performance as determined by Architect and DSA.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness.
1. Repair defective finished surfaces including spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced section regardless of width, and other objectionable conditions.
  2. After concrete has cured fourteen days, correct high spots by grinding.
  3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish areas to blend into adjacent concrete.
  4. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least 3/4 inch clearance all around. Dampen concrete surface in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete. Place, compact, and finish patching concrete to blend with adjacent finished concrete.
  5. Repair random cracks and single holes 1 inch or less in diameter with drypack grout. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place drypack grout before bonding agent has dried. Compact and finish patching material to match adjacent concrete.
- E. Moist cure patches and repairs for at least 72 hours.

F. Perform concrete structural repairs subject to Architect's and DSA's acceptance.

### 3.12 FIELD QUALITY CONTROL

A. General: Comply with requirements of Division 01.

B. Testing Service: Owner will select and pay for independent testing agency.

C. Strength Test Specimen Cylinders: Conduct sampling, curing, and testing per ASTM C172, ASTM C31/C31M, and ASTM C39/C39M. Contractor shall provide molds required for strength test cylinders. Test samples shall be taken at the point of concrete placement.

1. Frequency: Samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, nor less than once for each 50 cubic yards of concrete, nor less than once for each 2000 square feet of surface area for slabs or walls. Additional samples for seven-day compressive strength tests shall be taken for each class of concrete at the beginning of the concrete work or whenever the mix or aggregate is changed.
2. A strength test shall be the average of the strengths of at least two 6 inch by 12 inch cylinders or at least three 4 inch by 8 inch cylinders made from the same sample of concrete and tested at the test age designated for the determination of concrete compressive strength.
3. Cylinder Label and Records: Mark and date each test cylinder. Maintain records of test specimen cylinders and send copies to Architect, Structural Engineer, DSA, Project Inspector, and Owner. Record the following information:
  - a. Cylinder identification mark.
  - b. Date made.
  - c. Concrete supplier.
  - d. Slump.
  - e. Specified concrete design strength.
  - f. Pour location and type of structural member.
  - g. Compressive strength test date and age.
  - h. Admixtures added to concrete mix.
  - i. Air content.
4. Compressive Strength Tests: Test laboratory cured specimens at the following ages and report compressive strengths as follows:
  - a. 7 days at the start of use of each class of concrete or change in mix or aggregates.
  - b. 7 days where early compressive strength is required.
  - c. 28 days.
  - d. 56 days.
  - e. Hold specimens for one strength test in reserve.
5. Test Reports: Furnish two copies of test reports directly from testing agency to Contractor, Architect, Structural Engineer, DSA, Project Inspector, and Owner.

- D. Slump Test: ASTM C143/C143M. Conduct slump testing when test cylinders are made and additionally for every 150 cubic yards of concrete. Perform additional tests when concrete consistency appears to change. Slump not meeting slump in accepted mix design ( $\pm$  one inch) will be rejected. Contractor shall provide slump cones.
- E. Air Content Tests: ASTM C231/C231M for normal weight concrete. Conduct air content tests from the first two batches of concrete mixed each day and when test cylinders are made. Concrete not meeting air entrainment requirements shall be rejected and removed.
- F. Density: ASTM C138/C138M. Conduct density testing when test cylinders are made.
- G. Concrete temperature: ASTM C1064/C1064M. Check concrete temperature when test cylinders are made and every hour when ambient temperature in below 40 degrees F or above 90 degrees F.
- H. In the event the cylinders tested do not meet the required concrete design strength, conduct core tests and additional tests or inspections as may be required by Architect to ascertain strength of placed concrete. Costs for additional tests and inspections shall be borne by Contractor.
- I. Floor Flatness/Levelness: Provide verification of Floor and Slab Flatness and Levelness as indicated in Article **Error! Reference source not found.**E of this Section. Furnish copies of report directly from testing agency to Contractor, Architect, Project Inspector, and Owner.

END OF SECTION

Concrete Mixture Design Submittal Checklist

- Specify Use: All mix designs must clearly note the concrete type or use. (i.e. footings, slab on grade, site concrete)
- Mix Design: Provide concrete mixture designs with proportions and characteristics including all admixtures.
- Gradation: Provide combined aggregate gradation by weight for all course and fine aggregates.
- Weight: Provide dry unit weight of mix. Normal weight concrete shall be limited to 145 PCF.
- Material Certificates: Provide supplier's certification that materials conform to specifications. This includes aggregates, admixtures, and cementitious materials such as cement, fly ash, silica fume, slag cement, and metakaolin.
- Product Data: Provide product literature for each product and admixture used. Include manufacturer's specification, written instructions, and installation procedures.
- Required SCM: Mix design must contain the percentage or supplementary cementitious materials noted in mix design table of the specifications.
- Admixtures: Where multiple admixtures are used, provide a letter from all manufacturers indicating there are no compatibility problems or adverse effects resulting from combination of products.
- Shrinkage: Provide shrinkage test per modified ASTM C157/C157M at 21 days. Shrinkage test must be for the same mix specified or a similar mix with the same water cement ratio and aggregate source. (Exception: shrinkage testing is not required for below grade concrete)
- Testing / Proportion Method: Concrete must be proportioned per the requirements of ACI Spec-318-20. Indicated method used and provide complete test data and documentation for the chosen proportion method.



SECTION 07 84 00

FIRESTOPPING

**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. Mineral wool safing insulation in wall and floor/ceiling construction.
- B. Firestop sealants and caulks.
- C. Elastomeric firestop sealants.
- D. Firestop putty.
- E. Intumescent putty pads.
- F. Flexible firestop spray.
- G. Head-of-wall gasket.
- H. Firestop collars.
- I. Firestopping for large openings.
- J. Cast-in-place firestop devices.
- K. Intumescent wrap.
- L. Firestop mortar.
- M. Fire-rated cable pathway.
- N. Fire-rated HVAC retaining angles.
- O. Firestop plugs.
- P. Fire-rated T collar devices.
- Q. Fire-rated grommets.

1.02 RELATED SECTIONS

- A. Section 07 92 00 – Joint Sealants.
- B. Section 09 21 16.23 – Gypsum Board Shaft Wall Assemblies.
- C. Divisions 21 – 23 Sections, as applicable to mechanical work.
- D. Divisions 26 – 28 Sections, as applicable to electrical work.

### 1.03 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM C679 – Standard test Method for Tack-Free Time of Elastomeric Sealants.
  - 2. ASTM D6904 – Standard Practice for Resistance to Wind-Driven Rain for Exterior Coatings Applied on Masonry.
  - 3. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
  - 4. ASTM E814 – Standard Test Method for Fire Tests of Penetration Firestop Systems.
  - 5. ASTM E1399 – Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.
  - 6. ASTM E1966 – Standard Test Method for Fire-Resistive Joint Systems.
  - 7. ASTM E2174 – Standard Practice for On Site Inspection of Installed Fire Stops.
  - 8. ASTM E2307 – Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus
  - 9. ASTM E2393 – Standard Practice for On Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
  - 10. ASTM G21 – Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
  - 11. International Firestop Council Guidelines for Evaluating Firestop Systems Engineering Judgments.
  - 12. UL Fire Resistance Directory.
  - 13. UL 263 – Fire Tests of Building Construction and Materials.
  - 14. UL 723 – Test for Surface Burning Characteristics of Building Materials.
  - 15. UL 1479 – Standard for Fire Tests of Through-Penetration Firestops.
  - 16. UL 2079 – Tests for Fire Resistance of Building Joint Systems.

### 1.04 SUBMITTALS

- A. Submit under provisions of Division 01.
- B. Provide manufacturer's brochures describing firestop materials and insulation proposed for use, and types of mechanical fasteners to be used in the installation of the firestopping materials.
- C. Certificates of Compliance: Before installation of products specified in this Section, Contractor shall furnish to Architect a certificate certifying that materials to be incorporated in the work conform to specified requirements.
- D. Submit certification that the installers of products specified in this Section meet the qualification requirements described in Article 1.6 of this Section.

- E. Submit manufacturer's product literature and installation procedures for each type of firestop material to be installed. Literature shall indicate product characteristics, typical uses, performance and limitation criteria, and test data.
- F. Submit material safety data sheets for each product at the time firestopping products are delivered to the job site.
- G. Shop Drawings: Show typical installation details for the methods of installation. Indicate which firestop materials will be used where and application requirements to meet specific jobsite conditions.
- H. Provide manufacturer's Engineering Judgment (EJ) identification number and drawing details when no UL system is available for an application. Engineering Judgment shall be developed in accordance with the latest California Fire Code requirements. Engineering Judgment shall include both project name, and name of contractor who will install the firestop system in accordance with EJ drawing. Submit Engineering Judgment to DSA for review and approval prior to installation.

#### 1.05 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Materials and installation shall comply with requirements of governing regulations and authorities.
  - 1. Comply with requirements of 2022 California Building Code, Chapter 7, "Fire and Smoke Protection Features".
- B. Firestopping systems (materials and design) shall be F-rated to meet the hourly rating of the wall or floor as tested by nationally accepted test agencies per ASTM E814, UL 1479, or UL 2079 in a configuration representative of field conditions. T-ratings for floors shall be as required in the 2022 CBC Chapter 7 "Fire and Smoke Protection Features", as applicable to design conditions. L-ratings shall be tested in accordance with ANSI/UL 1479 (smoke barriers) and ANSI/UL 2079 (joints), such that for each 100 square feet of area, the total cumulative leakage of each firestop assembly shall not exceed 50 cubic feet per minute.
- C. To the fullest extent possible, all firestopping products installed on the project shall be from one manufacturer.
- D. Unless specified and approved, no pipe insulation shall be removed; all insulation shall remain intact, continuous and undamaged when firestopped.
- E. A manufacturer's direct representative (not distributor or agent) shall be on-site prior to the initial installation of firestop systems to train appropriate Contractor personnel in proper selection and installation procedures. This shall be done per manufacturer's written recommendations published in their literature and drawing details.
- F. Firestop systems do not reestablish the structural integrity of load-bearing partitions/ assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load-bearing or shear wall assembly.

- G. Firestop applications for which no UL tested system is available through an acceptable manufacturer, submit acceptable manufacturer's Engineering Judgment derived from similar UL design systems or other acceptable tests, to DSA, for review and approval prior to installation. Engineering Judgment drawings shall meet the requirements set forth by the International Firestop Council (September 7, 1994).

#### 1.06 INSTALLER QUALIFICATIONS

- A. Engage an experienced installer who is certified, licensed, and FM Approved in accordance with FM 4991, certified by UL as a Qualified Contractor, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products per specified requirements. A manufacturer's willingness to sell its firestopping products to Contractor or to an Installer engaged by Contractor does not confer qualification on the buyer.
- B. Installation Responsibility: Assign installation of through-penetration firestop systems and fire-resistant joint systems to a single sole source firestop specialty contractor.
- C. The work shall be installed by a contractor with at least one of the following qualifications:
  - 1. FM 4991 Approved Contractor.
  - 2. UL Approved Contractor.
  - 3. Qualified by the firestopping manufacturer as having been provided the necessary training to install firestop products per specified requirements.
- D. The installer shall have no less than three years of experience with fire stop installation.

#### 1.07 DEFINITION

- A. Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, water and hot gases through penetrations in fire-rated wall and floor assemblies.

#### 1.08 SYSTEM DESCRIPTION

- A. Firestopping materials shall comply with ASTM E119, ASTM E814, ASTM E1399, ASTM E1966, ASTM E2307, UL 263, UL 1479 and UL 2079 to achieve a fire rating as noted on Drawings.
- B. Firestop all interruptions to fire rated assemblies, materials, and components.

#### 1.09 PERFORMANCE REQUIREMENTS

- A. Provide and install firestopping materials to meet applicable codes and installation requirements for each firestopping application. Products using caulking, putty, wrap strips, mortar, composite boards and/or mechanical devices shall be used as appropriate for the specific condition.
- B. Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

- C. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- D. When caulking is used, provide and install flexible caulking materials. Cured firestop materials 1/8 inch thick shall be able to bend around a 1 inch mandrel without breaking.
- E. Provide products that upon curing do not re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during and after construction. Latex sealants containing sodium silicate or other water soluble intumescent ingredients are not permitted.
- F. Provide firestop sealants sufficiently flexible to accommodate motion such as pipe vibration, water hammer, thermal expansion and other normal building movement without damage to the seal.
- G. Pipe insulation shall not be removed, cut away or otherwise interrupted through wall or floor openings. Provide products appropriately tested for the thickness and type of insulation utilized.
- H. Fire rated pathway devices shall be the preferred product and shall be installed in all locations where frequent cable moves, add-ons and changes will occur.
- I. When mechanical cable pathways are not practical, openings within walls and floors designed to accommodate voice, data and video cabling shall be provided with re-enterable products specifically designed for retrofit.
- J. Penetrants passing through fire-resistance rated floor-ceiling assemblies contained within chase wall assemblies shall be protected with products tested by being fully exposed to the fire outside of the chase wall. Systems within the UL Fire Resistance Directory that meet this criterion are identified with the words "Chase Wall Optional".
- K. Provide fire-resistive joint sealants sufficiently flexible to accommodate movement such as thermal expansion and other normal building movement without damage to the seal.
- L. Provide fire-resistive joint sealants designed to accommodate a specific range of movement and tested for this purpose in accordance with a cyclic movement test criteria as outlined in UL 2079.
- M. Provide penetration firestop systems subjected to an air leakage test conducted in accordance with Standard, UL 1479 for penetrations with published L-Ratings for ambient and elevated temperatures as evidence of the ability of firestop system to restrict the movement of smoke.
- N. Provide firestopping composed of components that are listed as compatible with each other, the substrates forming openings and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- O. Provide components for each firestopping system that is needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance rated systems.

- P. Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E814.
  - 1. F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.
- Q. Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E814.
  - 1. F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
  - 2. T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
- R. Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E814.
  - 1. L-Rating: Not exceeding 5.0 cubic feet per minute per square foot of penetration opening at both ambient and elevated temperatures.
- S. At fire rated assemblies, provide a firestop system with an Assembly Rating as determined by UL 2079 that is equal to the time rating of construction assembly.
- T. Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of one or less as tested per ASTM G21.
- U. Rain and water resistance: Provide perimeter joint sealant tested in accordance with ASTM D6904 with less than one hour tack free time as tested in accordance with ASTM C679.
- V. To the greatest extent possible, provide cast-in-place firestop devices prior to concrete placement.

#### 1.10 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to the project site in the manufacturer's original packaging. Clearly identify manufacturer, contents, brand name, applicable standard, lot number, UL label and mixing and installation instructions.
- B. Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements, including temperature restrictions. Immediately remove damaged or deteriorated materials from the job site.
- C. Comply with recommended procedures, precautions, or remedies described in material safety data sheets as applicable.
- D. All firestop materials shall be installed prior to expiration of shelf life.
- E. Do not install damaged or expired materials.

#### 1.11 SCHEDULING

- A. Coordinate installation with other trades whose work may be affected or have effect.

- B. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

#### 1.12 PROJECT CONDITIONS

- A. Conform to manufacturer's printed instructions for installation and, when applicable, curing in accordance with temperature and humidity. Conform to ventilation and safety requirements.
- B. Do not use materials that contain flammable solvents.
- C. Schedule installation of firestopping after completion of penetrating item installation but prior to covering or concealing of openings.
- D. Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.
- E. Weather conditions:
  - 1. Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.
  - 2. Do not install firestopping products when substrates are wet due to rain, frost, condensation, or other causes.
- F. During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Acceptable firestopping manufacturers, unless noted otherwise:
  - 1. Hilti, Tulsa, OK; 866-445-8827, [www.us.hilti.com](http://www.us.hilti.com).
  - 2. Specified Technologies Inc. (STI), Somerville, NJ; 800-992-1180, [www.stifirestop.com](http://www.stifirestop.com).
  - 3. 3M, St. Paul, MN; 800-328-1687, [www.solutions.3m.com](http://www.solutions.3m.com).
  - 4. Substitutions: Under provisions of Division 01.

#### 2.02 MINERAL WOOL INSULATION

- A. Acceptable Manufacturers and Products:
  - 1. Owens Corning Thermafiber, Inc., Wabash, IN; 888-834-2371, [www.thermafiber.com](http://www.thermafiber.com).
  - 2. Johns Manville, Denver, CO; 800-654-3103, [www.jm.com](http://www.jm.com).
  - 3. Rockwool, Milton, Ontario, Canada; 800-265-6878, [www.rockwool.com](http://www.rockwool.com).
  - 4. Substitutions: Under provisions of Division 01.
- B. At through penetrations, head of wall construction gaps, and perimeter safig slots, provide required density mineral wool per tested system, installed with correct orientation for joint movement and properly compressed per tested system.

- C. Accessories: Provide all accessories and anchors for installation as recommended by the manufacturer.

## 2.03 FIRESTOP SEALANTS

- A. Sealant for penetrations by noncombustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT).

- B. Silicone Sealants:

- 1. Acceptable Manufacturers and Products:

- a. Hilti. Product: CFS-S SIL Silicone Sealant.
    - b. Specified Technologies Inc. Product: SpecSeal SIL Silicone Firestop Sealant.
    - c. 3M. Products:

- 1) Fire Barrier Water Tight Sealant 1003 SL.
      - 2) Fire Barrier Silicone Sealant 2000+.

- d. Substitutions: Under provisions of Division 01.

- 2. Sealant shall be a one-part silicone compound, non-sag for vertical applications and self-leveling for horizontal applications. Sealant shall be UL Classified (UL 1479) and tested in accordance with ASTM E814 requirements. Penetrations in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7 requirements.

- C. Intumescent Latex Sealants:

- 1. Acceptable Manufacturers and Products:

- a. Hilti. Product: FS-One Max.
    - b. Specified Technologies Inc. (STI). Products:

- 1) SpecSeal Series SSS Sealant.
      - 2) SpecSeal LCI Sealant.
      - 3) LC Sealant.

- c. Substitutions: Under provisions of Division 01.

- 2. Sealant shall be a one-part intumescent latex compound. When exposed to high heat or flame, sealant shall be capable of expanding to seal off the annular spaces and voids at the joint. Expansion shall continue at temperatures greater than 230 degrees F. Sealant shall be thixotropic and suitable for caulking or troweling onto vertical and overhead surfaces. Sealant shall be UL Classified (UL 1479) and tested in accordance with ASTM E814 requirements. Penetrations in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7 requirements.

2.04 ELASTOMERIC FIRESTOP SEALANT

- A. Sealant for penetrations and joints between structurally separate sections of walls and floors at top-of-walls.
- B. Acceptable Manufacturers and Products:
  - 1. Hilti. Products:
    - a. CFS-S SIL GG.
    - b. CFS-S SIL SL.
  - 2. STI. Product: SpecSeal Series ES100 Elastomeric Sealant.
  - 3. 3M. Products: Fire Barrier Sealants 1000, 1003, 2000, 2000+, 2001, and 2003.
  - 4. Substitutions: Under provisions of Division 01.
- C. Elastomeric sealant shall be a non-halogenated, latex-based or silicone-based, highly flexible caulk. The sealant shall be thixotropic for high-build application using standard caulking equipment or by troweling onto vertical surfaces or overhead. Self-leveling sealants are acceptable for horizontal applications. The sealant shall be UL Classified (UL 2079) and tested to the requirements of ASTM E814. Closures in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7.

2.05 ACRYLIC FIRESTOP SEALANT

- A. Universal fire caulk, providing a flexible seal for fire rated joints and through penetrations.
- B. Acceptable Manufacturers and Products:
  - 1. Hilti. Product: CP 606.
  - 2. Substitutions: Under provisions of Division 01.
- C. Acrylic-based firestop sealant that provides movement capability in fire rated joints and seals through-penetrations applications.

2.06 FIRESTOP PUTTY

- A. Putty for penetrations by combustible items (penetrants consumed by high heat and flame) including insulated metal pipe, PVC jacketed flexible cable, or cable bundles and plastic pipe (closed piping systems). Clay-based products will not be allowed.
- B. Acceptable Manufacturers and Products:
  - 1. Hilti. Product: CP 618 Putty Stick.
  - 2. STI. Product: SpecSeal SSP Putty.
  - 3. Substitutions: Under provisions of Division 01.

- C. Putty shall be a one-part intumescent, non-hardening compound. The putty, when exposed to high heat or flame shall be capable of expanding to seal off annular spaces created. Range of continuing expansion shall be from 230 degrees F to greater than 1,000 degrees F. The putty shall be soft and pliable with aggressive adhesion. The putty shall be UL Classified (UL 1479) and tested to the requirements of ASTM E814. Penetrations in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7.

#### 2.07 INTUMESCENT PUTTY PAD

- A. Firestop Putty Pads: Intumescent moldable butyl-based firestop putty pad. Clay-based products will not be allowed.
- B. Acceptable Manufacturers and Products:
  - 1. Hilti. Products:
    - a. CFS-P PA Putty Pad.
    - b. CP 617 Putty Pad.
  - 2. STI. Products:
    - a. SpecSeal SSP4S 7.25 inches by 7.25 inches.
    - b. SpecSeal SSP9S 9 inches by 9 inches.
  - 3. Substitutions: Under provisions of Division 01.

#### 2.08 FLEXIBLE FIRESTOP SPRAY

- A. Firestop spray for perimeter fire barrier system, fire-rated construction joints, and other gaps.
- B. Acceptable Manufacturers and Products:
  - 1. Hilti. Product: CFS-SP WB.
  - 2. STI. Products:
    - a. SpecSeal AS200 Elastomeric Firestop Spray
    - b. SpecSeal Fast Tack Elastomeric Silicone/Urethane Hybrid Firestop Spray.
  - 3. 3M. Products: Firedam Spray and Fire Barrier Spray.
  - 4. Substitutions: Under provisions of Division 01.
- C. Spray shall be flexible, sprayable water-based coating that dries in ambient conditions to form a flexible seal that will compress/extend with the intended range of the joint. The spray shall be UL classified (UL 2079) and tested to the requirements of ASTM E1966. Closures in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7. Provide silicone-based firestopping products where building perimeter fire barrier systems are required.

#### 2.09 HEAD-OF-WALL GASKET

- A. Intumescent cover for head-of-wall track providing fire, smoke, and acoustic ratings.

B. Acceptable Manufacturers and Products:

1. Hilti. Product: CFS-TTS Top Track System.
2. STI. Product: SpecSeal Series TTG SpeedFlexTrack Top Gasket.
3. Substitutions: Under provisions of Division 01.

C. Preformed gasket shall be UL classified (UL 2079) and tested to the requirements of ASTM E1966. Closures in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7.

2.10 FIRESTOP COLLARS

A. Collars for penetrations by combustible plastic pipe (opening piping systems).

B. Acceptable Manufacturers and Products:

1. Hilti. Products:
  - a. CP643N Firestop Collar.
  - b. CP644 Firestop Collar.
2. STI. Products:
  - a. SpecSeal SSC.
  - b. SpecSeal LLC Firestop Collar.
3. 3M. Products:
  - a. Fire Barrier PPD Plastic Pipe Device.
  - b. Ultra Plastic Pipe Device.
4. Substitutions: Under provisions of Division 01.

C. Firestop collar shall be made of a galvanized steel housing and shall contain a section of intumescent material. The material shall be designed to expand when exposed to fire. The collars shall be UL classified (UL 1479) and tested to the requirements of ASTM E814. Closures in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7.

2.11 FIRESTOPPING FOR LARGE OPENINGS

A. Firestopping for large size, complex penetrations made to accommodate cable trays, multiple steel and copper pipes and electrical busways in raceways. Products may be used in conjunction with other firestopping products, systems, and devices.

B. Acceptable Manufacturers and Products:

1. Hilti. Product: CFS-BL Firestop Block.
2. STI. Products:
  - a. SpecSeal SSB Firestop Pillows.
  - b. SpecSeal CS Composite Sheet.

- c. SpecSeal SSM Mortar.
  - 3. 3M. Product: Fire Barrier Pillows or Fire Barrier CS-195+ Composite Sheet and Fire Barrier Mortar.
  - 4. Substitutions: Under provisions of Division 01.
- C. For large openings, install intumescent compound or mortar. Intumescent compounds, when exposed to high heat or flame, shall be capable of expanding to seal off annular spaces created. Product shall be UL classified (UL 1479) and tested to the requirements of ASTM E814. Closures in fire rated assemblies shall be protected and sealed in accordance with CBC Chapter 7.

## 2.12 CAST-IN-PLACE FIRESTOP DEVICES

- A. Devices for use with non-combustible and combustible pipes (closed and open piping systems), conduit, and cable bundles penetrating concrete floors and framed gypsum board wall assemblies.
- B. Acceptable Manufacturers and Products:
  - 1. Hilti. Products:
    - a. CP 680-P Cast-in-Place Firestop Device.
      - 1) Add Aerator Adapter when used in conjunction with aerator (Sovent) system.
    - b. CP 680-M Cast-in-Place Firestop Device for use with non-combustible penetrants.
    - c. CP 653 Firestop Speed Sleeve.
  - 2. STI. Product: SpecSeal CD Cast-In Firestop Device.
    - a. Accessories:
      - 1) Add Aerator Adapter when used in conjunction with aerator (Sovent) system.
      - 2) Metal Deck Adapters on corrugated metal decks.
      - 3) Extension Tubes where required for thick concrete floors.
  - 3. Substitutions: Under provisions of Division 01.
- C. Acceptable Penetrations: Sealing pipes and cables up to 6 inches in diameter in penetration through fire-rated floors, suitable for: vented or closed plastic pipes, PVC, CPVC, ABS, innerduct, FRPP, steel, cast-iron, copper pipes, insulated steel and copper pipes, EMT and ENT electrical conduits, bundled cables, and blank openings.

## 2.13 INTUMESCENT WRAP

- A. Intumescent Wrap: Precut wrap strips for plastic and insulated pipe penetration through rated assemblies.
- B. Acceptable Manufacturers and Products:
  - 1. Hilti. Product: CP 648, Firestop Wrap Strip.

2. STI. Products:
  - a. SpecSeal RED2.
  - b. SpecSeal BLU2 Wrap Strip.
3. Substitutions: Under provisions of Division 01.

#### 2.14 FIRESTOP MORTAR

- A. Fire-resistant, cement-based mortar for firestop-sealing medium-sized to large openings with non-combustible pipes or cable trays, and permanent fire seal for cables, cable trays and non-combustible pipes. For use with concrete and masonry assemblies, and for walls and floors rated up to three hours.
- B. Acceptable Manufacturers and Products:
  1. Hilti. Product: CP 637 Firestop Mortar.
  2. STI. Product: SpecSeal SSM Firestop Mortar.
  3. Substitutions: Under provisions of Division 01.

#### 2.15 FIRE-RATED CABLE PATHWAY

- A. Gangable fire-rated device modules capable of retrofit, comprised of steel raceway with intumescent foam pads allowing 0 percent to 100 percent cable fill for cable penetrations through gypsum or CMU walls, concrete floors and concrete walls.
- B. Acceptable Manufacturers and Products:
  1. STI. Product: SpecSeal EZ Path Pathway Device Series 22, 33 or 44.
  2. Substitutions: Under provisions of Division 01.

#### 2.16 FIRE-RATED HVAC RETAINING ANGLES

- A. Steel angle system with integral intumescent firestop gasket for use on steel HVAC ducts.
- B. Acceptable Manufacturers and Products:
  1. STI. Product: SpecSeal Fyre-Flange Steel Firestop Retaining Angle.
  2. Substitutions: Under provisions of Division 01.

#### 2.17 FIRESTOP PLUGS

- A. Re-enterable, foam rubber plug impregnated with intumescent material for use in blank openings and cable sleeves.
- B. Acceptable Manufacturers and Products:
  1. Hilti. Product: CFS-PL Firestop Plug.
  2. STI. Product: SpecSeal FP Intumescent Firestop Plug.
  3. Substitutions: Under provisions of Division 01.

2.18 FIRE-RATED T COLLAR DEVICES

- A. Louvered steel collar system with synthetic aluminized polymer coolant wrap installed on metallic pipes where T Ratings are required by applicable building code requirements.
- B. Acceptable Manufacturers and Products:
  - 1. STI. Product: SpecSeal T-Collar Device.
  - 2. Substitutions: Under provisions of Division 01.

2.19 FIRE-RATED GROMMETS

- A. Molded two-piece grommet made from plenum grade polymer with a foam inner core for sealing individual cable penetrations up to 0.27 inch diameter.
- B. Acceptable Manufacturers and Products:
  - 1. STI. Product: EZ-Firestop Grommet.
  - 2. Substitutions: Under provisions of Division 01.

2.20 ACCESSORIES

- A. Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

**PART 3 - EXECUTION**

3.01 CONDITIONS REQUIRING FIRESTOPPING

- A. General: Provide firestopping for conditions specified whether or not firestopping is indicated and, if indicated, whether such material is designed as insulation, safing or otherwise.
- B. Penetrations:
  - 1. Penetrations include conduit, cable wire, pipe, duct or other elements that pass through one or both outer surfaces of a fire-rated floor, wall or partition.
  - 2. These requirements for penetrations shall apply whether or not sleeves have been provided, and whether or not penetrations are to be equipped with escutcheons or other trim. If penetrations are sleeved, firestop annular space, if any, between sleeve and wall opening.
- C. Provide firestopping to fill miscellaneous voids and openings in fire-rated construction as specified herein.
- D. Provide intumescent moldable pads over backs and sides of all electrical junction and utility boxes at fire rated walls.

3.02 EXAMINATION

- A. Verify site conditions under provisions of Division 01.

- B. Verify openings are ready to receive the work of this Section.

### 3.03 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material or other matter that may affect bond of firestopping material.
- B. Remove incompatible materials that may affect bond.
- C. Install noncombustible backing materials to arrest liquid material leakage.
- D. Examine the areas and conditions where firestops are to be installed and notify Architect of conditions detrimental to the proper and timely completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected by Contractor in a manner acceptable to Architect.
- E. Verify penetrations are properly sized and in suitable condition for application of materials.
- F. Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.
- G. Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

### 3.04 INSTALLATION

- A. General:
  - 1. Installation of firestops shall be performed by an applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures. Written verification of the manufacturer's training shall be submitted to Architect.
  - 2. Apply firestops in accordance with fire test reports, fire resistance requirements, acceptable sample installations, manufacturer's recommendations, and listing descriptions.
  - 3. Provide sprinkler piping with NFPA 13 required annular space using firestop to allow movement.
  - 4. Coordinate with plumbing, mechanical, electrical and other trades to assure that all pipe, conduit, cable and other items which penetrate fire-rated construction have been permanently installed prior to installation of firestops.
  - 5. All penetrations for pipes, conduits, tubing or other building service elements shall be installed below the head-of-wall joint such that the distance between the top of the wall and the top of the penetrant is a minimum of 3 inches, no exceptions.
- B. Regulatory Requirements: Install firestop materials in accordance with published "Through-Penetration Firestop Systems" in UL's Fire Resistance Directory.
- C. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration materials.
  - 1. Seal all holes or voids made by penetrations to ensure an air- and water-resistant seal.
  - 2. Protect materials from damage on surfaces subjected to traffic.

D. Field Quality Control:

1. Prepare and install firestopping systems in accordance with manufacturer's printed instructions and recommendations.
  2. Follow safety procedures recommended in the Material Safety Data sheets.
  3. Finish surfaces of firestopping which are to remain exposed in the completed work to a uniform and level condition.
  4. All areas of work must be accessible until inspection by the applicable Code authorities.
  5. Correct unacceptable firestop installations and provide additional inspection to verify compliance with this Section at no additional cost.
  6. All firestop assemblies shall be identified with a permanently affixed ID label as follows:
    - a. Firestop System Warning Label: Minimum 3 inch by 5 inch label, red color or with red colored type and "WARNING: THROUGH PENETRATION FIRESTOP SYSTEM – DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE" written in bold type. Label shall be adhesive backed or provide other means of permanent attachment. Identified or included spaces for the following information:
      - 1) Name of manufacturer.
      - 2) Name of Installer.
      - 3) Date firestop system was installed.
      - 4) Firestop System UL number or manufacturer's engineered design number.
      - 5) F Rating and/or T Rating, as applicable.
  7. All fire-rated wall assemblies shall be identified with signs or by stenciling in accessible concealed floor, floor-ceiling, or attic spaces at intervals not exceeding 30 feet and within 15 feet of the end of each wall per CBC Section 703.5. Lettering shall be not less than 3 inches in height with a minimum 3/8 inch stroke in contrasting color, incorporating the appropriate wording such as: "FIRE AND/OR SMOKE BARRIER-PROTECT ALL OPENINGS", with the relevant hourly fire resistance rating clearly stated.
  8. Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
  9. Keep areas of work accessible until inspection by applicable code authorities.
  10. Perform under this Section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- E. Installation shall be completed in a neat, workmanlike manner according to manufacturer's recommendations. Securely fasten and anchor insulation in place to prevent displacement or sagging of material. Safing insulation shall be adequately lapped.
- F. Install material at fire rated horizontal to vertical assembly closures and at fire rated walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items requiring firestopping.
- G. Apply primer and materials in accordance with manufacturer's instructions.
- H. Apply firestopping material in sufficient thickness to achieve rating.
- I. Compress fibered material to achieve a density of forty percent of its uncompressed density.

J. Dam material to remain.

### 3.05 INSPECTIONS

- A. Firestopping inspections shall meet the requirements of CBC Section 1705A.18.
- B. Inspection of completed work shall be performed by DSA and/or the building underwriter's designee. If required by DSA or underwriter, inspections may be performed by an independent, third-party construction inspection and testing service provided that:
  - 1. Inspections are performed to the requirements of the following standards as applicable:
    - a. Construction Joints: ASTM E2393.
    - b. Service Penetrations: ASTM E2174.
  - 2. Individual(s) performing inspection shall provide evidence of valid Errors and Omissions Insurance coverage for this service.
  - 3. Individual(s) performing inspection shall not have any financial connection to installer, firestop manufacturer, distributor, or supplier.

### 3.06 CLEANING

- A. Clean Work under provisions of Division 01.
- B. Clean adjacent surfaces of firestopping materials.
- C. Remove spilled and excess materials adjacent to firestopping without damaging adjacent surfaces.
- D. Leave finished work in a neat and clean condition with no evidence of spillovers or damage to adjacent surfaces.

### 3.07 PROTECTION OF FINISHED WORK

- A. Protect finished Work under provisions of Division 01.
- B. Protect adjacent surfaces from damage by material installation.
- C. Where firestopping is installed at locations which will remain exposed in the completed work, provide protection as necessary to prevent damage to adjacent surfaces and finishes, and protect as necessary against damage from other construction activities.

END OF SECTION



SECTION 07 92 00

JOINT SEALANTS

**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. Sealants.
- B. Sealant accessories.

1.02 RELATED SECTIONS

- A. Section 03 35 00 – Miscellaneous Cast-In-Place Concrete.
- B. Section 07 84 00 – Firestopping.
- C. Section 08 11 00 – Metal Doors and Frames.
- D. Section 09 21 16.23 – Gypsum Board Shaft Wall Assemblies.

1.03 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM C510 – Standard Test Method for Staining and Color Change of Single or Multicomponent Joint Sealants.
  - 2. ASTM C719 – Standard Test Method for Adhesion and Cohesion of Elastomeric Joint Sealants Under Cyclic Movement (Hockman Cycle).
  - 3. ASTM C794 – Standard Test Method for Adhesion in Peel of Elastomeric Joint Sealants.
  - 4. ASTM C834 – Standard Specification for Latex Sealants.
  - 5. ASTM C881 – Standard Specification for Epoxy Resin Base Bonding Systems for Concrete.
  - 6. ASTM C919 – Standard Practice for Use of Sealants in Acoustical Applications.
  - 7. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
  - 8. ASTM C1087 – Standard Test Method for Determining Compatibility of Liquid Applied Sealants with Accessories Used in Structural Glazing Systems.
  - 9. ASTM C1193 – Standard Guide for Use of Joint Sealants.
  - 10. ASTM C1248 – Standard Test Method for Staining of Porous Substrate by Joint Sealants.
  - 11. ASTM C1311 – Standard Specification for Solvent Release Sealants.
  - 12. ASTM C1521 – Standard Practice for Evaluating Adhesion of Installed Weatherproofing Sealant Joints.

13. ASTM D2203– Standard Test Method for Staining from Sealants.

1.04 SUBMITTALS

- A. General: Submit in accordance with Division 01.
- B. Product Data: Submit manufacturer’s descriptive literature and product specification for each product, including primers and sealing compounds.
  - 1. Provide manufacturer’s literature with selected colors clearly indicated.
- C. Quality Assurance/Control Submittals:
  - 1. Product validation/assurance submittals.
  - 2. Manufacturer’s laboratory adhesion and stain testing results.
  - 3. Joint sealants field adhesion to joint substrates test results.
  - 4. Installer qualifications.
  - 5. Written certification from the subcontractor that joints are of the proper size and design, that the materials supplied are compatible with adjacent materials and backing, that the materials will properly perform to provide permanent watertight, airtight or vapor tight seals (as applicable), and that materials supplied meet specified performance requirements.
- D. Sample Manufacturer’s Warranty.
- E. Closeout Submittals: Cleaning and maintenance data.

1.05 DEFINITIONS

- A. Sealant Types:
  - 1. S: Single component sealant, cures by moisture reaction.
  - 2. M: Multiple component sealant; cures by chemical reaction.
- B. Sealant Grades:
  - 1. NS: Non-sag or gunnable sealant that permits application in joints on vertical surfaces without sagging or slumping.
  - 2. P: Pourable sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
  - 3. SL: Self-leveling sealant that has sufficient flow to form a smooth, level surface when applied in a horizontal joint.
- C. Sealant Classes:
  - 1. 12.5: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 12.5 percent of the joint width as measured at the time of application.
  - 2. 25: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 25 percent of the joint width as measured at the time of application.

3. 35: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 35 percent of the joint width as measured at the time of application.
4. 50: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase and decrease of at least 50 percent of the joint width as measured at the time of application.
5. 100/50: A sealant that when tested for adhesion and cohesion under cyclic movement shall withstand an increase of at least 100 percent and a decrease of at least 50 percent of the joint width as measured at the time of application.

D. Sealant Uses:

1. A: Sealant acceptable for use on an aluminum substrate.
2. G: Sealant acceptable for use on a glass substrate.
3. I: Sealant designed for use in joints which are submerged continuously in a liquid.
  - a. Immersion rated sealant applications require primer.
4. M: Sealant acceptable for use on a mortar substrate.
5. NT: Sealant designed for use in joints in non-traffic areas.
6. T: Sealant designed for use in joints in pedestrian and vehicular traffic areas such as walkways, plazas, decks, and parking garages.
7. O: Sealant acceptable for use on substrates other than those listed above including, but not limited to, color anodized aluminum, metals other than aluminum, painted surfaces, brick, stone, tile, and wood.

E. Miscellaneous:

1. FC: Fast cure sealants; provides lesser cure times than corresponding standard cure sealants.

1.06 SUSTAINABLE DESIGN REQUIREMENTS

- A. Meet VOC requirements of South Coast Air Quality Management District (SCAQMD) Rule 1168. Information is available at [www.aqmd.gov](http://www.aqmd.gov). VOC limit expressed in grams per liter as follows:

Sealant	VOC Limit
Architectural	250
Other	420

Sealant Primer	VOC Limit
Architectural – Nonporous	250
Architectural – Porous	775
Other	750

- B. Provide sealants with no carcinogen or reproductive toxicant components at more than one percent of total mass of product as defined in the following lists:

1. California OEHHA, Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Information is available at [www.oehha.ca.gov/prop65.html](http://www.oehha.ca.gov/prop65.html).
2. California Air Resources Board (CARB), list of Toxic Air Contaminants (California Air Toxics). Information is available at [www.arb.ca.gov/toxics](http://www.arb.ca.gov/toxics).

#### 1.07 QUALITY ASSURANCE

##### A. Qualifications:

1. Manufacturer Qualifications: Firm specializing in manufacturing products specified in this Section.
2. Applicator Qualifications: Firm specializing in installing work specified in this Section with experience on at least five projects of similar nature in past three years.

B. Product Validation/Assurance: Provide products with current SWRI Validation or provide independent third-party laboratory test results showing product meets performance requirements in accordance with ASTM C920 and as specified in this Section.

C. Compatibility: Materials forming joints and adjacent materials shall not adversely affect sealant materials or sealant color per ASTM C1087.

D. Staining: Sealants shall not stain joint substrates per ASTM C510, ASTM C1248, and ASTM D2203.

E. Manufacturer Adhesion, Cohesion, and Stain Testing: Provide manufacturer's laboratory adhesion and cohesion testing per ASTM C719 and ASTM C794, and stain testing per ASTM C510, using specimens of actual substrates to ensure sealant compatibility with substrate before product acceptance.

F. Joint Sealants Field Test for Adhesion and Cohesion to Joint Substrates: Perform field tests for each elastomeric joint sealant in accordance with ASTM C1521, with the manufacturer's representative present prior to installation as follows:

1. Install joint sealants in five foot joint lengths. Allow sealant to fully cure before testing.
2. Make a knife cut of the sealant across the joint and along each side of the joint approximately 3 inches long.
3. Place a mark on the sealant tab, 1 inch from the adhered joint to the tab's free end.
4. Grasp a 2 inch piece of sealant firmly just beyond the 1 inch mark and pull at a 90 degree angle.
5. Record whether or not sealant in joint maintained adhesion to substrate.
6. Record percentage length of sealant elongation.
7. Sealant product acceptance shall be based on pass/fail adhesion performance.

G. Coordination: Coordinate work in this Section with work in related Sections.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of Division 01.

B. Deliver materials in the unopened, original containers or unopened packages with manufacturer's name, labels, product identification, color, expiration period, curing time and mixing instructions for multi-component materials.

- C. Storage and Protection: Store materials in a dry secure location with ambient temperature range of 60 degrees F to 80 degrees F.
- D. Carefully handle and store to prevent inclusion of foreign materials.

1.09 PROJECT/SITE CONDITIONS

A. Environmental Limitations:

- 1. Do not proceed with installation of primers and joint sealants under the following conditions:
  - a. When ambient and substrate temperature conditions are less than 40 degrees F, or as otherwise recommended by manufacturer.
  - b. When joint substrates are wet.

B. Joint-Width Conditions:

- 1. Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.10 SEQUENCING

- A. Apply waterproofing, water repellents, and preservative finishes after sealants have fully cured.

1.11 WARRANTY

A. Comply with provisions of Division 01.

- B. Provide manufacturer's warranty against material defects, air and water tightness, loss of adhesion, cohesion, and staining as follows:

- 1. Silicone sealants – Twenty years.
- 2. Urethane sealants – Five years.
- 3. Other sealants – Two years.

- C. Provide installer's two year workmanship warranty.

1.12 MAINTENANCE DATA

- A. Submit in accordance with Division 01.

- B. Provide cleaning and maintenance information, recommended inspection intervals, and instructions for repairing and replacing failed sealant joints.

**PART 2 - PRODUCTS**

2.01 MANUFACTURERS

- A. Acceptable Manufacturers:

1. BASF Corporation – Building Systems, Shakopee, MN; 800-433-9517 [www.buildingsystems.basf.com](http://www.buildingsystems.basf.com).
2. GE Silicones, Huntersville, NC; 951-201-2000, [www.gesilicones.com](http://www.gesilicones.com).
3. Pecora Corporation, Harleysville, PA; 800-523-6688, [www.pecora.com](http://www.pecora.com).
4. Sika Corporation, Lyndhurst, NJ; 800-933-7452, [www.usa.sika.com](http://www.usa.sika.com).
5. The Euclid Chemical Company, Cleveland, OH; 800-321-7628, [www.euclidchemical.com](http://www.euclidchemical.com).
6. Tremco Sealant Weatherproofing Division of RPM International, Inc., Beachwood, OH; 800-321-7906, [www.tremcosealants.com](http://www.tremcosealants.com).

B. Substitutions: Under provisions of Division 01.

## 2.02 SEALANTS

A. General:

1. Provide sealants that have been tested and found suitable for the substrates to which they will be applied.
2. Color: As selected by Architect from manufacturer's full range of colors.

B. Interior Sealants:

1. Interior Sealant: Nonoxidizing, skinnable, paintable, gunnable, non-staining, non-bleeding acrylic latex sealant; ASTM C834; Type S; Grade NS; Class 12.5; use: O.

a. Products:

- 1) Tremco Tremflex 834.
- 2) Pecora Corp. AC-20 + Silicone.
- 3) or accepted equal.

b. Use at interior trim and finish joints expecting minimal movement.

2. Interior Sealant: Low modulus, moisture curing, non-staining, non-bleeding polyurethane sealant; ASTM C920; Type S; Grade NS; Class 35; uses: A, M, NT, O.

a. Products:

- 1) Tremco Dymonic FC.
- 2) Euclid Chemical Company Eucolastic 1NS.
- 3) Sika Sikaflex 1a.
- 4) or accepted equal.

b. Use at interior vertical expansion, control, and air seal joints.

3. Traffic Sealant: Self leveling, chemical curing, non-staining, non-bleeding polyurethane sealant; ASTM C920; Type M; Grade NS or Grade P; Class 25; uses: M, O, T.

a. Products:

- 1) Pecora Corp. Urexpan NR-200.

- 2) BASF MasterSeal SL 2.
- 3) Sika Sikaflex-2c SL.
- 4) or accepted equal.

b. Use at:

- 1) Interior horizontal traffic joints in low-slope concrete with slopes less than five percent.

## 2.03 ACCESSORIES

- A. Joint Cleaner: Non-corrosive and non-staining type as recommended by sealant manufacturer; compatible with joint forming materials.
- B. Primers: Non-staining, quick-drying type and consistency recommended by the sealant manufacturer for the particular application.
- C. Joint Backing: Non-adhering backing to sealant; non-staining, compatible with sealant and primer such as round, closed cell or bi-cell polyethylene foam rod; oversized 25 percent to 50 percent larger than joint width. Materials impregnated with oil, bitumen or similar materials are not permitted.
- D. Bond Breakers: Type and consistency recommended by the sealant manufacturer to suit the particular application.
- E. Bond Breaker Tape: Self-adhesive, pressure sensitive polyethylene tape.
- F. Masking Tape: Non-staining, non-absorbent tape compatible with joint sealants and adjacent joint surfaces.

## PART 3 - EXECUTION

### 3.01 EXAMINATION

- A. Examine job site conditions; verify substrate, surfaces, and joint openings are ready to receive work and field measurements are as shown on drawings, as specified in this Section, and as recommended by manufacturer.
- B. Report unacceptable conditions to Architect. Begin installation only when unacceptable conditions have been corrected.

### 3.02 PREPARATION

- A. Clean, prepare, and prime joints in accordance with ASTM C1193 and manufacturer's written instructions.
- B. Remove loose materials and foreign matter that might impair sealant adhesion. Clean porous materials such as concrete by grinding, sand or water blast cleaning, mechanical abrading, acid washing or a combination of these methods as required to provide a clean, sound base surface for sealant adhesion.
  1. Remove laitance by acid washing, grinding or mechanical abrading.

2. Remove form oils, release agents, chemical retardants, by sand or water blast cleaning.
  3. Blow from joints with oil-free compressed air loose particles resulting from grinding, abrading, or blast cleaning prior to sealant application.
- C. Mechanically or chemically clean nonporous surfaces such as metal. Remove temporary protective coatings on metallic surfaces using solvents that leave no residue as recommended by metal surface manufacturer. When masking tape or strippable films are used, remove the tape or film and clean any residual adhesive. Apply and wipe-dry cleaning solvents using clean, lint-free cloths or paper towels, do not allow solvent to air dry without wiping.
- D. Protect elements surrounding the work of this Section from damage or disfiguration. Apply masking tape to adjacent surfaces to prevent damage to finishes from sealant installation.

### 3.03 APPLICATION

- A. Apply sealants in accordance with ASTM C1193, manufacturer’s written instructions, and accepted shop drawings.
- B. Apply acoustical sealants in accordance with ASTM C919, manufacturer’s written instructions, except where more stringent requirements are specified herein, and accepted shop drawings.
- C. Apply sealant where indicated on the Drawings and at all exterior joints and openings in the building envelope that are observable sources of air or water infiltration.
- D. Measure joint dimensions and size materials to achieve required width-to-depth ratios. Acceptable joint width-to-depth ratios:

Material	Joint Width	Joint Depth	
		Minimum	Maximum
Metal or other nonporous surfaces.	1/4 inch (minimum)	1/4 inch	1/4 inch
	Over 1/4 inch	1/2 of width	1/2 inch
Wood, concrete, or other porous surfaces.	1/4 inch (minimum)	1/4 inch	1/4 inch
	Over 1/4 inch	1/2 of width	1/2 inch
	Over 1/2 to 2 inches	1/2 inch	1/2 inch
	Over 2 inches	As recommended by sealant manufacturer.	

- E. Install joint backing to achieve desired joint width-to-depth ratio. Roll the material into the joint to avoid lengthwise stretching. Do not twist or braid rod stock.
- F. Install bond breaker where joint backing is not used to prevent three-sided adhesion.
- G. Apply primer where required and where recommended by sealant manufacturer for sealant adhesion.
- H. Install sealants within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

- I. Install sealants immediately after joint preparation.
- J. Install sealants free of air pockets, foreign embedded matter, ridges, and sags.
- K. Produce uniform, cross sectional shapes and depths relative to joint width that allow optimum sealant movement capability.
- L. Tool joints concave. Use dry tooling method.
- M. Cure sealants in compliance with their manufacturer's instructions to obtain high early bond strength, internal cohesive strength, and durability. Do not disturb seals until completely cured.

3.04 CLEANING AND REPAIRING

- A. Immediately clean work under provisions of Division 01.
- B. Clean adjacent soiled surfaces. Use a cleaning agent as recommended in writing by the sealant manufacturer. Remove any masking tape immediately after tooling joints, leaving finished work in neat and clean condition.
- C. Repair or replace defaced or disfigured caused by work of this Section.

3.05 PROTECTION OF FINISHED WORK

- A. Protect finished installation under provisions of Division 01.
- B. Protect sealant until cured.
- C. Do not paint sealants until sealant is fully cured.
- D. Do not paint silicone sealant.
- E. Protect joint sealants from contact with contaminating substances and from damage. Cut out, remove, and replace contaminated or damaged sealants, immediately, so that they are without contamination or damage at time of Project Completion.

END OF SECTION



SECTION 08 11 00

METAL DOORS AND FRAMES

**PART 1 - GENERAL**

1.01 SUMMARY

A. Work Included:

1. Non-rated and fire rated rolled steel doors, panels, and frames.
2. Louvers.

B. Referenced Sections:

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.
2. Section 08 71 00 – Door Hardware.
3. Section 09 21 16.23 – Gypsum Board Shaft Wall Assemblies
4. Section 09 91 00 – Painting.

1.02 REFERENCES

- A. ANSI A250 .8 – Recommended Specification for Standard Steel Doors and Frames.
- B. ANSI A250.3 - Test Procedure and Acceptance Criteria for Factory-Applied Finish Painted Steel Surfaces for Steel Doors and Frames.
- C. ANSI A250 .10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- D. ASTM A653 - Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot- Dip Process.
- E. ASTM A924 - General Requirements for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
- F. NFPA 80 - Fire Doors and Windows.
- G. SDI-105 - Recommended Erection Instructions for Steel Frames.
- H. DHI - Door and Hardware Institute.
- I. CBC - California Building Code, (CCR) California Code of Regulations, Title 24, Part 2 and Part 6.
- J. UL 9 - Fire Tests of Window Assemblies.

K. UL 10C - Fire Tests of Door Assemblies.

#### 1.03 QUALITY ASSURANCE

A. Conform to requirements of ANSI A250.8.

B. Fire rated door, panel, and frame construction to conform to UL 9 and UL 10C.

C. Installed frame and door assembly to conform to NFPA 80 for fire rated class indicated on Drawings.

D. Manufacturer shall have both fabrication and assembly plant located within the continental United States or Canada. Products that are either fabricated or assembled outside the continental United States or Canada are not acceptable.

#### 1.04 SYSTEM REQUIREMENTS

A. Regulatory Requirements

1. Conform to CBC, California Building Code, (CCR) California Code of Regulations, Title 24, Part 2 for fire rated frames and doors.

#### 1.05 SUBMITTALS

A. Submit shop drawings and product data under provisions of Division 01.

B. Indicate frame configuration, anchor types and spacings, location of cutouts for hardware, reinforcement, and finish.

C. Indicate door elevations, internal reinforcement, and closure method.

#### 1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store, protect, and handle products under provisions of Division 01.

B. Store products on site under cover.

C. Place products on at least 4-inch wood sills to prevent rust and damage.

D. Protect doors and frames with resilient packaging.

#### 1.07 SEQUENCING AND SCHEDULING

A. Sequence work under the provisions of Division 01.

B. Schedule work under the provisions of Division 01.

- C. Schedule delivery of all doors and frames so as not to delay progress of other trades.

## **PART 2 - PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- A. Amweld Building Products, Inc., [www.amweld.com](http://www.amweld.com).
- B. Curries Mfg. Inc., [www.curries.com](http://www.curries.com).
- C. Door Components, Inc., [www.doorcomponents.com](http://www.doorcomponents.com).
- D. Fleming, [www.flemingdoor.com](http://www.flemingdoor.com).
- E. Krieger Steel Products Company, [www.kriegersteel.com](http://www.kriegersteel.com).
- F. Republic Builders Products Corporation, [www.republicdoor.com](http://www.republicdoor.com).
- G. Curries, [www.curries.com](http://www.curries.com).
- H. Ceco, [www.cecodoor.com](http://www.cecodoor.com).
- I. Substitutions: Under provisions of Division 01.

### **2.02 MATERIALS**

- A. Doors, Panels and Frames
  - 1. Steel: Commercial quality cold rolled steel conforming to ASTM A653 galvanized to A60 or G60 coating class or Type 8, A40 (ZF120) according to ASTM A924 with minimized spangle, mill phosphatized.
  - 2. Interior Doors: ANSI A250.8, Level 2 heavy duty, Model 1, minimum 0.042-inch-thick faces (18 GA. Minimum).
  - 3. Interior Frames: ANSI A250.8, Level 2, 0.053-inch-thick material (16 GA. Minimum), core thickness.
  - 4. Panels: Same materials and construction as specified for doors.
- B. Door Core
  - 1. Interior Door Core: Impregnated cardboard honeycomb.
- C. Frame Anchors
  - 1. Wood Stud Anchor: U shaped anchor, welded to frame, 1 inch wide, 0.053-inch-thick steel, with 2 pre-punched holes in nailing flange. UL listed as required for fire rating.
  - 2. Floor Clip: Angle anchor, full width of frame, 0.067-inch-thick steel.

#### D. Protective Coatings

1. Bituminous Coating: Fibered asphalt-based corrosion proofing and sound deadener compound. Equivalent to Transcoat 101-F, [www.oilservice.com](http://www.oilservice.com).
2. Primer: Clean and treat with three stage iron phosphate process. Provide baked-on shop coat of EPA compliant gray synthetic rust - inhibitive enamel primer meeting acceptance criteria of ANSI 250.10.

#### E. Hardware Reinforcement

1. Fabricate frames and doors with hardware reinforcement plates welded in place.
2. Hinge reinforcing shall be full width of frame profile.
3. Provide spacers for all thru-bolted hardware.
4. Reinforcement components shall be the following minimum thickness:
5. Hinge (door and frame)      3/16 inch
6. Mortise Lock or Deadbolt    0.093 inch
7. Bored Lock or Deadbolt      0.093 inch
8. Flush Bolt Front              0.093 inch
9. Surface Bolt                    0.093 inch
10. Surface Applied Closer      0.093 inch
11. Hold Open Arm                0.093 inch
12. Pull Plates and Bars         0.067 inch
13. Surface Exit Device         0.093 inch
14. Floor Checking Hinge        0.167 inch
15. Pivot Hinge                    0.167 inch

### 2.03 FABRICATION

- A. When shipping limitations so dictate, frames for large openings shall be fabricated in sections designed for splicing.
- B. Fabricate frames as full profile welded units.
- C. All face, rabbet and soffit joints between abutting members shall be continuously welded and finished smooth when exposed to exterior.
- D. Corner joints shall have all contact edges closed tight, with faces mitered and continuously welded.
- E. Provide 3/8-inch back bend return on frames where gypsum board wall material occurs whether on one or both sides.
- F. Dust cover boxes or mortar guards of 0.016-inch-thick steel shall be provided at all hardware mortises on frames.
- G. Reinforce frames wider than 48 inches with roll formed, 0.093-inch-thick steel channels fitted tightly and welded into frame head, inverted U-shape profile.

- H. Prepare frame for silencers. Provide three (3) single rubber silencers for single doors on strike side.
- I. Provide steel spreader temporarily attached to feet of both jambs as a brace during shipping and handling. Spreader is not to be used for installation purposes.
- J. Attach fire rated label to each frame and door unit.
- K. Manufacturing Tolerances
  - 1. Manufacturing tolerance shall be maintained within the following limits:
  - 2. Frame width                    +1/16 inch -1/32 inch
  - 3. Frame height                    +3/64 inch
  - 4. Frame face                    +-1/32 inch
  - 5. Frame stop                    +-1/32 inch
  - 6. Frame rabbet                    +-1/64 inch
  - 7. Frame depth                    +-1/32 inch
  - 8. Frame throat                    +-1/16 inch
  - 9. Door width and height    +3/64 inch
  - 10. Door thickness                +-1/16 inch
  - 11. Hardware location            +-1/32 inch
  - 12. Door flatness                 +-1/16 inch

## 2.4 FINISHES

- A. Primer: Baked on rust-inhibitive enamel.
- B. Finish: Site paint under provisions of Section 09 91 00.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. Install frames in accordance with SDI-105.
- B. Install doors in accordance with DHI.
- C. Install fire doors and frames in accordance with NFPA 80.
- D. Seal penetration of all surface applied screws on exterior face of frames at glass stops and hardware attachments.
- E. Coordinate with wall construction and details for anchor placement. Provide anchors as follows:
  - 1. Frames up to 7 feet 6 inches height - 4 anchors each jamb.

2. Frames 7 feet 6 inches to 8 feet 0-inch height - 5 anchors each jamb, plus an additional anchor for each 2 feet or fraction thereof over 8 feet 0 inch.
- F. Floor anchors - one (1) anchor each jamb for interior doors. Where wall construction will not allow placement of floor anchor, provide one (1) additional jamb anchor as close to floor as possible.
- G. Existing wall anchors shall be welded to provide non-removable condition. Welded bolt head to be ground, dressed, and finished smooth.
- H. Exposed field welds to be finished smooth and touched up.
- I. Primed or painted surfaces which are scratched or marred shall be touched up.
- J. Hardware to be applied in accordance with hardware manufacturer's templates and instructions.
- K. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

### 3.02 CONSTRUCTION

#### A. INSTALLATION TOLERANCES

1. Edge clearance for swinging doors shall not exceed the following:
  - a. Between door and frame at head and jamb: 1/8 inch.
  - b. At door sill with threshold. (From bottom of door to top of threshold): 3/8 inch.
  - c. At door sill with no threshold: 1/2 inch.
  - d. At door bottom and rigid floor covering per NFPA 80: 1/2 inch.
  - e. At door bottom and nominal floor covering per NFPA 80: 5/8 inch.
2. Frame installation tolerance shall not exceed the following:
  - a. Squareness  $\pm 1/16$  inch.
  - b. Alignment  $\pm 1/16$  inch.
  - c. Plumbness  $\pm 1/16$  inch.
  - d. Diagonal Distortion  $\pm 1/32$  inch.

END OF SECTION

SECTION 08 71 00

DOOR HARDWARE

**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. BHMA finish door hardware for gates, hollow metal doors, and frames.
- B. Accessories including but not limited to door stops, kickplates, seals.

1.02 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

- A. Hardware templates for gates, doors, and frames.

1.03 RELATED SECTIONS

- A. Section 07 92 00 – Joint Sealants.
- B. Section 08 11 00 – Metal Doors and Frames.
- C. Section 32 31 19.16 – Swinging Decorative Metal Gates.

1.04 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

- A. Hardware templates for gates, doors, and frames.

1.05 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only.
  - 1. Refer to Division 01 for definitions, acronyms, and abbreviations.
  - 2. Unless otherwise noted; standards, manuals, and codes refer to the latest edition as of the issue date of this Project Manual.
- B. Conform to the following Referenced Standards and Requirements:
  - 1. CBC – 2022 California Building Code.
  - 2. ADA – Americans with Disabilities Act - 2010 Standards for Accessible Design.
  - 3. ANSI A156 Series – Builders Hardware Manufacturers Association (BHMA) Standards Set.
  - 4. California State Fire Marshal Fire Door Assembly Tests Standard 12-7-4
    - a. Fire-rated doors and frames shall meet UL rated assembly requirements.
    - b. Manufacturers of UL rated assemblies and devices shall provide documentation that assemblies have been tested and comply with California State Fire Marshal, Fire Door Assembly Tests/Standards #12-7-4 and shall be installed accordingly.

- C. Conform to the following Regulatory Requirements (CBC – 2022 California Building Code):
1. Doors / Doorways as part of an accessible route shall comply with CBC Section 11B-404.
  2. All hardware for accessible doors shall meet the requirements of CBC Sections 11B-404.2.7, 11B-404.2.9, and 1010.2.2.
  3. The clear opening width for a door shall be 32 inches minimum. The swinging doors it shall be measured between the face of the door and the frame stop, with the door open 90 degrees.
    - a. There shall be no projections into it below 34 inches above finish floor and 4 inch maximum projections into it between 34 inches and 80 inches above finish floor or ground.
    - b. Door closers and stops shall be permitted to be 78 inches minimum above finish floor or ground per CBC Section 11B-404.2.3.2.
  4. Hand-activated door opening hardware, handles, pulls, latches, locks, and other operating devices on accessible doors:
    - a. Shall be operable with one hand and shall not require tight grasping, pinching, or twisting of the wrist.
    - b. Lever hardware shall be so mounted / centered between 36 inches and 44 inches above finished floor or ground.
    - c. Panic hardware shall be so mounted / centered between 36 inches and 44 inches above finished floor or ground. The clear width of the exit way is not less than 32 inches measured between the face of the door and the opposite stop per CBC Section 11B-404.2.3.
    - d. Hardware for door handles, pulls, latches, locks, and other operating devices for use on means of egress doors shall comply with SFM Standard 12-10-2, Section 12-10-202 as contained in CCR Title 24, Part 12.
  5. The force for pushing or pulling a door open shall be as follows per CBC Section 11B-404.2.9:
    - a. Interior hinged doors, sliding or folding doors and exterior hinged doors operating force required to push or pull open a door shall not exceed 5 pounds (22.2 N).
      - 1) These forces do not apply with to the force required to retract latch bolts or disengage other devices that hold the door in a closed position.
    - b. The force required to activate any operable parts, such as retracting latch bolts or disengaging other devices, shall be no greater than 5 pounds to comply with CBC Section 11B-309.4.
    - c. Forces shall be applied to the latch side of the door per CBC Section 1010.1.3.1.
  6. Door closing speeds shall be as follows per CBC Section 11B-404.2.8:
    - a. Mount door closers for maximum swing of door before setting stops.
    - b. Doors/gates closers, when provided, shall have sweep period adjusted: minimum of 5 seconds for a door/gate to close from the 90-degree position to the 12 degree position.
    - c. Doors/gates with spring hinges require a minimum of 1.5 seconds to close from the 70 degree to the closed position.
  7. Floor stops shall not be located in the path of travel and 4 inches maximum from walls.
  8. 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. Such conditions must be clearly demonstrated and indicated in the specifications for devices:
    - 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).
9. 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 per CBC Section 11B-703.4.2.

#### 1.06 QUALITY ASSURANCE

##### A. Supplier Qualifications and Documentation:

1. Hardware Supplier Qualifications: Firm specializing in the supply and servicing of institutional and commercial door hardware; accredited by manufacturers; and having a minimum of three years documented experience. Hardware supplier to furnish list of at least ten past, finished projects. Include date competed, project location, and references. At least one member of the firm's staff shall be a member of DHI in good standing and is a DHI certified consultant having earned the title Architectural Hardware Consultant (AHC).

##### B. Manufacturer of Submitted Devices - Qualifications and Documentation:

1. Manufacturer Qualifications: Manufacturer specializing in manufacturing institutional and commercial door hardware with a minimum five years with the following documented experience. Furnish list of at least ten past, finished projects. Include date competed, project location, and references. Past project contact information will determine if Builders Hardware is acceptable.

##### C. Installer of Submitted Devices - Qualifications and Documentation:

1. Installer of assembly shall be trained in the trade of hanging commercial doors on commercial frames with commercial hardware. Supplier and Installer of door assemblies shall be authorized representative of manufacturers and have minimum of five years successful experience in detailing, supplying, and installing door assemblies specified on projects of similar size, complexity, and type to this Project. Provide written documentation to show closers will be installed by an individual with successful experience installing closers to meet 5-pound opening force for non-rated door complexity.

#### 1.07 SUBMITTALS

- A. The hardware groups/sets specified in Section 08 71 00 - Part 3 are intended to establish type and design standard when used together with the requirements of this Section, Drawings, and general provisions of the Contract, including General and Supplementary Conditions, and Division 01 Specification Sections. Examine Contract Documents and furnish proper hardware for door openings. Refer to specifications for clarification and detailed requirements and provide products and services in specifications even if not written in hardware groups/sets in Section 08 71 00 - Part 3.
- B. For each opening submit coordinated (means and methods) requirements in accordance with Division 01 and a detailed door, frame, and hardware schedule. See pre-hardware and hardware scheduling requirements below. Submittals that do not meet means and methods, including missing related doors/frames submittal/shop drawings, will be returned for correction before checking.

C. Pre-Hardware Scheduling Tasks:

1. Coordinate work of this Section with other directly affected Sections and scope.
2. Provide required Division 08, means and method type work in accordance with Contract Documents at no additional cost to project, including Division 01 and language below. This Section supplier shall be provided with full documents, not just Section 08 71 00 Part 3 hardware group/sets as that process does not meet Contract requirements.
3. Means and method type work includes, but is not limited to, coordination with plans and other specifications, templating, Section 08 71 00, and other Division 08 Section engineering and coordination. Starting submittal work or labor before means and method type work is completed does not constitute change orders.
4. Provide Request for Information (RFIs) for clarification items before submittals. This Section is not to be a stand-alone submittal but requires multiple Sections and Drawings coordination before submittals will be reviewed.
  - a. Coordinate length and sizes for hardware devices before submittals, Verify the door hardware is compatible for use with the doors and door/frames.
  - b. Report all prevailing conditions that will adversely affect satisfactory execution of work before submittals.
    - 1) Example 1: If door stiles would inhibit the use of specified hardware, provide RFIs before starting detailed hardware headings or group submittal process.
    - 2) Example 2: Coordinate length and sizes for hardware devices before ordering materials. Verify the door hardware is compatible for use with the doors and/or door/frames including, but not limited to, special templates and sizes of devices.
  - c. This Section clarification items (RFIs) shall be reviewed by a non-design team coordinator before sending to design team for review.
    - 1) For clarification items that are means and methods (directed to or from one vendor to another vendor, framer/installer), Contractor shall coordinate and answer or list questions that are not design scope.
5. Multiple submittals for this Section work will not meet Contract requirements. Exceptions are as follows:
  - a. Submittals may be broken up into different door vendor packages (for example: one gate vendor package, one hollow metal door vendor package) but breaking each of these packages into multiple or separate packages is not permissible (example: separate project buildings or different floors broken out not permitted).
  - b. Frames that are required to be ordered early in the build process (under ten frames / openings required to meet project deadlines for early site work) may be broken into separate packages but remaining hardware in these packages will be rejected and not reviewed.
6. Coordinate with door/frame internal reinforcement for door hardware. In particular, coordinate door preparation in accordance with applicable regulatory and trade standards specified.
7. Coordinate keying requirements with all openings with one Vendor. For keying scope, even if different Section door/frame/gate scope packages are submitted with different hardware schedule submittals, only one Section 08 71 00 supplier is to oversee, coordinate, submit, furnish, and install keying. Coordinate per Section 08 71 00 and per means and methods before submits begin.

D. Hardware Schedule:

1. Submit required vendor qualification letters and documentation (see above "QUALITY ASSURANCE").
2. Non-design team coordination and requirements:
  - a. Submittals for coordinated door/frame/hardware items, shall be submitted at the same time for review of total opening requirements. Do not submit Section 08 71 00 scope without coordinated door and frame packages and above RFI/clarification process tasks completed. Submittals that do not include related doors/frames will be returned for correction before checking.
  - b. Section submittals and/or shop drawings to be reviewed and have comments by non-design team (Contractor) before sending to design team. If submittals do not meet Contract requirements, return to hardware vendor for re-submittal. In many cases, unacceptable submittals are passed though without non-design team (Contractor) comments. Coordinate per Contract.
3. Submit hard copies of hardware schedule (number of copies per Division 01) as well as submit editable, PDF files via electronic email of ftp site process in Vertical Format as illustrated by the Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Horizontal-type schedules will be returned for correction before reviewing.
  - a. Shop drawings / hardware schedule shall clearly indicate each hardware group specified and manufacturer of each item proposed as well as each door number that the hardware is assigned to.
  - b. Vertical schedule format sample:

Heading Number 1 (Door Schedule or Architectural Assigned Hardware Group/Set number from Part 3 = HW # __)					
1 Single Door #1 - Exterior from Corridor 101					
		Opening Size	90°	RH	Rating
Quantity	Device Description	Device # (include specification language)	Finish	Manufacturer	
4	Hinges	4.5 x 4.5 NRP x fasteners	630		
1	Lockset		630	SC	
1	I/C Cylinders	Rim or Mortise x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626	SC	
1	Permanent Core	20-740	626	SC	
1	Stop and Holder	1261	626	TR	
1	Door Silencers	SR64 or SR65 (as required)	GR	IV	

4. Illustrations from manufacturer's catalogs and product data:
    - a. Provide cut sheets and product data with vertical format hardware submittal (same timeframe) as well as door and frame information to be reviewed as one submittal package. Manufacturer's hard copy as well as PDF catalog cut sheets and product data shall not be submitted before editable, PDF files vertical format hardware submittal. See above Sequence of Format requirement. Catalog cut sheets and product data sent as submittals before the typed-out nomenclature of hardware part numbers (vertical format hardware submittal) will be returned without review.
  5. Provide hardware schedule and hardware templates to door and frame manufacturer. Provide two templates to those manufacturers who are not currently registered template book holders.
- E. Vendor meetings or coordination prior to purchasing materials:
1. Convene coordination meeting between all opening vendors and installers at least two weeks prior to purchasing doors, frames, door hardware required for complete systems. Attendance includes but is not limited to hardware supplier and/or installer, door supplier and/or installer, frame supplier and/or installer, security card reader vendor and/or installer. If hardware changes are required due to these meetings, communicate changes to design team before ordering materials.
- F. Templates:
1. Provide listing of manufacturer's template numbers for each item of hardware in hardware schedule.
  2. Submit templates and "Reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.
- G. Installation Instructions:
1. Provide manufacturer's written installation and adjustment instructions for finish hardware.
  2. Send installation instructions to site with hardware.
- H. Contract Closeout Submittals: Include specific requirements indicated below.
1. Operating and maintenance manuals: Submit three sets containing the following:
    - a. Complete information in care, maintenance, and adjustment, data on repair and replacement parts, and information on preservation of finishes.
    - b. Catalog pages for each product.
    - c. Name, address, and phone number of local representative for each manufacturer.
    - d. Parts list for each product.
    - e. Copy of final accepted hardware schedule, edited to reflect "As installed".
    - f. Copy of final keying schedule.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

- A. Comply with requirements of Division 01.

- B. Deliver products in manufacturer's original containers, dry and undamaged, with seals and labels intact.
- C. Storage: Store materials in a cool and dry location, elevated from the ground and protected from the elements, and secured from theft or pilferage.

#### 1.09 WARRANTY

- A. Comply with provisions of Division 01.
- B. Provide warranties of respective manufacturers' regular terms of sale from day of final acceptance as follows:
  - 1. Locksets: "L" Series (3) years – "ND" Ten years.
  - 2. Electronic: One year.
  - 3. Closers: Ten years.
  - 4. Exit devices: Three years.
  - 5. All other hardware: Two years.

#### 1.10 MAINTENANCE

- A. Provide special wrenches and tools applicable to each special hardware component.
- B. Provide maintenance tools and accessories supplied by hardware manufacturer.

### **PART 2 - PRODUCTS**

#### 2.01 FINISHES

- A. Typical BHMA finish designation references:
  - 1. Typical BHMA finish designation references:
    - a. BHMA 626 – Satin chromium plated brass or bronze.
    - b. BHMA 628 – Satin or dull aluminum, clear anodized (uncoated).
    - c. BHMA 630 – Satin stainless steel.
  - 2. Closers: BHMA 689 – Sprayed aluminum paint finish (back of house where specified).

#### 2.02 HARDWARE TEMPLATE

- A. Make templates for hardware to be applied to gates and metal doors.
- B. Hinge templates shall conform to ANSI A156.7.
- C. Promptly furnish template information or templates to door and frame manufacturers.
- D. Coordinate hardware items to prevent interference with each other.

#### 2.03 SCREWS, BOLTS, AND FASTENING DEVICES

- A. All exposed fasteners to be stainless steel or zinc plated.
- B. Exposed head oval Phillips type screws in countersunk holes unless otherwise specified.
  - 1. Use screws, bolts, washers, grommets, nuts, and other fastening devices of appropriate length, type, head, metal, and finish as necessary for proper match and application of hardware.
  - 2. For all protection plates (armor-plates, kick-plates, and mop-plates) provide smooth, unobstructed surface with counter sunk fasteners with no sharp edges or an approved adhesive per below (no raised fasteners allowed).
- C. Closer and exit/panic devices:
  - 1. Install using concealed fasteners. Where there is insufficient blocking in the door or reinforcement in the door and/or frames (see related Sections as design should have blocking in the door or reinforcement in the door and/or frames) utilize through bolts or SNB devices.

#### 2.04 FIRE RATED DOORS AND EXIT DOORS

- A. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device. Provide all specifications even if not written in hardware sets/groups.
- B. Provide all hardware necessary to meet the requirements of CBC for fire doors and exit doors, as well as to other requirements specified, even if such hardware is not specifically mentioned under Article "Hardware Schedule" of this Section.

#### 2.05 SUBSTITUTIONS

- A. Products referenced by specific brand names and model numbers have been identified by Owner to match other products in use either completed or in the course of completion. No substitutions permitted per Public Contract Code Section 3400.
  - 1. Otherwise refer to Division 01 for substitutions.

#### 2.06 HANGING HARDWARE

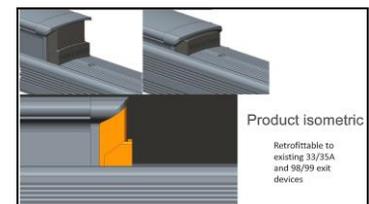
- A. Gate Hanging Devices:
  - 1. Ornamental and Steel Gate Self-Closing Hinges:
    - a. Acceptable Manufacturers:
      - 1) Locinox Manufacturing (no known equal).
    - b. Mammoth 180 Hydraulic Closers/Hinges Set. Ultra heavy duty 180-degree hydraulic gate closer and hinge for gates up to 440 pounds.
    - c. Heavy duty full surface mounted hinge and vertical built-in closer not exceed 5 pounds opening force.
- B. Butt Hinges and Self-Closing Hinges:

1. Acceptable Manufacturers:
  - a. Ives Manufacturing by Allegion.
  - b. Hager Manufacturing.
  - c. Stanley Manufacturing.
2. Where hardware groups/sets have different information (number of hinges and sizing), refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device.
  - a. Butt hinges shall be manufactured in accordance with ANSI/BHMA A156.1.
  - b. Self-closing hinges and pivots shall be manufactured in accordance with ANSI/BHMA A156.17.
  - c. Provide wide throw hinges where required:
    - 1) Submit and provide hinge widths sufficient to clear trim projection when door swings 180 degrees. All doors shall swing 180 degrees if wall allows.
    - 2) Utilize wide throw type hinges to clear frame or wall obstructions/cladding in order for doors to completely open. See 180-degree language above.
    - 3) Confirm hinge sizing with frame and wall details.
  - d. For doors 1-3/4 inches thick and up to 36 inches wide, provide hinge height of 4-1/2 inches.
  - e. For doors 1-3/4 inches thick and 37 inches to 48 inches wide, provide heavy duty, four ball bearing hinges and height of 5 inches.
  - f. Provide two butts for doors up to 60 inches high and one additional butt for each 30 inches of height or fraction thereof.
  - g. Provide non-removable pins at exterior doors.
  - h. Provide ball-bearing hinges.
    - 1) Non-ball-bearing hinges are not acceptable.

#### 2.07 SECURING DEVICES (INCLUDING ACCESS CONTROL CARDREADER LEVER TRIM)

- A. Provide all latching devices that are lockable including, but not limited to, door locks and panic/exit devices that comply with CBC Sections 1010.2 through 1010.2.8.2. All new construction projects shall include locks that allow the doors to be locked from the inside.
  1. This requirement applies to classrooms and any other school room with an occupancy of five or more persons, but does not include doors that are locked from the outside at all times or student restrooms.
- B. Cylindrical Locksets and Latchsets:
  1. Acceptable Manufacturers:
    - a. Schlage Lock Co. ND Series.
    - b. Owner's standard, no substitutions permitted.
  2. Levers:
    - a. Provide levers to return to door within 1/2 inch.
      - 1) Provide exterior side lever trim with vandal resistant feature. Locked exterior lever freely rotates withstanding abuse and vandalism while remaining securely locked. Example: Schlage ND series Vandlgard™.

3. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:
    - a. Provide cylindrical locksets exceeding the ANSI/BHMA A156.2 Grade 1 performance standards for strength, security, and durability in the categories below.
      - 1) Abusive Locked Lever Torque Test – minimum 3,100 inch-pounds without gaining access.
      - 2) Offset lever pull – minimum 1,600-foot pounds without gaining access.
      - 3) Vertical lever impact – minimum 100 impacts without gaining access.
      - 4) Cycle life - tested to minimum 16 million cycles per ANSI/BHMA A156.2 Cycle Test with no visible lever sag or use of performance aids such as set screws or spacers.
    - b. Backsets: 2-3/4 inches.
    - c. Provide solid steel anti-rotation through bolts and posts to control excessive rotation of lever.
    - d. Provide lockset that allows lock function to be changed to over twenty other common functions by swapping easily accessible parts.
    - e. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
    - f. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
    - g. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
      - 1) Provide ANSI 4-7/8 inch standard strike.
      - 2) Provide curved lip-type strike at all locations if possible to prevent catching clothing or other objects on strike. Where required, provide detail and flat strike.
      - 3) Where required, provide extended lip strike so that the lock or latchset latch will not come in contact with frame or added trim on or adjacent to the frame. Example: Don Jo device #MEST-104, but provide submitted manufacturer equivalent extended lip strike.
- C. Exit Devices:
1. Acceptable Manufacturers:
    - a. Von Duprin.
    - b. Owner's standard, no substitutions permitted.
  2. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:
    - a. The unlatching force of panic hardware shall not exceed 5 pounds, applied in the direction of travel, certified by UL to meet requirements of CBC Section 11B-309.4 (Von Duprin nomenclature "AX").
    - b. Exit devices shall be ANSI A156.3, Grade 1; UL Listed.
    - c. Provide panic devices complying with CBC Section 1010.2.9. The panic/exit device push-bar shall extend across no less than one-half the width of the doors/gates.
    - d. Panic hardware shall comply with 2022 CBC. Panic bar shall be mounted 38 inches to 44 inches above finish floor.
    - e. All exit devices shall meet Section 12-10-302: For Von Duprin shipped to project site with exit device, isometric cap as to not catch items on panic device push bar (nomenclature "PA")



2.08 KEY SYSTEMS (CYLINDERS, CORES, AND KEYS)

- A. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on drawings and detailed requirements for each type of device. Keying specifications below override hardware set/group nomenclature.
- B. For all locking or dogging devices, provide complete cylinder system and coordination whether or not specified in Section 08 71 00, Part 3 hardware sets as required by locking device.
  - 1. Different locking devices require a set of different requirements including, but not limited to, appropriate cams for mortise-type cylinders, appropriate tail pieces and size for rim-type cylinders, blocking rings as required for locking and cylinder devices to not rattle and meet manufacturers' warranties, as well as cylinders that are to be coordinated with construction cores/cylinders and final pinned cores/cylinders shipped to Owner by Registered Mail per below to meet system requirements.
  - 2. Scope is means and method type work by a certified locksmith and/or DHI individual to engineer rim or mortise cylinders and blocking rings or tail-piece components as required for submitted locking devices. Since there could be as many as 500 options for rim or mortise cylinders with the locking devices and different manufactures that may be submitted, this means/methods-type work is required (similar to templating doors and frames to accept hardware). Coordinate as required.
- C. Key Systems (Cylinders, Cores, and Keys):
  - 1. Manufacturers:
    - a. Schlage Lock Co.
    - b. Owner's standard, no substitutions permitted.
  - 2. For all locking or dogging devices, provide complete Primus XP Level 3/Primus keying system whether or not specified in Section 08 71 00, Part 3 hardware sets including lock cores, mortise cylinders, and rim cylinders keyed as directed by Owner in submittal process. Key System shall be:
    - a. Furnish a Proprietary Schlage master key system as directed by the owner or architect. Key system to be designated and combinationed by the Schlage Master Key Department even if pinned by the Authorized Key Center, Authorized Security Center or a local authorized commercial dealer. This is to be a Schlage Primus keying system. SCUSD to verify all keyways. Patented Schlage Lock Co. Primus XP provide as follows:
      - 1) 6 pin x Standard Core plug (D Series) x 626 finish
      - 2) 6 pin x Rim type x IC Core (Exit Device) x 626 finish
      - 3) 6 pin x 1-1/4" Mortise x IC Core (KR Mullions and CD) x 626 finish
    - b. Furnish Schlage Padlocks and the cylinders to tie them into the master key system for gates, storage boxes, utility valve security, roof hatches and roll-up doors keyed as directed in the keying schedule.
      - 1) Furnish KS43D2200 padlock for use with non-I/C Schlage cylinders. Furnish 47- 413 (conventional) or 47-743-XP (PrimusXP) with above.
      - 2) Furnish KS43G3200 padlock for use with FSIC Schlage cylinders. Furnish 23-030 (Classic / Everest) or 20-740 (PrimusXP) with above.
      - 3) Furnish KS41D1200 padlock for use with SFIC Schlage cylinders. Furnish 80-037 (Everest-B) with above.

- c. Keyway: Provide as instructed by Owner during submittal process.

D. Keying Requirements:

1. Provide keyed, construction cores and keys during the construction period.
  - a. Provide full sized cylinders or brass construction cores and brass keys at all interior and exterior doors. Plastic cores are not permitted.
  - b. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway or key section as the Owner's permanent keying system. Permanent cores and keys prepared according to the accepted keying schedule shall be furnished to the Owner.
2. Keying Meeting and Programming Schedule:
  - a. Do not provide keying matrix in original hardware submittals. After hardware has been submitted and reviewed in accordance with Division 01 and Section 08 71 00 requirements, arrange a keying matrix/programming meeting with Owner Representative and the project hardware suppliers/vendors that is certified to assist the Owner Representative in developing cylinders/keying system based on reviewed submittals per below (contract with a certified hardware suppliers/vendors/locksmith to perform the following tasks without the design team or design consultants input (keying meetings require confidentiality with no one outside these meetings knowing the District keying system).
    - 1) Copies of all plans (pages with door or gate numbers on them) shall be brought to the meeting with keyed doors highlighted for review (Contractor scope). After the meeting, provide the Owner Representative with both a scanned digital/PDF copy of the marked-up plans, as well as the original copies of the plans delivered to the District with meeting notes.
    - 2) Copies of all reviewed door, frame, gate, and hardware submittals shall be brought to the meeting with keyed doors highlighted for review (do not use the original specifications for keying meeting). After the meeting, provide the Owner Representative with both a scanned digital/PDF copy of any hardware submittal pages that have mark ups, as well as the original copies of the meeting's hardware submittal pages delivered to the Owner's Representative with meeting notes.
    - 3) Follow procedures for keying meeting and programming schedule as outlined by the Door Hardware Institute. DHI procedures are based on Door Hardware Institute core class entitled Masterkeying class #AHC200.
  - b. Keying meeting to produce a programming schedule/matrix based on the following:
    - 1) Furnish keys in the following quantities (total quantity of keys part of bid package):
      - a) 5 each Grand master-keys per set.
      - b) 6 each Masterkeys per set.
      - c) 3 each Change keys each lock, core, or cylinder.
      - d) 5 each Permanent Extractor keys.
      - e) 9 each Construction masterkeys.
      - f) 2 each Construction Core Extractor keys.
    - 2) Permanent keys and cores shall be stamped with the applicable key mark for identification. The visual key control marks or codes shall not include the actual key cuts.
    - 3) Permanent keys shall be stamped "Do Not Duplicate".

- c. Furnish typed programming meeting notes in PDF, editable electronic format as well as mailed, hard copy to Owner Representative (see above required PDF and hard-copy requirements).
  - d. Transmit pinned cores/cylinders as well as cut grand masterkeys, masterkeys, change keys, and other security keys to Owner Representative by Registered Mail, return receipt requested. All permanent cores and keys shall be sent directly from the factory to the Owner Representative for ID and verification.
3. Accompany Owner Representative to install permanent cylinders and/or cores:
- a. In above keying meeting, plan time to accompany Owner Representative/assist the installation process of permanent cores in contracted permanent locking or keying housings.
  - b. Owner Representative and Contractor to agree on timeline when Owner Representative will have their completed pinned cores ready for installation.
  - c. Contractor responsible to prepare locking systems, installation ready for final cores, free from dirt, debris or overtightening of locking devices that may cause binding of keyed devices).
  - d. On project walk to assist in permanent core install, Contractor responsible to un-install construction cores. Construction core devices are Contractor purchased and Contractor can keep or dispose of non-security construction cores.
  - e. Provide instructions for adjustments and maintenance of hardware and hardware finishes.

## 2.09 CLOSING DEVICES

### A. Surface Mounted Closers:

1. Rack and Pinion Manufacturers:
  - a. LCN Manufacturing: 4040XP as scheduled.
  - b. Owner's standard, no substitutions permitted.

### B. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device:

1. ANSI A156.4, Grade 1; UL Listed; meets UL 10C and SFM Standard 12-7-4 for positive pressure fire test. Whether or not specified in hardware groups/sets, submit 4040XP. A written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.
2. Closers shall have multi-size spring power adjustment to permit setting of spring from 1 through 6 with additional spring power available. Provide ADA compliant setting nomenclature during submittals as recommended by closer manufacturer.
3. At locations with acid or corrosive conditions provide LCN SRI (SRI primer for installations in corrosive conditions available with powder coat only).
4. All door closers shall be fully hydraulic and have full rack and pinion action with a shaft diameter of a minimum of 11/16 inch and piston diameter of 1 inch to ensure longevity and durability under all closer applications.
5. All parallel arm closers shall incorporate one-piece solid forged steel arms with bronze bushings. 1-9/16 inch steel stud shoulder bolts, shall be incorporated in regular arms, hold-open arms, arms with hold open and stop built in. All other closers to have forged steel main arms for

strength, durability, and aesthetics for versatility of trim accommodation, high strength, and long life.

6. All parallel arm closers so detailed shall provide advanced backcheck for doors subject to severe abuse or extreme wind conditions. This advanced backcheck shall be located to begin cushioning the opening swing of the door at approximately 45 degrees. The intensity of the backcheck shall be fully adjustable by tamper resistant non-critical screw valve.
7. Closers shall be installed to permit doors to swing 180 degrees.
8. All closers shall utilize a stable fluid withstanding temperature range of 120 degrees F. to -30 degrees F. without requiring seasonal adjustment of closer speed to properly close the door.
9. Provide the manufactures drop plates, brackets and spacers as required at narrow head rails and special frame conditions. NO wood plates or spacers will be allowed. Door frames shall be reinforced at all mounting locations.

## 2.10 STOPS AND HOLDERS

### A. Floor Stops:

1. Acceptable Manufacturers:
  - a. ABH Manufacturing.
  - b. Ives Manufacturing.
  - c. Triangle Brass Manufacturing Company, Inc. (Trimco).

## 2.11 ACCESSORIES

### A. Kick/Mop Plates:

1. Acceptable Manufacturers:
  - a. Triangle Brass Manufacturing Company, Inc. (Trimco).
  - b. Ives Manufacturing.
  - c. Hager Manufacturing.

### B. Where hardware groups/sets have different information, refer to the following for clarification. Provide hardware groups/sets devices along with added devices as indicated on Drawings and detailed requirements for each type of device.

1. Coordinate length and sizes for hardware devices before ordering materials (verify the door hardware is compatible for use with the doors and door/frames). Protection plate example: LDW nomenclature in Part 3 means "less door width". A 48 inch wide door would have a 46 inch wide protection plate. Width shall be one inch less than door width unless doors have protective edge guards or center mullions. Coordinate before submittals.
2. At rated doors (UL fire), furnish protection plates with engraved UL listing information. Example: Trimco added part #ULS added to all kickplates specified below that are on UL or rated doors/openings.

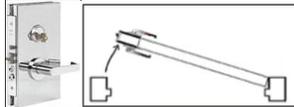
### C. Weatherstripping.

1. Acceptable Manufacturers:
  - a. Pemko Manufacturing, Inc.
  - b. Zero International.

c. National Guard Products (NGP).

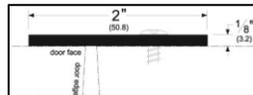
D. Gates and Gate Hardware Accessories:

1. Provide welded astragals, lock patches (templates), and/or welded mounting devices required for a complete installation of specified hardware, whether or not shown on Drawings and details. Weld in accordance with manufacturer's recommendations. Provide devices ground smooth, prime and paint to match gate/fence system. See Section 09 91 00 for paint and primer requirements. Inserted pictures below are examples of lock patches and/or welded mounting devices. Template gates for each type of hardware device.



2. Gate Astragal:

- a. Provide fully welded astragal full height of gate to overlap either adjacent fence post or the adjacent gate at pair of gates.
  - 1) Provide full height astragal in width indicated on Drawings. If not indicated, provide astragal width no less than 2 inches wide. See inserted picture below.
  - 2) Provide full height astragal overlap width per details. If not indicated, provide overlap of astragal no less than 3/4 inch wide.
  - 3) Provide 1/8 inch astragal thickness. See inserted picture below.
  - 4) Where Pemko Manufacturing 357 Series astragal is utilized by gate manufacturer, do not use screws or order with screw holes. Nomenclature: ND prefix or suffix required by Pemko on 357 Series astragal.



- b. Provide devices ground smooth and painted to match gate/fence system. See Section 09 91 00 for paint and primer requirements.

3. Gate Canebolts:

- a. Where nomenclature or device "524 Series" non-padlock cane bolt-type devices are specified in hardware group/sets, provide by Crown Industrial, South San Francisco, CA; (650) 952-5150; <http://www.crown-industrial.com/>, or accepted equal.
- b. Where nomenclature or device "stock #0524PL and/or part #0000478" series padlockable cane bolt-type devices are specified in hardware group/sets, provide series by Crown Industrial, South San Francisco, CA; (650) 952-5150; <http://www.crown-industrial.com/>, or accepted equal.
- c. On pairs of gates that have ingress or egress lever trim and or exit/panic device push-pad trim on active side gate, install cane bolt away from the door edge so that both the cane bolt and supplied the padlock cannot not impede the active gate from opening at any time, providing free egress. No cane bolt at active leaf or exit or ingress gate unless it is fully automatic and opens with the same motion that releases the latch.

- d. Provide compatible galvanized steel pipe canebolt receptor and strike plate mounted in concrete slab as required.
  - 1) At padlockable canebolts, provide sufficient canebolt receptor depth to enable use of padlock.
  - 2) Provide canebolt receptors at both closed position of gate and open position of gate at 90 degrees, unless shown differently on Drawings.
- e. Canebolts shall be mounted and welded in accordance with manufacturer's recommendations.
  - 1) Coordinate with other welding requirements in Contract Documents.
  - 2) Provide devices ground smooth and painted to match gate/fence system. See Section 09 91 00 for paint and primer requirements.
- f. Products by the following manufacturers will be considered for acceptance providing all specified criteria have been met in full. Furnish all items and components of hardware required to complete the work in accordance with specifications, Contract Documents, and intended operation.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Examine doors and frames and verify mounting locations as indicated on shop drawings.
- B. Report unacceptable conditions to the Architect. Begin installation only when unacceptable conditions have been corrected.

#### **3.02 INSTALLATION**

- A. Install in accordance with manufacturer's printed instructions and accepted shop drawings.
- B. Door-Floor Clearances:
  - 1. Unless otherwise shown, provide the following door-floor clearances:
    - a. Maximum 3/8 inch.
- C. Hardware Placement:
  - 1. Unless otherwise shown or required by CBC 2022, ADA - 2010 Standards for Accessible Design and/or Title 24, place hardware at the following heights:
    - a. Hinges: Door and frame manufacturer's standard scope per additional specifications and plans.
    - b. Lever handles for latchsets, lockset and panic/exit device pull, lever trim:
      - 1) 38 inches above finish floor/surface.
      - 2) Verify manufacturer's template with door design.
    - c. Panic devices push bar:
      - 1) Panic hardware shall be so mounted / centered between 36 inches and 44 inches above finished floor or ground.
      - 2) Verify manufacturer's template with door design to meet CBC 2022 exterior, pull side trim.

- d. Closers:
  - 1) To meet opening force requirements

- 2. Hardware for door handles, pulls, latches, locks, and other operating devices for use on means of egress doors shall comply with SFM Standard 12-10-2, Section 12-10-202 as contained in CCR Title 24, Part 12.

D. Installation:

- 1. Except for hinges, do not install hardware until painting and finishing work is completed.
- 2. Pre-drill pilot holes in wood for screws. Drill and tap for surface mounted hardware on metal.
- 3. Hinges: Set hinges snug and flat in mortises. Hand turn screws to flat seat – do not drive.
- 4. Locksets: Install locks with keyways in proper position. Install levers, roses, and escutcheons firmly affixed.
- 5. Floor Stops: After gate closer devices are installed, and gate is opened as far as possible without #1) occupant excessive force on gate closer; and #2) door does not hit adjacent wall or other surfaces, stops shall be installed at substantial completion a maximum of 4 inches from adjacent walls and as far away from the hinge point as possible (preference is to have stops installed just below end of gate, or lever or pull locations).

3.03 PAINT OR FIELD FINISHES

- A. Coordinate with Contact Documents including, but not limited to, Section 09 91 00 for paint and primer requirements.
- B. Fire rated labels on doors and frames shall not be painted.

3.04 ADJUSTING

- A. Adjust parts for smooth, uniform operation.
- B. Lubricate moving parts with manufacturer recommended lubricant.
- C. Replace units that cannot be adjusted and lubricated to operate freely and smoothly as intended for the application.
- D. Adjust door closer devices:
  - 1. Adjust closer operating.
    - a. Interior and Exterior Doors: not to exceed 5.0 pounds force.
    - b. When fire doors are required, the maximum effort to operate the door may be increased to the minimum allowed by the appropriate administrative authority, not to exceed 15 pounds opening force.
  - 2. Adjust closer delay and operating speeds to comply with requirements of 2022 CBC Section 11B-404.2.8.1 and ADA – Americans with Disabilities Act - 2010 Standards for Accessible Design.
    - a. Doors/gates closers, when provided, shall have sweep period adjusted: minimum of 5 seconds for a door/gate to close from the 90-degree position to the 12-degree position.

- b. Doors/gates with spring hinges require a minimum of 1.5 seconds to close from the 70 degree to the closed position.

3.05 CLEANING

- A. Clean as recommended by manufacturer. Do not use materials or methods which may damage finish or surrounding construction.

3.06 HARDWARE SCHEDULE

- A. Manufacturers Legend:

<u>Code</u>	<u>Name</u>
IV	Ives Manufacturing
SC	Schlage Manufacturing
VO	Von Duprin Manufacturing
LC	LCN Closers
PE	Pemko Manufacturing
TR	Trimco Manufacturing
AB	ABH Manufacturing
LO	Locinox (Mammoth Hinges)
TO	TORXUN Manufacturing

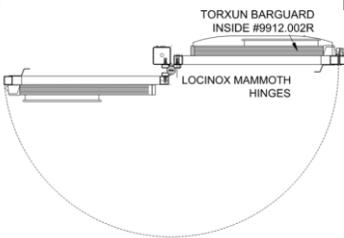
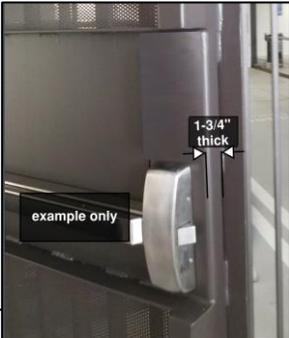
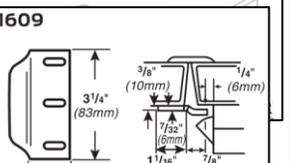
- B. Hardware Columns - Example (Legend):

Qty	Device Description	Device # (include specification language)	Finish	Manu
1	-----	--		

- C. The following hardware sets are intended to establish type and standard of quality when used together with the requirements of this Section (see above Section and related Sections including Division 01). Examine Contract Documents and furnish proper hardware for door openings. Refer to Door Schedule on the Drawings for Hardware Group/Set assignments for each opening.

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

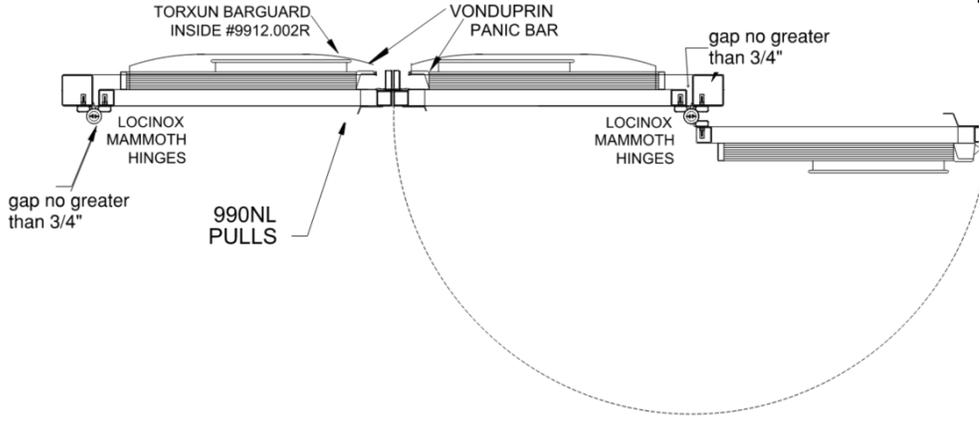
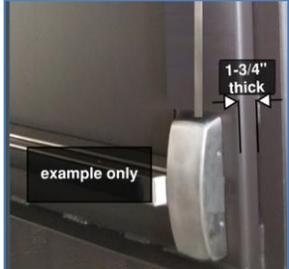
**Hardware Group/Set #101**

1	Ea.	Hydraulic Closers / Hinges Sets 	Mammoth 180 Hydraulic Closers/Hinges Set: Ultra heavy duty 180 degree hydraulic gate closer and hinge for gates up to 440 pounds x Silver Finish (Note: if round post similar to chain-link, provide additional Locinox brackets part #CLB Mammoth)		LO
1	Ea.	Bar Guard (inside)	TORXUN Guard (inside) Part #9912.002R		TO
1	Ea.	Rim-Type Exit/Panic Device x Pull and Key Override	WH CD AX PA 98NL x 990NL x strike (mount all devices in weldable squared-off boxes as required for panic device and strike template requirements (see below)		626 VO
1	Ea.	Strikes and Weldable Boxes (template as required by all furnished hardware, see Section 08 71 00, Part 1 for templating requirements and full specs which call for fully welded, no seams, ground smooth, prime and finishes per architectural drawings and welding/paint specifications)	Furnish and install: #1) Welded, templated areas for devices (requires 1-3/4" thick gate stile and/or boxes as required where device is installed (templates to have custom welded areas preferred yet contact technicians at <a href="http://www.keedex.com">www.keedex.com</a> for alternate weldable boxes if necessary - means and methods no-designer, show detailed templating in submittals and shop drawings). #2) Provide welded areas and brackets as required for condition for either special strike #1609 or combo devices #050996 strike bracket with 299F (means and methods no-designer, show detailed templating in submittals and shop drawings).	  	
2	Ea.	I/C Cylinders (Rim or Mortise)	20-057 or 20-061 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)		626 SC
1	Ea.	Permanent Core	20-740-EP (Exterior)		626 SC
1	Ea.	Permanent Core	20-030-EP (Interior)		626 SC

1	Ea.	Stop and Hold Open	1804		630	AB
1	Ea.	Bottom of doors to be greater than 10" Clear, Unobstructed and Smooth Surface	Per above specifications and by gate manufacturer (push-side, ground smooth, primed, and painted to match gate).			
1	Ea.	Painted Full Height Astragal	Per above specifications and by gate manufacturer and per specifications (utilized as a positive stop – when gate closes against the astragals the opening cannot swing back in toward the egress side)			
<p>Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents including, but not limited to, additional hardware devices requirements in the above specification language, architectural plans, and full specification documents.</p>						

Blank space below and after a Group/Set is intentional to avoid, if possible, splitting a Hardware Group/Set onto two pages

**Hardware Group/Set #102**

2	Ea.	Hydraulic Closers / Hinges Sets	<p>Mammoth 180 Hydraulic Closers/Hinges Set: Ultra heavy duty 180 degree hydraulic gate closer and hinge for gates up to 440 pounds x Silver Finish (Note: if round post similar to chain-link, provide additional Locinox brackets part #CLB Mammoth)</p> 	LO
2	Ea.	Bar Guard (inside)	TORXUN Guard (inside) Part #9912.002R (or equal devices as required by architectural details, and language in Section 08 71 00)	TO
2	Ea.	<p>Surface Vertical Rod Exit/Panic Device x Keyed ANSI 03 Lever</p> 	<p>WH CD AX PA 9827NL x 990NL-R/V x LBR</p> 	626 VO
4	Ea.	I/C Cylinders (Rim or Mortise)	20-057 or 20-061 x appropriate cam x blocking rings as required (rim or mortise type and quantity as required by locking device)	626 SC
2	Ea.	Permanent Core	20-740-EP (Exterior)	626 SC
2	Ea.	Permanent Core	20-030-EP (Interior)	626 SC
2	Ea.	Auxiliary Floor Stop	FS18L (see Section 08 71 00, Part 3 installation)	630 IV
2	Ea.	Bottom of doors to be greater than 10" Clear, Unobstructed and Smooth Surface	Per above specifications and by gate manufacturer (push-side, ground smooth, primed, and painted to match gate).	
<p>Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents including, but not limited to, additional hardware devices requirements in the above specification language, architectural plans, and full specification documents.</p>				

**Hardware Group/Set #103**

	Ea.	Hinge	5BB1 x NRP (size-quantity per Section 08 71 00)	630	IV
1	Ea.	Storeroom Lockset	ND96PD RHO x 10-025	626	SC
1	Ea.	Permanent Core	20-740-EP (Exterior)	626	SC
1	Ea.	Closer x Stop Arm	4040XP x CUSH (installed at 90 degrees)	689	LC
1	Ea.	Kick Plate	KO050 10" tall x 2" LDW (less door width) x B4E (beveled edges) x counter sunk per Section 08 71 00, Part 2 (no raised fasteners)	630	TR
1	Ea.	Seal	S88D seals (head, jambs) by Pemko or approved manufacturer		

Note: Furnish all devices and components for hardware groups/set above in accordance with Contract Documents including, but not limited to, additional hardware devices required in Section 08 71 00 language, architectural plans, and full specification documents.

END OF SECTION

## SECTION 09 21 16.23

## GYPSUM BOARD SHAFT WALL ASSEMBLIES

**PART 1 - GENERAL**

## 1.01 SECTION INCLUDES

- A. Gypsum board shaft wall assemblies for the following:
  - 1. Wall and ceiling construction.

## 1.02 RELATED SECTIONS

- A. Section 07 84 00 – Firestopping.
- B. Section 07 92 00 – Joint Sealants.
- C. Section 09 91 00 – Painting.
- D. Divisions 21 - 23 – Mechanical Sections as applicable to the Project.
- E. Divisions 26 - 28 – Electrical Sections as applicable to the Project.

## 1.03 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. American Iron and Steel Institute (AISI) Code of Standard Practice.
  - 2. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 3. ASTM C475 – Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
  - 4. ASTM C954 – Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
  - 5. ASTM C1047 – Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
  - 6. ASTM C1396/C1396M – Standard Specification for Gypsum Board.
  - 7. ASTM E72 – Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.

- 8. ASTM E84 – Standard Test Method for Surface Burning Characteristics of Building Materials.
- 9. ASTM E119 – Standard Test Methods for Fire Tests of Building Construction and Materials.
- 10. GA 216 – Gypsum Association Recommended Specifications for the Application and Finishing of Gypsum Board.
- 11. GA 600 – Gypsum Association Fire Resistance Design Manual.
- 12. UL – Underwriters Laboratories Inc.: Design Numbers for Fire-Resistance Rated Assemblies.

#### 1.04 SUBMITTALS

- A. Submit in accordance with Division 01.
- B. Product Data: Provide product data and material safety data sheets on gypsum board, joint tape, topping compound, texture and all accessories.
- C. Submit manufacturer's installation instructions.

#### 1.05 QUALITY ASSURANCE

- A. Installer: Firm specializing in work of this Section.
- B. Fire-Resistance Ratings: Provide fire-resistance ratings as indicated on Drawings. Materials and construction shall be identical to assemblies with fire-resistance ratings determined according to ASTM E119 by a testing and inspecting agency.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures for installing gypsum board shaft-wall assemblies including, but not limited to, the following:
  - 1. Fasteners proposed for anchoring nonstructural steel framing to building structure.
  - 2. Wiring devices in shaft-wall assemblies.
  - 3. Doors and other items penetrating shaft-wall assemblies.
  - 4. Items supported by shaft-wall-assembly framing.
  - 5. Mechanical work enclosed within shaft-wall assemblies.

#### 1.06 REGULATORY REQUIREMENTS

- A. Install in strict accordance with all published applicable regulations by local, state or federal agencies that may have jurisdiction.

#### 1.07 DELIVERY, STORAGE AND HANDLING

- A. Steel framing and related accessories shall be stored and handled in accordance with the A.I.S.I. "Code of Standard Practice."

- B. All materials shall be stored in a safe, dry area in the original factory supplied packaging clearly marked with type of material and UL or other labels as required. It is the responsibility of Contractor to ensure that all materials are properly stored at the jobsite and remain free of damage and defects.

#### 1.08 JOB AND ENVIRONMENTAL CONDITIONS

- A. Warm environment is ideal; avoid installation in subfreezing or wet conditions.
- B. Protect applicators and occupants from nuisance dust when saw-cutting.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

##### A. Acceptable Manufacturers:

1. United States Gypsum Company, Chicago, IL; 800-874-4968, [www.usg.com](http://www.usg.com). Product: Cavity Shaft Wall.
2. National Gypsum Company, Charlotte, NC 28211; phone: 704-365-7300, fax: 800-329-6421, [www.nationalgypsum.com](http://www.nationalgypsum.com). Product: eXP Cavity Shaftwall System.
3. Georgia-Pacific Corporation, Atlanta, GA 30303; toll free: 800-824-7503, phone: 404-652-4000, fax: 404-230-5624, [www.gp.com](http://www.gp.com). Product: DensGlass Shaftliner.
4. PABCO Gypsum, Newark, CA 94560; phone: 510-792-9555, fax: 510-794-8725, [www.pabco gypsum.pac coast.com](http://www.pabco gypsum.pac coast.com). Product: PABCORE SHAFTLINER Type X Gypsum Board.

##### B. Substitutions: Under provisions of Division 01.

#### 2.02 PANEL PRODUCTS

- A. Gypsum Board: ASTM C1396/C1396M; 5/8-inch thick, Type X, maximum permissible length; ends square cut, tapered edges.
- B. Gypsum Shaftliner Board: ASTM C1396/C1396M; 1-inch thick, Type X, maximum permissible length, 24 inches wide, double beveled edges.
  1. Basis-of-Design Product: Sheetrock Brand Gypsum Liner Panels by United States Gypsum Company; or accepted equal.

#### 2.03 METAL FRAMING

- A. Conform to the requirements of Section 09 22 16 for conditions indicated on Drawings.
- B. Metal Studs: Steel C-H Studs, J and E-Studs.
- C. Metal Runners: J-Runners.

#### 2.04 ACCESSORIES

- A. Accessories: As recommended by the gypsum board manufacturer to meet required fire ratings.

- B. Corner Bead, U Bead (Edge Trim), Metal Trim and Control Joints: GA 216; ASTM C1047; sheet steel, zinc coated by hot-dipped process in accordance with ASTM A653/A653M, minimum G40 coating.
- C. Joint Materials: ASTM C475, GA 216; reinforcing tape, joint compound, adhesive, water and fasteners.
- D. Fasteners: Screws, Type S, conforming to ASTM C954, self-drilling and self-tapping steel screws with double-lead thread design as approved by system manufacturer for standard and heavier gauge load bearing steel framing.
- E. Sealants: Refer to Section 07 92 00.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

- A. Verify that site conditions are ready to receive work and meet the design criteria for an approved installation.
- B. Ensure all materials are free of defects and are labeled by an approved listing and labeling service.
- C. Do not proceed with installation until deficiencies are corrected and surfaces are acceptable.
- D. Beginning of installation means acceptance of existing conditions.

#### **3.02 SHAFT WALL INSTALLATION**

- A. Comply with GA 600 and with shaft wall system manufacturer's installation instructions and details.
  - 1. Fire-Resistance Rating: As indicated on Drawings.
- B. Studs and Liner Panels:
  - 1. Position steel runners at floor and ceiling with the short leg toward finish side of wall. Securely attach runners to structural support with power driven fasteners at both ends and maximum 24 inches on centers. With steel frame construction, install floor and ceiling runners and J or E-Studs before installing gypsum liner panels (Two-hour steel fireproofing). For other structural steel fireproofing requirements, use Z-shaped stand-off clips secured to structural steel before fireproofing application.
  - 2. Cut liner panels 1 inch less than floor-to-ceiling height and erect vertically between J-Runners. Where shaft walls exceed maximum available panel height, position liner panel end joints within upper and lower third points of wall. Stagger joints top and bottom in adjacent panels. Screw studs to runners on walls over 16 feet in height.
  - 3. Use steel C-H Studs 3/8 inch to not more than 1/2 inch less than floor-to-ceiling height, and install between liner panels with liner inserted in the groove. Install full-length steel J or E-studs vertically at T-intersections, corners, door jambs, and columns. Install full-length E-Studs over gypsum liner panels both sides of closure panels. For openings, frame with vertical J or E-Stud edges, horizontal J-Runner at head and sill, and reinforcing as shown on Drawings. Suitably frame all openings to maintain structural support for wall.

- C. Install floor-to-ceiling steel E-Studs each side of steel hinged door frames and jamb struts each side of elevator door frames to act as strut-studs. Attach strut-stud to floor and ceiling runners with two 3/8 inch Type S-12 pan head screws. Attach strut-studs to jamb anchors with 1/2 inch Type S-12 screws. Over steel doors, install a cut-to-length section of J-Runner and attach to strut-studs with 3/8 inch Type S-12 screws.
- D. Gypsum Panels (Single layer one side, one hour fire-rating): Apply 5/8 inch Type X gypsum board panels, on corridor side. Position gypsum panel vertically and fasten to studs and runners with 1 inch Type S Screws 12 inches on centers.
- E. Gypsum Panel Joints: Comply with applicable requirements of Section 09 29 00. Finish all face layer joints and internal angles with a Joint System installed according to manufacturer's recommendations. Spot exposed fasteners on face layers and finish corner bead, control joints and trim as required, with at least three coats of joint compound, feathered out onto panel faces and sanded smooth.
- F. Corner Bead: Reinforce all vertical and horizontal exterior corners with corner bead fastened with clinch-on tool or staples 9 inches on centers on both flanges along entire length of bead.
- G. Metal Trim: Where shaft wall terminates against masonry or other dissimilar material, apply metal trim over face layer edge and fasten with screws or staples spaced 9 inches on centers.
- H. Control Joints: Break panels behind joint. Apply acoustical sealant to fill gap and attach control joint to face layer with staples spaced 6 inches on centers on both flanges along entire length of joint.
- I. Screws: Power-drive at least 3/8 inch from edges or ends of gypsum panels to provide uniform dimple 1/32 inch deep. In gypsum base, set flush with surface without tearing face paper.
- J. Do not bridge architectural or building expansion joints with shaft-wall assemblies; frame both sides of expansion joints with furring and other support.
- K. At fire rated walls with more than a 16 foot vertical span, do not fasten shaft wall top track directly to support above. In these conditions, provide slip track or slip clips for attachment of shaft wall top track to supporting structure, with appropriate firestopping products.
- L. At penetrations in shaft wall, maintain fire-resistance rating of shaft-wall assembly by installing supplementary steel framing around perimeter of penetration and fire protection behind boxes containing wiring devices, elevator call buttons, elevator floor indicators, and similar items. Refer to Section 07 84 00 for firestopping products and requirements.
- M. Acoustical Insulation: Install acoustical insulation per Section 09 81 00.
- N. Acoustical Sealant: Install acoustical sealant per Section 07 92 00.

### 3.03 TOLERANCES

- A. Maximum Variation from True Flatness: 1/4 inch in 10 feet in any direction.

3.04 CLEANING AND PROTECTION

- A. Cleaning and Repair: Clean surfaces that have been spotted or soiled during wallboard application.
- B. Defective Work: Remove and replace defective work that cannot be satisfactorily repaired, at the direction of Architect, at no cost to Owner.
  - 1. Remove and replace panels that are wet, moisture damaged, or mold damaged.
- C. Protection: Protect installed work against damage from other construction work.
- D. Upon completion of the work under this Section, remove all surplus material, rubbish and debris from the premises and leave floors "broom clean".

END OF SECTION

SECTION 09 91 00

PAINING

**PART 1 – GENERAL**

1.01 SUMMARY

A. Section Includes:

1. Surface preparation.
2. Products and application.
3. Surface finish schedule.

B. Related Sections:

1. The General Conditions, Supplementary Conditions and Division 1 are fully applicable to this Section, as if repeated herein.
2. Section 08 11 00 – Metal Doors and Frames.
3. Section 09 21 16.23 – Gypsum Board Shaft Wall Assemblies

1.02 REFERENCES

- A. ASTM D16 – Standard Terminology for Paint, Related Coatings, Materials, and Applications.

1.03 DEFINITIONS

- A. Conform to ASTM D16 for interpretation of terms used in this Section.

1.04 SYSTEM DESCRIPTION

- A. Preparation of all surfaces to receive final finish.
- B. Painting and finishing work of this Section using coating systems of materials including primers, sealers, fillers, and other applied materials whether used as prime, intermediate, or finish coats.
- C. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.
- D. Painting and finishing all exterior and interior surfaces of materials including structural, mechanical, and electrical work on site, in building spaces, and above or on the roof.
- E. Paint exposed surfaces except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces.

1.05 SUBMITTALS

- A. Submit product data under provisions of Division 01.
- B. Provide manufacturer's technical information and instructions for application of each material proposed for use by catalog number.
- C. List each material by catalog number and cross-reference specific coating with specified finish system.
- D. Provide manufacturer's certificate that products proposed meet or exceed specified materials.
- E. Submit samples under provisions of Division 01.
- F. Submit two (2) samples 8-1/2 x 11 inch in size of each paint color and texture applied to cardboard. Resubmit samples until acceptable color, sheen and texture is obtained.
- G. On same species and quality of wood to be installed, submit two (2) 4 x 8-inch samples showing system to be used.

1.06 QUALITY ASSURANCE

- A. Product Manufacturer: Company specializing in manufacturing quality paint and finish products with five (5) years' experience.
- B. Applicator: Company specializing in commercial painting and finishing with five (5) years documented experience.
- C. Regulatory Requirements
  - 1. Comply with applicable codes and regulations of governmental agencies having jurisdiction including those having jurisdiction over airborne emissions and industrial waste disposal. Where those requirements conflict with this specification, comply with the more stringent provisions.
  - 2. Comply with the current applicable regulations of the California Air Resources Board (CARB) and the Environmental Protection Agency (EPA).
  - 3. Coats: The number of coats specified is the minimum number acceptable. If full coverage is not obtained with the specified number of coats, apply such additional coats as are necessary to produce the required finish.
  - 4. Employ coats and undercoats for all types of finishes in strict accordance with the recommendations of the paint manufacturer.
  - 5. Provide primers and undercoat paint produced by the same manufacturer as the finish coat.
- D. Field Samples
  - 1. Provide field samples under provisions of Division 01.
  - 2. On wall surfaces and other exterior and interior components, duplicate specified finishes on at least 100 sq. ft. of surface area.

3. Provide full-coat finishes until required coverage, sheen; color and texture are obtained.
4. Simulate finished lighting conditions for review of field samples.
5. After finishes are accepted, the accepted surface may remain as part of the work and will be used to evaluate subsequent coating systems applications of a similar nature.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site and store and protect under provisions of Division 01.
- B. Deliver products to site in sealed and labelled containers; inspect-to verify acceptance.
- C. Full unopened 1 GAL can (new) - Container labelling to include paint Formula, manufacturer's name, type of paint, brand name, brand code, coverage, surface preparation, drying time, cleanup, color designation, and instructions for mixing and reducing. Paint containers not displaying product identification will not be acceptable.
- D. Store paint materials at minimum ambient temperature of 50 degrees F and a maximum of 90 degrees F, in well-ventilated area, unless required otherwise by manufacturer's instructions.
- E. Take precautionary measures to prevent fire hazards and spontaneous combustion.

1.08 PROJECT CONDITIONS

- A. Environmental Requirements
  1. Provide continuous ventilation and heating facilities to maintain interior surface and ambient temperatures above 50 degrees F with a maximum humidity level of 50 percent for 24 hours before, during, and 48 hours after application of finishes, unless required otherwise by manufacturer's instructions.
  2. Do not apply exterior coatings during rain or snow, or when relative humidity is above 50 percent, unless required otherwise by manufacturer's instructions.
  3. Minimum Application Temperatures for Latex Paints: 50 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.
  4. Minimum Application Temperature for Varnish and Urethane Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
  5. Provide lighting level of 80 feet candles measured mid-height at substrate surface.

1.09 OWNER'S INSTRUCTIONS

- A. Extra Material
  1. If product used was SCUSD Paint shop's #1 choice listed in these technical specs, please provide 1-quart only unopened container of each color and surface texture to Owner along with physical draw down and formula; however, if any other product other than our first choice is used, do not provide any attic stock and instead only provide physical draws with formula for each color used.

- a. Separate draw downs and formula are required for each paint product, color, and sheen used.
2. Label each container with paint mixture formula, color, texture, and room locations in addition to the manufacturer's label.

#### 1.12 WARRANTY

- A. All "Deep Tone" colors shall be warranted for 10-year color retention with a delta loss of no more than 75 cie lab units.

### **PART 2 - PRODUCTS**

#### 2.01 ACCEPTABLE MANUFACTURERS

- A. Unless specifically identified otherwise, product designations included at end of Section are those of the Dunn Edwards, [www.dunnedwards.com](http://www.dunnedwards.com) and shall serve as the standard for kind, quality, and function.
- B. Subject to compliance with requirements, other manufacturers offering equivalent products are:
  1. Dunn Edwards, [www.dunnedwards.com](http://www.dunnedwards.com).
  2. Sherwin Williams, <https://www.sherwin-williams.com/painting-contractors/project-solutions/commercial>
- C. Substitutions: Under provisions of Division 01.

#### 2.02 MATERIALS

- A. Ready mixed, except field catalyzed coatings. Process pigments to a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
- B. Good flow and brushing properties; capable of drying or curing free of streaks or sags.
- C. "Deep Tone" colors to be composed of 100 percent acrylic pigments, factory ground, with a colored base.
- D. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified, of commercial quality.
- E. Chemical Components of Interior Paints and Coatings: Shall not exceed the limitations of Green Seal's Standard GS-11 for VOC content and the following restrictions:
  1. Flat Paints and Coatings: VOC content of not more than 50 g/L.
  2. Non-Flat Paints and Coatings: VOC content of not more than 150 g/L.
  3. Anticorrosive Coatings: VOC content of not more than 250 g/L.

- F. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
  
- G. Restricted Components: Paints and coatings shall not contain any of the following:
  - 1. Acrolein.
  - 2. Acrylonitrile.
  - 3. Antimony.
  - 4. Benzene.
  - 5. Butyl benzyl phthalate.
  - 6. Cadmium.
  - 7. Di (2-ethylhexyl) phthalate.
  - 8. Di-n-butyl phthalate.
  - 9. Di-n-octyl phthalate.
  - 10. 1, 2-dichlorobenzene.
  - 11. Diethyl phthalate.
  - 12. Dimethyl phthalate.
  - 13. Ethylbenzene.
  - 14. Formaldehyde.
  - 15. Hexavalent chromium.
  - 16. Isophorone.
  - 17. Lead.
  - 18. Mercury.
  - 19. Methyl ethyl ketone.
  - 20. Methyl isobutyl ketone.
  - 21. Methylene chloride.
  - 22. Naphthalene.
  - 23. Toluene (methylbenzene).
  - 24. 1, 1, 1-trichloroethane.
  - 25. Vinyl chloride.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
  
- B. Examine surfaces to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
  
- C. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
  - 1. Gypsum Wallboard 12 percent.
  - 2. Exterior Located Wood 15 percent, measured in accordance with ASTM D2016.
    - a. Beginning of installation means acceptance of existing surfaces.

### 3.02 PREPARATION

#### A. Work Not to Be Painted

1. Painting is not required on surfaces in concealed and inaccessible areas such as furred spaces, foundation spaces, utility tunnels, pipe spaces and duct shafts.
2. Do not paint metal surfaces such as stainless steel, chromium plate, brass, bronze, and similar finished metal surfaces.
3. Do not paint anodized aluminum or other surfaces which are specified to be factory pre-finished.
4. Do not paint sandblasted or architecturally finished concrete surfaces.
5. Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or identifications.
6. Do not paint exterior hot-dipped galvanized materials/products as specified elsewhere.

#### B. Surface Preparation

1. Remove all tacks, stickers, staples adhesive glue, picture hangers, protruding nails, tape and adhesive glue, and all other foreign materials from surfaces prior to priming or painting. Mask off and protect existing room identification tags including Asbestos tags on door frames.
2. All exterior surfaces to be painted will be pressure washed to remove all loose paint, blisters, bridged cracks, surface-chalk and loose debris at no less than 3200-PSI, or sand blasted.
3. If prior is not possible, washing all surfaces with TSP made by Synco or Jasco, by hand means, scraping and sanding of all surfaces is required prior to pre-priming for proper patching and painting of surfaces.
4. Prior to any painting, any wood or metal deficiencies should be replaced including but not limited to, doors, facial boards, overhang wood, siding, trim etc.
5. All glossy surfaces WILL be sanded prior to any paint application. NO EXCEPTIONS.
6. All factory primed new material wood, metal etc, will be sanded prior to priming and painting.
7. All surfaces to be patched will be pre-primed with the proper material as per manufacture specifications for substrate.
8. Wash all doors, casings and other surfaces with TSP made by Synco or Jasco to remove oily dirt, dust, smoke, and other residues that could prevent proper adhesion of any paint products.
9. For all fillers and patching compounds used, surfaces will be primed before, after application, and before finish paint being applied.
10. All prep work will be done like the SCUSD standard NO EXCEPTIONS. This includes patching, scraping, sanding, caulking, and removal of all drips, sags, runs and removal of all foreign matter on or in painted surface.
11. Grandstand Seats:
  - a. Remove existing paint down to bare wood on all surfaces of wood planks.
  - b. Remove existing paint down to bare metal on all surfaces of metal supports. Remove all corrosion and rust using SSPC SP-3 method of surface preparation.

### 3.03 APPLICATION

- #### A. Apply products in accordance with manufacturer's instructions.

- B. Do not apply finishes to surfaces that are not dry.
- C. Apply prime coat to surfaces which are to be painted or finished.
- D. Apply each coat to uniform finish.
- E. Sand lightly between coats to achieve required finish.
- F. Allow applied coat to dry according to the Manufacturers Specifications before the next coat is applied.
- G. The number of coats specified is the minimum that shall be applied. Apply additional coats when undercoats, stains or other conditions show through final paint coat, until paint film is of uniform finish, color, and appearance.
- H. Paint mill finished door seals to match door or frame.
- I. Cloudiness, spotting, lap marks, brush marks, runs, sags, spikes and other surface imperfections will not be acceptable.
- J. Where spray application is used, apply each coat of the required thickness. Do not double back to build up film thickness of two (2) coats in one pass.
- K. Where roller application is used, roll and redistribute paint to an even and fine texture. Leave no evidence of roller laps, irregularity of texture, skid marks, or other surface imperfections.
- L. Finishing Mechanical and Electrical Equipment:
  - 1. Refer to Division 23 and Division 26 for schedule of color coding and identification banding of equipment, ductwork, piping, and conduit.
  - 2. Paint shop primed equipment. Do not paint shop prefinished items.
  - 3. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
  - 4. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are prefinished.
  - 5. Replace identification markings on mechanical or electrical equipment when painted accidentally.
  - 6. Paint interior surfaces of air ducts, and connector and baseboard heating cabinets that are visible through grilles and louvers with one (1) coat of flat black paint, to limit of sight line. Paint dampers exposed behind louvers, grilles, and connector and baseboard cabinets to match face panels.
  - 7. Paint exposed conduit and electrical equipment occurring in finished areas with existing matching wall color.
  - 8. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
  - 9. Color code equipment, piping, conduit, and exposed ductwork in accordance with requirements indicated. Color band and identify with flow arrows, names, and numbering.

10. Replace electrical plates, hardware, light fixture trim, and fittings removed prior to finishing.
11. Paint grilles, registers, and diffusers which do not match color of adjacent surface.
12. Do not paint moving parts of operating units; mechanical or electrical parts such as valve operators; linkages; sensing devices; and motor shafts.
13. Do not paint over labels or equipment identification markings.
14. Do not paint mechanical room specialties such as compressors, boilers, pumps, control panels, etc.
15. Do not paint switch plates, light fixtures, and fixture lenses.

### 3.04 CONSTRUCTION

#### A. Priming:

1. All new or bare galvanized metal will first be etched and then primed with appropriate galvanized latex or oil base primer, use cleaner and primer measures as per manufactures specification.
2. All door and Casings may be sprayed. Doors may also be tight rolled with a 3/8th inch nap roller. All casings to be brushed or laid off with a brush. ABSOLUTELY NO EXCEPTIONS.
3. All holes and cracks are to be filled with the proper exterior patching compound and latex caulking with silicone.
4. All rusty ferrous and ferrous metal are to be primed with a rust-inhibitive red, gray or white oxide all galvanized metal will be primed with a galvanized primer.

#### B. Finish Coat

1. All existing walls and overhangs to be coated with 100% acrylic exterior eggshell exterior paint.
2. All fascia boards to be coated with 100% acrylic exterior semi-gloss paint.
3. All metal poles, ungalvanized OR painted handrails, and iron gates are to be finished in water-borne alkyd urethane semi-gloss finish paint.
4. All doors and casings to have water-borne alkyd urethane finish, including tops, bottoms, and proper edges of doors and casings according to trade standards. All doors can be sprayed or tight rolled with a 3/8th inch nap roller or sprayed. All Casings must have sprayed or brushed finishes. NO EXCEPTIONS.
5. All trim finishes are to be done in water-borne alkyd urethane semi-gloss paint.
6. All colors and product material to be used are to be APPROVED by the SCUSD paint shop Supervisor before application NO EXCEPTIONS.
7. Interior lower walls below door header to be painted with water-borne alkyd urethane.
8. Interior doors and door trim to be painted with water-borne alkyd urethane.

### 3.05 REPAIR/RESTORATION

#### A. PATCHING

1. After completion of painting in any one room or area, repair surfaces damaged by other trades.
2. Touch-up or re-finish as required to produce intended appearance.

3.06 FIELD QUALITY CONTROL

- A. Field inspection and testing will be performed under provisions of Division 01.
- B. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary.
- C. The Owner will engage the services of an independent testing agency to sample paint material being used.
- D. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
- E. The testing agency will perform appropriate quantitative materials analysis and other characteristic testing of materials as required by the Owner.
- F. If test results show materials being used and their installation do not comply with specified requirements or manufacturer's recommendations, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing and repaint surfaces to acceptable condition.

3.07 CLEANING

- A. As Work proceeds, promptly remove paint where spilled, splashed, or spattered.
- B. During progress of Work maintain premises free of unnecessary accumulation of tools, equipment, surplus materials, and debris.
- C. Collect cotton waste, cloths, and material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

3.08 PROTECTION OF COMPLETED WORK

- A. Protect finished installation under provisions of Division 01.
- B. Erect barriers and post warning signs. Maintain in place until coatings are fully dry.
- C. Confirm that no dust generating activities will occur following application of coatings.

3.09 SCHEDULES

- A. Color Schedule Guidelines
  - 1. Paint and finish colors shall be selected by the Architect from manufacturer's entire range to match District standard colors or compliment those colors with the approval of the SCUSD Paint Shop Supervisor.
  - 2. Access doors, registers, exposed piping, electrical conduit and mechanical/electrical panels: Generally, the same color as adjacent walls.

3. Interior steel doors, frames and trim: Generally, a contrasting color to adjacent walls.
4. Doors generally are all the same color, but of a contrasting color from frame and trim.
5. Exterior and interior steel fabrications: Generally, a contrasting color to adjacent walls.
6. Exposed interior mechanical/ductwork: Generally, a contrasting color to adjacent walls or ceiling.
7. Ceilings are generally to be painted a different color than walls.

B. Exterior Painting Schedule

1. Wood Substrates:
  - a. Prime Coat: Primer, waterbased, exterior, Dunn-Edwards, Ultra-Grip Premium UGPR00 or EZ-Prime Premium EZPR00
  - b. Intermediate Coat: Latex, exterior, matching topcoat.
  - c. Topcoat: Latex, exterior, eggshell, Dunn-Edwards, Evershield, EVSH30, 100% acrylic, (Gloss Level 3).  
Or
  - d. Topcoat: Latex, exterior, low sheen, Dunn-Edwards, Evershield, EVSH40, 100% acrylic, (Gloss Level 4).  
Or
  - e. Topcoat: Latex, exterior, semi-gloss, Dunn-Edwards, Evershield, EVSH50, 100% acrylic, (Gloss Level 5).
2. Ferrous Metal Substrates:
  - a. Waterborne Urethane Alkyd Enamel System:
    - 1) Galvanizing Coat: Zinc Rich Primer. Product: ZRC Galvilite Galvanizing Repair Compound as manufactured by ZRC Worldwide Company, Phone: (800) 831-3275, or accepted equal.
    - 2) Prime Coat: Primer, rust inhibitive, waterborne alkyd, interior/exterior, Dunn-Edwards, Bloc-Rust Premium BRPR00 Series or Enduraprime rust preventative primer ENPR00.
    - 3) Intermediate Coat: Waterborne urethane alkyd, interior/exterior matching topcoat.
    - 4) Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).  
Or
    - 5) Topcoat: Waterborne urethane alkyd, interior/exterior, low sheen, Dunn-Edwards, Aristoshield ASHL40, (Gloss Level 4).  
Or
    - 6) Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5)
3. Non-Ferrous Metal Substrates:
  - a. Waterborne Urethane Alkyd Enamel over a Latex Primer System:
    - 1) Prime Coat: Primer, waterbased, interior/exterior, Dunn-Edwards Ultrashield Galvanized Metal Primer ULGM00.
    - 2) Intermediate Coat: Waterborne urethane alkyd, interior/exterior, matching topcoat.
    - 3) Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).  
Or

- 4) Topcoat: Waterborne urethane alkyd, interior/exterior, low sheen, Dunn-Edwards, Aristoshield ASHL40, (Gloss Level 4).  
Or
- 5) Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5)

C. Interior Painting Schedule

1. Gypsum Board Substrates:

- a. Prime Coat: Primer sealer, latex, interior, Dunn-Edwards, Vinylastic Select VNSL00.
- b. Intermediate Coat: Latex, interior, matching topcoat
- c. Topcoat: Latex, interior/exterior, eggshell, Dunn-Edwards, Evershield, EVSH30, (Gloss Level 3).  
Or
- d. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3).  
Or
- e. Topcoat: Waterborne urethane alkyd, interior/exterior, low sheen, Dunn-Edwards, Aristoshield ASHL40, (Gloss Level 4).  
Or
- f. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5)

2. Ferrous Metal Substrates:

- a. Ultra-Premium Low Odor / Zero VOC Latex over a Waterborne Alkyd Primer System:
  - 1) Prime Coat: Primer, alkyd, anti-corrosive, for metal, Dunn-Edwards, Bloc-Rust Premium BRPR00 Series or Enduraprime rust preventative primer ENPR00.
  - 2) Intermediate Coat: Latex, interior, matching topcoat.
  - 3) Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3)  
Or
  - 4) Topcoat: Waterborne urethane alkyd, interior/exterior, low sheen, Dunn-Edwards, Aristoshield ASHL40, (Gloss Level 4).  
Or
  - 5) Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).

4. Non-Ferrous Metal Substrates:

- a. Pre-Treatment: Water based, Krud Kutter, Metal Clean & Etch SCME-01
- b. Prime Coat: Primer, water based, Dunn-Edwards, Ultrashield Galvanized Metal Primer ULGM00.
- c. Intermediate Coat: Latex, interior, matching topcoat.
- d. Topcoat: Waterborne urethane alkyd, interior/exterior, eggshell, Dunn-Edwards, Aristoshield ASHL30, (Gloss Level 3)  
Or
- e. Topcoat: Waterborne urethane alkyd, interior/exterior, low sheen, Dunn-Edwards, Aristoshield ASHL40, (Gloss Level 4).

- Or  
f. Topcoat: Waterborne urethane alkyd, interior/exterior, semi-gloss, Dunn-Edwards, Aristoshield ASHL50, (Gloss Level 5).

Cross-Over Chart			
Paint Type	Dunn-Edwards BOD	Kelly Moore	Sherwin Williams
<b>100% Acrylic Eggshell Exterior Paint</b>	EVSH30 Evershield 100% Acrylic	1294 Envy Exterior 100% Acrylic	KxxW000xx Series Emerald Exterior Acrylic Latex
<b>100% Acrylic Low Sheen Exterior Paint</b>	EVSH40 Evershield 100% Acrylic	1294 Envy Exterior 100% Acrylic	KxxW000xx Series Emerald Exterior Acrylic Latex
<b>100% Acrylic Semi-Gloss Exterior Paint</b>	EVSH50 Evershield 100% Acrylic	1298 Envy Exterior 100% Acrylic	KxxW000xx Series Emerald Exterior Acrylic Latex
<b>Water-Borne Alkyd Urethane Eggshell Interior/Exterior Paint</b>	ASHL30 Aristoshield Urethane Alkyd	1997 Epic Urethane Alkyd Enamel	KxxW0xxxx Series Emerald Urethane Trim Enamel
<b>Water-Borne Alkyd Urethane Low Sheen Interior/Exterior Paint</b>	ASHL40 Aristoshield Urethane Alkyd	1997 Epic Urethane Alkyd Enamel	KxxW0xxxx Series Emerald Urethane Trim Enamel
<b>Water-Borne Alkyd Urethane Semi-Gloss Interior/Exterior Paint</b>	ASHL50 Aristoshield Urethane Alkyd	1998 Epic Urethane Alkyd Enamel	KxxW0xxxx Series Emerald Urethane Trim Enamel

END OF SECTION

## SECTION 10 21 13

## TOILET COMPARTMENTS AND CUBICLES

**PART 1 – GENERAL**

## 1.01 SUMMARY

## A. Section Includes:

1. Urinal Screens.

## 1.02 REFERENCES

- A. National Fire Protection Association 101 Life Safety Code, Chapters 5, 6, 8-30.
- B. ANSI A117.1: Accessible and Usable Buildings And Facilities.
- C. Title 24, California Code of Regulations, Parts 2, 3, and 5.
- D. ADA, Accessibility Guidelines for Buildings and Facilities, Federal Register Volume 56, Number 144, Rules and Regulations.
- E. US Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Program.
- F. American Society for Testing and Materials Standards:
  1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
  2. ASTM D2794 Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
  3. ASTM D2197 Standard Test Method for Adhesion of Organic Coatings by Scrape Adhesion.
  4. ASTM D6578 Standard Practice for Determination of Graffiti Resistance.

## 1.03 SYSTEM DESCRIPTION

## A. Performance Requirements

1. Graffiti Resistance: Partition material shall have the following graffiti removal characteristics when tested in accordance with ASTM D6578-00 Standard Practice for Determination of Graffiti Resistance in accordance with Section 9, "Graffiti Removal Procedure Using Manual Solvent Rubs":
  - a. Cleanability: Five (5) required staining agents shall be cleaned off material.
2. Scratch Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D2197-98(2002) Standard Test Method for Adhesion of Organic Coating by Scrape Adhesion, using Gardner Stock #PA-2197/ST pointed stylus attachment on scrape tester:
  - a. Scratch Resistance: Maximum Load Value shall exceed 10 kilograms.

3. Impact Resistance: Partition material shall have the following characteristics when tested in accordance with ASTM D2794-93(1999)e1 Standard Test Method for Resistance of Organic Coating to the Effects of Rapid Deformation (Impact), using .625" hemispherical indenter with 2-lb impact weight:
  - a. Impact Resistance: Maximum Impact Force value shall exceed 30 inch-lbs.
4. Fire Resistance: Partition material shall comply with the following requirements, when tested in accordance with ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials:
  - a. Smoke Developed Index: Not to exceed 450.
  - b. Flame Spread Index: Not to exceed 75.
  - c. Material Fire Ratings:
    - 1) National Fire Protection Association (NFPA): Class B.
    - 2) International Code Council (ICC): Class B.

#### 1.04 SUBMITTALS

- A. Comply with requirements of Division 01.
- B. Manufacturer's Data.
  1. Provide required number copies of:
    - a. Product data sheets.
    - b. Installation instructions.
    - c. Cleaning and maintenance instructions.
    - d. Replacement parts information.
- C. Shop Drawings.
  1. Provide required number of copies of all shop drawings.
  2. Show fabrication and erection of compartment assemblies, to extent not fully described by manufacturer's data sheets.
  3. Show anchorage, accessory items and finishes.
  4. Provide location drawings for bolt hole locations in supporting members for attachment of compartments.
- D. Samples.
  1. Furnish sections showing mounting brackets, stile anchoring and leveling devices, concealed threaded inserts, panel, stile, and edge construction.

#### 1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver items in manufacturer's original unopened protective packaging.
- B. Store materials in original protective packaging to prevent physical damage or wetting.

C. Handle so as to prevent damage to finished surfaces.

1.06 WARRANTY

- A. Furnish ten-year limited warranty for panels against breakage, corrosion, delamination, and defects in factory workmanship.
- B. Furnish one-year guarantee against defects in material and workmanship for stainless steel mounting brackets.

1.07 ATTIC STOCK

- A. Provide one additional full size urinal screen panel.

**PART 2 - PRODUCTS**

2.01 MANUFACTURER (DISTRICT STANDARD)

- A. Model numbers for toilet partitions manufactured by Bobrick Washroom Equipment, Inc., represented by R. E. Edwards & Associates (925-829-2942), are listed to establish a standard of quality for design, function, materials, workmanship, and appearance. Other manufacturers may be submitted for evaluation by the architect by following the conditions of the substitutions clause. Unless approval is obtained ten days prior to the bid date, all bids shall be based on the standard of quality. The architect shall be the sole judge as to the acceptability of all products submitted for substitution.
- B. Toilet partitions shall be the product(s) of a single manufacturer.

2.02 MOUNTING CONFIGURATIONS

- A. Urinal Screens shall be:
  - 1. Floor-Anchored (1091 Sierra Series):

2.03 COMPONENTS/MATERIALS

- A. Urinal Screens shall be all be manufactured from Solid Color Reinforced Composite material.
- B. Panel Material
  - 1. Urinal Screens shall be constructed of Solid Color Reinforced Composite material, which is composed of dyes, organic fibrous material, and polycarbonate/phenolic resins. Material shall have a non-ghosting, graffiti-resistant surface integrally bonded to core through a series of manufacturing steps requiring thermal and mechanical pressure. Edges of material shall be the same color as the surface.
  - 2. Subject to compliance with the material performance requirements, toilet partitions manufactured by others may be constructed from Solid Surface materials including, but not limited to:

- a. Dupont Corian Privacy Plus Partitions.
  - b. WilsonArt Solid Surface.
3. Urinal screens constructed of High-Density Polyethylene (HDPE) or High-Density Polypropylene will not be acceptable.
- C. Finish Thickness
1. Panels shall be 1/2" (13 mm).
- D. Mounting Brackets
1. Mounting brackets shall be stainless steel and extend full height of panel.
  2. U-channels shall be furnished to secure panels to stiles.
  3. Angle brackets shall be furnished to secure stiles to walls and panels to walls.
  4. Fasteners at locations connecting panels-to-stiles shall utilize through bolted, stainless steel, pin-in-head Torx sex bolt fasteners. Through-bolted fasteners shall withstand direct pull force exceeding 1,500 lbs. per fastener.
  5. Wall mounted urinal screen brackets shall be 11 gauge (3 mm) double thickness.
- E. Leveling Device shall be 7-gauge, 3/16" (5-mm) hot rolled steel bar; chromate-treated and zinc-plated; through-bolted to base of solid color reinforced composite stile.
- F. Stile Shoe shall be one-piece, 4" (102-mm) high, type-304, 22-gauge (0.8-mm) stainless steel with satin finish. Top shall have 90° return to stile. Shoe will be composed of one-piece of stainless steel and capable of being fastened (by clip) to stiles starting at wall line.
- G. Full-Height Post: At all partition panels over 5'-0" in unsupported length, provide a full-height 1-1/4"x1-1/4" stainless-steel post, Bobrick Part No. 100070 and Anchor Package Part No. 1002703. Provide floor and ceiling saddles. Fasteners into concrete floor shall be stainless steel. The panel shall be anchored to post to help eliminate side to side flex of the panel. At locations where post is taller than 8'-0" and/or is in a high vandalism area, provide custom stainless steel post with slip-joint as detailed on drawings.

### **PART 3 – EXECUTION**

#### **3.01 EXAMINATION**

- A. Check areas scheduled to receive urinal screens for correct dimensions, plumbness of walls, and soundness of surfaces that would affect installation of mounting brackets.
- B. Do not begin installation of urinal screens until conditions are satisfactory.

#### **3.02 ERECTION**

- A. Install compartments rigidly, straight, plumb, and level and in accordance with manufacturer's installation instructions.

- B. Installation methods shall conform to manufacturer's recommendation for backing and proper support.
- C. Conceal evidence of drilling, cutting, and fitting to room finish.
- D. Maintain uniform clearance at vertical edge of doors.
- E. Attach panel brackets securely to walls using anchor devices. All anchors shall be into solid wood blocking. No plastic expansion sleeves will be accepted.
- F. Attach panels and pilasters to bracket with through-sleeve tamperproof bolts and nuts.
- G. Anchor urinal screen panels to walls with continuous panel brackets. At free end, provide full-height post as noted in Paragraph 2.03-G.
- H. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster. Conceal floor fastenings with pilaster shoes.
- I. Contractor shall install backing/blocking as required for secure attachment.

### 3.03 ADJUSTMENT AND CLEANING

- A. Clean exposed surfaces of urinal screens.
- B. Remove protective maskings. Clean surfaces.
- C. Field touch-up of scratches or damaged enamel finish will not be permitted.
- D. Replace damaged or scratched materials with new materials.

END OF SECTION



## SECTION 13 11 00

## SWIMMING POOL GENERAL REQUIREMENTS

**PART 1 - GENERAL**

## 1.01 WORK INCLUDED

- A. The scope of the work included under this Section of the Specifications shall include swimming pool(s) as illustrated on the Drawings and specified herein. The General and Supplementary Conditions of the Specifications shall form a part and be included under this Section of the Specifications. The Swimming Pool Subcontractor shall provide all supervision, labor, material, equipment, machinery, plant and any and all other items necessary to complete the work. ALL OF THE WORK IN SECTIONS 13 11 00 – 13 11 08 IS TO BE THE RESPONSIBILITY OF ONE EXPERIENCED SWIMMING POOL SUBCONTRACTOR PRIMARILY ENGAGED IN THE CONSTRUCTION OF COMMERCIAL PUBLIC-USE SWIMMING POOLS. A SWIMMING POOL SUBCONTRACTOR SHALL BE CONSIDERED PRIMARILY ENGAGED AS REQUIRED HEREIN IF THE SUBCONTRACTOR DERIVED 50% OF ITS ANNUAL REVENUE FROM PUBLIC-USE SWIMMING POOL CONSTRUCTION FOR EACH OF THE LAST FIVE YEARS. THE SUBCONTRACTOR MUST HAVE ALSO, IN THE LAST FIVE YEARS CONSTRUCTED AT LEAST FIVE (5) COMMERCIALY DESIGNED MUNICIPAL AND PUBLIC-USE SWIMMING POOLS, EACH OF WHICH SHALL HAVE INCORPORATED A MINIMUM SIZE OF 6,000 SQUARE FEET OF WATER SURFACE AREA WITH A CONCRETE AND CERAMIC TILE PERIMETER OVERFLOW GUTTER AND SELF-MODULATING BALANCE TANK. The Swimming Pool Subcontractor shall furnish and install the swimming pool structures, finishes, cantilever forming, swimming pool mechanical and electrical systems, and all accessories necessary for a complete, functional swimming pool system, as herein described. Work shall include start-up, instruction of Owner's personnel, as-built drawings and warranties as required.

## 1.02 CODES, RULES, PERMITS, FEES

- A. The swimming pools shall be constructed in strict accordance with the applicable provisions set forth by authorities having jurisdiction over swimming pool construction and operation in the State of California.
- B. The Swimming Pool Subcontractor shall give all necessary notices, obtain all permits, and pay all government sales taxes, fees, and other costs in connection with their work; file all necessary plans, prepare all documents and obtain all necessary approvals of governmental departments having jurisdiction; obtain all required certificates of inspection for their work and deliver same to the Designated Representative before request for acceptance and final payment for the work.
- C. The Swimming Pool Subcontractor shall include in the work any labor, materials, services, apparatus, or drawings in order to comply with all applicable laws, ordinances, rules and regulations, whether or not shown on Drawings and/or specified.
- D. The Contractor shall submit all required documents and materials to all Governmental Departments having jurisdiction for any deferred approval items or substituted materials or products to obtain final approval to installation.

## 1.03 DESCRIPTION OF WORK

- A. Furnish and perform supervision, coordination, all layout, formwork, excavation, hand trim, disposing off-site of all unused material or debris to complete the swimming pool excavation to the dimensions shown on the plans.
- B. Furnish and install complete swimming pool structures, including reinforcing steel and cast-in-place or pneumatically placed concrete walls and floors.
- C. Furnish and install swimming pool finishes, including ceramic tile and marble plaster or other waterproof finishes.
- D. Furnish and install complete swimming pool mechanical system(s), including, but not limited to, circulation systems, filtration systems, pool water heating systems, water chemistry control systems, domestic water fill line systems, booster pump and special effects systems, and all pumps, piping, valves, and connections between system(s) and swimming pool(s).
- E. Furnish and install complete swimming pool electrical system(s) from P.O.C. in Mechanical Room, including, but not limited to, underwater lighting systems, water level control systems, timing systems, scoreboards, special effects systems, control circuitry, motor starters, time clocks, bonding, and all conduits, conductors, contactors, and switches between the system(s) and swimming pool(s).
- F. Furnish and install all swimming pool cantilever forming, deck equipment and required anchors and inserts for the specified equipment as required by code, shown on the Drawings and specified herein.
- G. After the initial filling of the swimming pool system(s), should any repairs, continuing work, or other Subcontractor responsibility require drainage or partial drainage of the swimming pool systems, the Swimming Pool Subcontractor shall be responsible for any subsequent refilling and shall complete the project with the swimming pool system(s) full of water, water in chemical balance, complete in every way, and in full operation.

#### 1.04 ASSIGNED RESPONSIBILITIES AND RELATED WORK

- A. It is the intent of this section of the Specifications to clarify Work responsibilities of the trades directly and indirectly involved in construction of the pool systems. All labor, equipment, materials and supplies furnished by the Swimming Pool Subcontractor and other Subcontractors per the contractual agreement with the General Contractor and Owner and shall be as directed by the Owner through their Designated Representative.
- B. THE SWIMMING POOL SUBCONTRACTOR SHALL NOT SUBCONTRACT ANY PORTION OF THE SWIMMING POOL CONSTRUCTION OR SWIMMING POOL EQUIPMENT INSTALLATION TO ANYONE OTHER THAN A SUBCONTRACTOR THAT SATISFIES THE REQUIREMENTS OF SECTION 13 11 00.
- C. References to "swimming pool systems" shall include the swimming pools, equipment, and accessories.
- D. The Owner will provide one complete water filling of the swimming pool(s), but will not assume any responsibility for the swimming pool system(s) until they have been proved fully operational, complete in every way and accepted by the Designated Representative.

#### 1.05 RESPONSIBILITIES OF THE CONTRACTOR

- A. The Contractor shall grade the swimming pool site(s), establish benchmarks, cut and fill as necessary to provide as level an area as possible at swimming pool deck elevation before swimming pool layout.
- B. The Contractor shall be responsible for horizontal dimensions and grade elevations accurately from established lines and benchmarks (as indicated on the Drawings) and be responsible for those grades.
- C. The Contractor shall provide adequate temporary light, electric power, heat and ventilation per Federal and State OSHA requirements to construct the swimming pool system(s).
- D. The Contractor shall not permit any heavy equipment activity over any area or within five (5) feet of any area under which swimming pool piping is buried. There shall be no exceptions to this requirement.
- E. The Contractor shall keep the swimming pool excavation(s) and swimming pool structure(s) free of construction residue and waste materials of their workmen or Subcontractors, removing said material from the swimming pools as required.
- F. The Contractor shall protect the swimming pool(s) from damage caused by their construction equipment and /or workmen and Subcontractors.
- G. The Contractor shall provide a representative at time of swimming pool start-up to coordinate all trades related to swimming pool system(s).

#### 1.06 RESPONSIBILITIES OF THE MECHANICAL SUBCONTRACTOR

- A. The Mechanical Subcontractor shall be licensed in the State of California and provide written notifications to Swimming Pool Subcontractor and contractor when necessary to excavate and backfill within the swimming pool construction site.
- B. The Mechanical Subcontractor shall not utilize any swimming pool piping trench for installation of any sanitary sewer, storm sewer, domestic water, hot water, chilled water or natural gas line.
- C. The Mechanical Subcontractor shall furnish and install all sanitary sewer piping, including vent stacks (if necessary), for backwash pits, floor drains and floor sinks as required by code, shown on Drawings, and herein specified.
- D. The Mechanical Subcontractor shall furnish and install all storm sewer piping and site drainage systems as required by code, shown on the Drawings, and herein specified.
- E. The Mechanical Subcontractor shall provide a minimum 75 psi water supply for swimming pool construction work within fifty (50) feet of the swimming pool construction site(s).
- F. The Mechanical Subcontractor shall furnish and install reduced pressure backflow protected domestic water lines to P.O.C. within swimming pool Mechanical Room as required by code, shown on the Drawings, and herein specified.

- G. The Mechanical Subcontractor shall furnish and install natural gas piping, pressure regulation and valving to P.O.C. within swimming pool Mechanical Room as required by code, shown on the drawings, and herein specified.
- H. The Mechanical Subcontractor shall furnish and install all ductwork, louvers, and all HVAC equipment within swimming pool Mechanical Room as required by code, shown on the Drawings, and herein specified.
- I. The Mechanical Subcontractor shall provide a representative at time of swimming pool start-up to coordinate work related to swimming pool system(s).

#### 1.07 RESPONSIBILITIES OF THE ELECTRICAL SUBCONTRACTOR

- A. The Electrical Subcontractor shall be licensed in the State of California and shall furnish and install electrical service to swimming pool Mechanical Room sized to accommodate all necessary swimming pool equipment as shown on the Drawings and herein specified.
- B. The Electrical Subcontractor shall furnish any temporary power needed by the Swimming Pool Subcontractor within fifty (50) feet of the swimming pool construction site(s).
- C. The Electrical Subcontractor shall furnish and install all conduits, conductors, starters/disconnects, panels, circuits, switches and equipment as required for lighting, ventilation and HVAC equipment within swimming pool Mechanical Room as required by code, shown on the Drawings, and herein specified.
- D. The Electrical Subcontractor shall furnish and install all conduits, conductors, panels, circuits, switches and equipment for area lighting as required by code, shown on the Drawings, and herein specified.
- E. All equipment, material and installation shall be as required under Division 16 of the Specifications and shall conform to CEC Article 680 (latest revision), State and Local Codes, and as may be required by all authorities having jurisdiction over swimming pool construction within the State of California.
- F. The Electrical Subcontractor shall provide a representative at time of swimming pool start-up to coordinate work related to swimming pool system(s).

#### 1.08 INTENT

- A. It is the intention of these specifications and Drawings to call for finished work, tested and ready for operation. Wherever the work "provide" is used, it shall mean "furnish and install complete and ready for use."
- B. Minor details not usually shown or specified, but necessary for proper installation and operation, shall be included in the work, the same as if herein specified or shown.

#### 1.09 SCHEDULE OF VALUES

- A. Provide a Schedule of Values for all work specified in each of the technical specifications listed in the table below, regardless of whether the work is performed by the swimming pool contractor or others. Values listed shall be fully burdened, with contractor general conditions, overhead, profit

and bonds included. Payments for swimming pool work completed shall not be approved until Schedule of Values has been submitted to and approved by Architect.

SWIMMING POOL SCHEDULE OF VALUES			
No.	Section #	Description	Value
1.	13 11 01	Swimming Pool Excavation	
2.	13 11 02	Swimming Pool Concrete	
3.	13 11 03	Swimming Pool Shotcrete	
4.	13 11 04	Swimming Pool Ceramic Tile	
5.	13 11 05	Swimming Pool Plaster	
6.	13 11 06	Swimming Pool Equipment	
7.	13 11 07	Swimming Pool Mechanical	
8.	13 11 08	Swimming Pool Electrical	
Total			

#### 1.10 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Subcontractor's use in preparing submittals.
- B. Coordination: Coordinate preparation and processing submittals with performance construction activities.
1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- C. Submittals Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation" for list of submittals and time requirements for schedules performance of related construction activities.
- D. Processing Time: Allow enough time for submittal review, including time for re-submittals as follows. Time for review shall commence on Architect's receipt of submittal.
1. Initial Review: Allow fifteen (15) days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Architect will advise Contract when a submittal being processed must be delayed for coordination.
  2. Concurrent Review: Where concurrent review of submittals by Architect's consultants, Owner, or other parties is required, allow twenty-one (21) days for initial review of each submittal.
  3. Direct Transmittal to Consultant: Where the Contract Documents indicate that submittals may be transmitted directly to Architect's consultants, provide duplicate copy of transmittal to Architect. Submittal will be returned to Architect before being returned to Subcontractor.
  4. If intermediate submittal is necessary, process it in same manner as initial submittal.
  5. Allow fifteen (15) days for processing each submittal.
  6. No extension of the Contract Time will be authorized because of failure to transmit submittals

enough in advance of the Work to permit processing.

- E. Identification: Place a title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on title block.
  2. Provide a space on title block to record Subcontractor's review and approval markings and action taken by Architect.
  3. Include the following information on title block for processing and recording action taken: (See Attached Sample)
    - a. Project name.
    - b. Date.
    - c. Name and address of Subcontractor.
    - d. Name of Subcontractor.
    - e. Name of Supplier.
    - f. Name of Manufacturer.
    - g. Unique identifier, including revision number.
    - h. Number and title of appropriate Specification Section.
    - i. Drawing number and detail references, as appropriate.
    - j. Other necessary identification.

SUBMITTAL FOR: SUBMITTAL TO: SUBCONTRACTOR:

Item Number:
Section Number:
Section Description:
Subcontractor:
Supplier:
Manufacturer:
Product Code:
Quantity:

Subcontractor Certification: Contractor's Submittal Stamp:

It is hereby certified that the equipment or material designated in this submittal is proposed to be incorporated in the above-named project and is in compliance with the contract drawings and / or specifications and is submitted for approval.

Certified by:
Date:
Job
Superintendent:
Revisions:

Architect's Review Stamp and Comments

- F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract documents on submittal.
- G. On all catalogue or cut sheets identify which model or type is being submitted.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Product data and shop drawings shall be packaged within a three-ring binder and colored samples shall be packaged on a heavy cardboard. Transmit each submittal using a transmittal form.
  - 1. On an attached separate sheet, prepared on Subcontractor's letterhead, record relevant information, request for data, revisions other than those requested by Architect on previous submittals and deviations from requirements of the Contract documents, including minor variations and limitations. Include the same label information as the related submittal.
  - 2. Include Subcontractor's certification stating that information submitted complies with requires of the Contract Documents.
  - 3. Transmittal Form: Provide locations on form for the following information:
    - a. Project name.
    - b. Date.
    - c. Destination (To:).
    - d. Source (From:).
    - e. Names of Subcontractor, manufacturer, and supplier.
    - f. Category and type of submittal.
    - g. Submittal purpose and description.
    - h. Remarks.
- I. Distribution: Furnish copies of final submittals to manufacturers, Subcontractors, suppliers, fabricators, installers, authorities having jurisdiction and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- J. Use for Construction: Use only final submittals with mark indicating action taken by Architect in connection with construction.

#### 1.11 SUBSTITUTIONS

- A. To obtain approval to use unspecified products, bidders shall submit requests for substitution at least ten (10) days prior to bid date. Requests shall only be considered if they clearly describe the product for which approval is asked, including all data necessary to demonstrate acceptability. All unspecified products and equipment will be considered on an "or equal" basis at the discretion of the Designated Representative. Requests for substitution received after the specified deadline will not be considered. Where a conflict exists between the requirements of the General Conditions / Special Conditions / Division 1 concerning substitutions and the requirements of this Article, this Article (Section 13 11 00, Article 1.10) shall govern.
- B. Where the Swimming Pool Subcontractor proposes to use an item of equipment other than that specified or detailed on the Drawings which requires any redesign of the structure, partitions, foundations, piping, wiring, or any other part of the architectural, mechanical, or electrical layout, all such redesign and all new drawings (stamped by California Licensed Engineer) and detailing required

shall be prepared by the Swimming Pool Subcontractor, at his own expense, submitted for review and approval by the Designated Representative prior to bid.

- C. Where such approved deviation requires a different quantity and arrangement of piping, supports and anchors, wiring, conduit, and equipment from that specified or indicated on the Drawings, the Swimming Pool Subcontractor shall furnish and install any such piping, structural supports, controllers, motors, starters, electrical wiring and conduit, and any other additional equipment required by the system, at no additional cost to the Owner.

#### 1.12 SURVEYS AND MEASUREMENTS

- A. The Swimming Pool Subcontractor shall base all measurements, both horizontal and vertical, from benchmarks established by the Contractor. All work shall agree with these established lines and levels. The mechanical Drawings do not give exact details as to elevations of piping, exact locations, etc. and do not show all offsets, control lines, pilot lines and other installation details. Verify all measurements at site and check the correctness of same as related to the work.

#### 1.13 DRAWINGS

- A. Drawings are diagrammatic and indicate the general arrangement of the systems and work included in the Subcontractor. Drawings are not to be scaled. The architectural drawings and details shall be examined for exact dimensions. Where they are not definitely shown, this information shall be obtained from the Designated Representative.

#### 1.14 SWIMMING POOL SUBCONTRACTOR

- A. The swimming pool construction work as herein described and specified in Division 13 of the Project Manual shall be the complete responsibility of a qualified and specifically licensed (C-53 license classification within the State of California) Swimming Pool Subcontractor with extensive experience in commercial public use swimming pool installations.
- B. The Contractor shall require the Swimming Pool Subcontractor to furnish to the Contractor performance and payment bonds in the amount of 100% of the Swimming Pool Subcontractor's bid written by a surety Company properly registered in the State of California and listed by the U.S. Treasury. The expense of the bond(s) is to be borne by the Subcontractor. The Contractor shall clearly specify the amount and requirements of the bond(s) in the Contractor's written or published request for subbids. The Contractor's written or published request for subbids shall also specify that the bond(s) expense is to be borne by the Subcontractor.
- C. Subcontractor certifies that it meets the qualifications and experience requirements established in Swimming Pool General Requirements, Section 13 11 00, as follows:
  - 1. Subcontractor has derived 50% of its annual revenue from public-use swimming pool construction for each of the last five (5) years.
  - 2. Subcontractor has, in the last five (5) years, constructed at least five (5) commercially designed municipal and public-use swimming pools, each of which have incorporated a minimum size of 6,000 square feet of water surface area with a concrete and ceramic tile perimeter overflow gutter and self-modulating balance tank.
  - 3. The following list of projects meet the requirements of section (b) above and the contact as

reference by the Contractor, the Awarding Authority of their agent or designee.

a. Owner: \_\_\_\_\_  
 Scope of Project: \_\_\_\_\_  
 Contact Person: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Architect for Project: \_\_\_\_\_

b. Owner: \_\_\_\_\_  
 Scope of Project: \_\_\_\_\_  
 Contact Person: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Architect for Project: \_\_\_\_\_

c. Owner: \_\_\_\_\_  
 Scope of Project: \_\_\_\_\_  
 Contact Person: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Architect for Project: \_\_\_\_\_

d. Owner: \_\_\_\_\_  
 Scope of Project: \_\_\_\_\_  
 Contact Person: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Architect for Project: \_\_\_\_\_

e. Owner: \_\_\_\_\_  
 Scope of Project: \_\_\_\_\_  
 Contact Person: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Architect for Project: \_\_\_\_\_

D. Swimming Pool Deck Subcontractor other than the swimming pool Subcontractor certifies that it meets the qualifications and experience requirements established in Swimming Pool General Requirements, Section 13 11 00, as follows:

1. Subcontract has, in the last five (5) years, constructed at least five (5) commercially designed cantilevered pool decks over perimeter gutters, each of which have incorporated a minimum size of 6,000 square feet of water surface area of the swimming pool.
2. The following list of projects meet the requirements of section (b) above and the contact as reference by the Contractor, the Awarding Authority of their agent or designee.

SWIMMING POOL DECK SUBCONTRACTOR

a. Owner: \_\_\_\_\_

Scope of Project: \_\_\_\_\_  
 Contact Person: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Architect for Project: \_\_\_\_\_

b. Owner: \_\_\_\_\_  
 Scope of Project: \_\_\_\_\_  
 Contact Person: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Architect for Project: \_\_\_\_\_

c. Owner: \_\_\_\_\_  
 Scope of Project: \_\_\_\_\_  
 Contact Person: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Architect for Project: \_\_\_\_\_

d. Owner: \_\_\_\_\_  
 Scope of Project: \_\_\_\_\_  
 Contact Person: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Architect for Project: \_\_\_\_\_

e. Owner: \_\_\_\_\_  
 Scope of Project: \_\_\_\_\_  
 Contact Person: \_\_\_\_\_  
 Phone Number: \_\_\_\_\_  
 Architect for Project: \_\_\_\_\_

1.15 OPERATING INSTRUCTIONS

A. The Swimming Pool Subcontractor shall determine from actual samples of pool water supplied by the Owner, the proper water management program necessary for maximum operating efficiency and comfort. The Swimming Pool Subcontractor shall provide the services of experienced personnel familiar with this type of pool system operation, in conformance with Section 13 11 05 of the Specifications.

1.16 MAINTENANCE MANUALS

A. The Swimming Pool Subcontractor shall provide six (6) bound sets for delivery to the Designated Representative of instructions for operating and maintaining all systems and equipment included in this Contract. Manufacturer's advertising literature or catalog pictures will not be acceptable for operating and maintenance instructions.

- B. Bound in ring binders shall be all parts lists, periodic maintenance instructions and troubleshooting guidelines for all pool equipment, including but not limited to filters, pumps, controllers, water chemistry control equipment, etc.

1.17 SECURE FROM THE OWNER

- A. A complete Owner-furnished filling of the swimming pools.
- B. The Owner's assistance, as specified herein, from the time of start-up until final written acceptance of the swimming pool system(s).
- C. Chemicals as required for swimming pool operation after Swimming Pool Subcontractor completes initial water chemistry balance and water treatment during the maintenance period described in Section 13 11 05 of the Specifications.

1.18 WARRANTY

- A. The Swimming Pool Subcontractor shall warrant all swimming pool structures, finishes and systems against defects in material and workmanship for a period of one year after the date of acceptance by the Owner. Any repair or replacement required due to defective material or workmanship will be promptly corrected by the Swimming Pool Subcontractor.

**PART 2 - PRODUCTS**

Not Used

**PART 3 - EXECUTION**

Not Used

END OF SECTION

## SECTION 13 11 01

## SWIMMING POOL EXCAVATION

**PART 1 - GENERAL**

## 1.01 DESCRIPTION

- A. Finish and fine grading to bring the surface of the ground to the required grades and elevations as indicated on the Drawings.
- B. Subgrade improvements and placing of compacted fills.
- C. Excavation and backfill for all swimming pool decks.

## 1.02 QUALITY ASSURANCE

- A. Requirements of Regulatory Agencies: Conform with requirements of the General Conditions, and more specifically the following:
  - 1. Comply with California Building Code, 2022 edition.
  - 2. Comply with applicable construction safety orders, latest edition, Federal and State OSHA.
  - 3. Comply with applicable trench safety provisions, latest edition, Federal and State OSHA.
- B. Qualifications of Workers:
  - 1. The entity performing the work of this Section shall have been successfully engaged in the respective trade for at least five (5) years immediately prior to commencement of the Work.
  - 2. For actual construction operations, use only trained and experienced workers with a minimum of three (3) years' experience with the materials and methods specified.
  - 3. Provide at least one person who shall be present at all times during execution of the work of this Section, with a minimum of five (5) years' experience with the type of materials being installed, the referenced standards, and who shall direct all Work performed under this Section.
- C. Project/Site Conditions:
  - 1. Be familiar with site and subsurface conditions.
  - 2. Excavation is unclassified and includes excavation to sub-grade elevations indicated or necessary, regardless of character of materials and obstructions encountered.
  - 3. Provisions for mitigation of wet soils due to seepage or rain shall be made during excavation and throughout construction. If wet soils are encountered within the swimming pool excavations, de-watering shall be provided and the Geotechnical Engineer shall make recommendations for moist soil mitigation.
  - 4. Where slope instability is encountered, all excavations within those areas shall be 2:1 or flatter. Forming of vertical walls may be necessary, and all soil conditions shall be field verified by the Geotechnical Engineer.
  - 5. Contractor shall review the Geotechnical Investigation Report as furnished by the Owner to determine the suitability of the soils.
- D. Adverse Weather Conditions:

1. During the periods when site soil moisture content is substantially in excess of moisture content required for optimum compaction, do not perform fill compaction.
2. When unfavorable weather conditions necessitate interrupting filling and grading operations, prepare areas by compaction of surface and grading to avoid collection of water. Provide adequate temporary drainage to prevent erosion.

#### 1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Provide submittals in conformance with requirements of Section 01 33 00.
- B. Required submittals include:
  1. Offsite fill material, if applicable.
- C. Submit proof of qualifications as specified in Article 1.02.B of this Section.

#### 1.04 EXCAVATING & TRENCHING, GENERAL REQUIREMENTS

- A. All trenches, holes, etc. are to be completely protected using solid barricades, steel plates, and plywood both during construction and during off hours, including night time.
- B. Flashing warning light barricades are required on sidewalks, roads, and any other critical areas that require night time protection.
- C. Roads, paths and sidewalks shall not be blocked at any time or in any way. Trenching across roads, paths or sidewalks involves special instructions and review of the construction procedure by the Owner at least three (3) days prior to the Work actually being started.
- D. Construction equipment, including all trucks, cars, etc. shall not be parked or driven on roads, paths or sidewalks. Items not allowed on roads, paths or sidewalks include hoses, power cords, ropes, construction materials, dirt and debris, etc.
- E. All roads, paths and sidewalks must remain clear and the Contractor shall maintain temporary safe and effective pedestrian access at all times.
- F. Drawings show existing major underground utilities using the best information available. The Contractor shall also fully check public works reference drawings prior to excavation. Call local Dig Alert to locate utilities to ensure safety.
- G. Call local Dig Alert to locate utilities to ensure safety.

### **PART 2 - PRODUCTS**

#### 2.01 MATERIALS

- A. General Fill – General Fill materials shall have an organic content of less than 3 percent by volume and shall not contain environmental contaminants or rocks or lumps larger than 6 inches in greatest dimension. From a geotechnical standpoint, onsite materials can be reused as General Fill if they meet or can be processed (e.g. by sorting and/or crushing) to meet the above requirements.

Non-Expansive Fill – Non-Expansive fill shall conform to the requirements for General Fill, have a Plasticity Index no greater than 12, and a Liquid Limit no greater than 40.

B. Geotechnical requirements for fill placement and compaction follow (per ASTM D-1557 – Test Methods).

- General Fill that is predominantly cohesive (>15 percent passing #200 sieve) shall be moisture conditioned, as necessary, to between 3 and 5 percent over optimum moisture content and compacted to at least 90 percent relative compaction.
- General fill that is predominantly granular (<15 percent passing #200 sieve) shall be moisture conditioned, as necessary, to between 2 and 4 percent over optimum moisture content and compacted to at least 95 percent relative compaction.
- Non-Expansive Fill shall be moisture conditioned, as necessary, to near optimum moisture content and compacted to at least 95 percent relative compaction.

### **PART 3 - EXECUTION**

#### **3.01 INSPECTION**

A. Verify drawing dimensions and elevations with actual field conditions. Inspect related Work and adjacent surfaces and report discrepancies and conditions which prevent proper execution of the Work to the Owner's Representative.

#### **3.02 SUBGRADE IMPROVEMENTS**

A. New pool deck subgrades are to be scarified a minimum of 6" and compacted to 90% per ASTM D1557.

#### **3.03 EXCAVATION**

A. Checking Layout: Contractor shall, before commencing the excavation work, check all lines, stakes and levels for dimensions, angles, elevations and grades with the survey.

B. Dimensions: Excavate to proper dimensions as shown, cut square and smooth with firm level bottoms. Prepared excavations shall be approved by Geotechnical Engineer. Excavations shall be free of loose or disturbed materials.

C. Excess Water Control: Keep all excavations free from standing water by pumping, draining or providing proper protection against water intrusion. If soil becomes soft, soggy or saturated, perform additional excavation to firm soil not affected by water.

D. Form Removal: Make all excavations of sufficient size to permit installation and removal of forms and all other required work.

E. Alternate Forming: Sides of structures may be formed by neat excavations where banks will stand without caving. If banks cave, provide forming as required and widen excavation to permit forming,

bracing and inspection. Provide forming in conformance with Section 13 11 02 and all recognized safety standards. Form all grade beams.

### 3.04 BACKFILLING

- A. Method: After concrete has been placed, forms removed and concrete work approved, backfill the excavations with earth to indicated or required grades. Carry on backfilling simultaneously on each side of walls or grade beams. Remove all rubbish and wood from the excavations before placing backfill.
- B. Concrete Protection: Prior to placing any backfill, adequately cure all concrete and provide any bracing required to ensure the stability of the structure. Protect waterproofing and dampproofing against damage in a manner acceptable to the Owner's Representative. Remove bracing as backfill operations progress.
- C. The on-site granitic bedrock may be utilized for trench backfill once it is processed. The on-site lean and fat clay should not be used for trench backfill. Imported fill should be free of organic material and rocks over 2 ½ inches in diameter.
- D. Backfill of all trenches should be placed in thin lifts and mechanically compacted to achieve a relative compaction of not less than 95 percent in paved areas and 90 percent in other areas per ASTM 1557. Care should be taken not to damage utility lines.
- E. Moisture: Rigidly control the amount of water used to ensure optimum moisture conditions for the type of fill material used. Excessive amounts of water causing saturation of earth will not be permitted. Compaction by flooding or jetting is prohibited.

### 3.05 GRADING

- A. Slopes: Grade to finish grades indicated on Drawings, with uniform slopes between all points.
- B. Subgrades: Blade to required grade and roll or tamp subgrades for exterior slabs, decks and paving.

### 3.06 CLEAN-UP

- A. Disposal: Haul away rubbish, debris, and rocks from site promptly and dispose of legally. Burning rubbish on site is prohibited.
- B. Dust and Noise Abatement: During entire period of construction keep area and material being loaded sprinkled to reduce dust in air and annoyance to premises and surrounding property.

END OF SECTION

## SECTION 13 11 02

## SWIMMING POOL CONCRETE

**PART 1 - GENERAL**

## 1.01 WORK INCLUDED

- A. Forming for cast-in-place concrete and shotcrete associated with swimming pools and pool decks.
- B. Reinforcement for cast-in-place concrete and shotcrete associated with swimming pools and pool decks.
- C. Cast-in-place concrete for swimming pool structures. Do not use waterproofing admixture of any kind.
- D. Cast-in-place concrete for swimming pool decks with Xypex C-500 crystalline waterproofing admixture. Waterproofing admixture for swimming pool decks only.
- E. Provide labor, materials and equipment as required to install sealant for all pool deck expansion joints, or any other caulking, as indicated on the aquatic Drawings and herein specified.

## 1.02 QUALITY ASSURANCE

- A. Qualifications of Workers:
  - 1. The entity performing the work of this Section shall have been successfully engaged in the respective trade for at least five (5) years immediately prior to commencement of the Work.
  - 2. For actual construction operations, use only trained and experienced workers with a minimum of three (3) years' experience with the materials and methods specified.
  - 3. Provide at least one person who shall be present at all times during execution of the work of this Section, with a minimum of five (5) years' experience with the type of materials being installed, the referenced standards, and who shall direct all Work performed under this Section.
- B. Standards:
  - 1. In addition to complying with the California Building Code (2022 edition), comply with all pertinent recommendations contained in "Guide to Formwork," Publication ACI 347R-14 of the American Concrete Institute.
  - 2. In addition to complying with California Building Code (2022 edition), 1908A, ACI 318-19 and ACI 506R and ACI 506.2, comply with all pertinent recommendations contained in "Guide to presenting Reinforcing Steel Design Details," Publication ACI 315R-18 of the American Concrete Institute.
  - 3. In addition to complying with all local codes and regulations, comply with all pertinent recommendations contained in American Society for Testing and materials (ASTM); ASTM C 920 "Standard Specification for Elastometric Joint Sealants."
- C. Tolerances: Construct all swimming pool concrete straight, true, plumb and square within a tolerance horizontally and vertically of 1/8" in total distance.

### 1.03 SUBMITTAL AND SUBSTITUTIONS

- A. Provide submittals in conformance with the requirements of Section 01 33 00.
- B. Samples and Certificates, Concrete Reinforcement:
  - 1. Provide all data and access required for testing as described in Sections 01 43 00 and 01 45 29 of the Specifications.
  - 2. All material shall bear mill tags with heat number identification. Mill analysis and report shall be made available upon request.
  - 3. Material not so labeled and identifiable may be required by the Owner to be tested by the testing laboratory selected by the Owner and at no additional cost to the Owner, in which case random samples will be taken for one series of tests from each 2-1/2 tons or fraction thereof of each size and kind of reinforcing steel.
  - 4. Design mix from batch plant demonstrating previous use history and associated strengths at 28 days.
  - 5. The Contractor shall submit a mix design stamped and signed by a licensed engineer for approval by the Owner's Representative prior to any placement of concrete.
  - 6. The Contractor shall submit a separate mix design stamped and signed by a licensed engineer for the swimming pool decks which contains the specified Xypex C-500 crystalline waterproofing admixture for approval by the Owner's Representative prior to any placement of concrete.
- C. Submit proof of qualifications as specified in Article 1.02.A of this Section.
- D. Submit reinforcing shop drawings for pool walls, gutters, floors, dike walls and balance tank, etc. as shown on the construction drawing.

### 1.04 PRODUCT HANDLING

- A. Delivery: Deliver materials to the Project Site in the manufacturer's original unopened containers with all labels intact and legible.
- B. Storage: Store materials under cover in a manner to prevent damage and contamination, and store only the specified materials at the Project Site.
- C. Protection: Use all means necessary to protect the swimming pool concrete before, during, and after installation and to protect the installed Work specified in other Sections.
- D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner.

## PART 2 - PRODUCTS

### 2.01 CONCRETE FORMWORK

- A. Form Materials:
  - 1. Form Lumber: All form lumber in contact with exposed concrete shall be new except as allowed for reuse of forms in Part 3 of this Section, and all form lumber shall be one of the following, a combination thereof, or an equal approved in advance by the Owner's Representative.

- a. "Plyform," Class I or II, bearing the label of the Douglas Fir Plywood Association; "Inner-Seal" Form as manufactured by Louisiana-Pacific, or approved equal.
  - b. Douglas Fir-Larch, number two grade, seasoned, surfaced four sides.
2. Form Release Agent: Colorless, non-staining, free from oils; chemically reactive agent that shall not impair bonding of paint or other coatings intended for use.
- B. Ties and Spreaders:
1. Type: All form ties shall be a type which do not leave an open hole through the concrete and which permits neat and solid patching at every hole.
  2. Design: When forms are removed, all metal reinforcement shall be not less than two (2) inches from the finished concrete surface.
  3. Wire Ties and Wood Spreaders: Do not use wire ties or wood spreaders.
- C. Alternate Forming Systems: Alternate forming systems may be used subject to the advance approval of the Owner's Representative.

## 2.02 CONCRETE REINFORCEMENT

- A. Bars: Bars for reinforcement shall conform to "Specifications for Deformed Carbon-Steel Bars for Concrete Reinforcement," ASTM A-615, Grade 60.
- B. Wire Fabric: Wire fabric shall conform to "Specifications for Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete," ASTM A1064.
- C. Tie Wire: Tie wire for reinforcement shall conform to "Specifications for Carbon Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete," ASTM A1064 black annealed 16-gauge tie wire.

## 2.03 CAST-IN-PLACE CONCRETE

- A. Concrete:
1. All concrete, unless otherwise specifically permitted by the Owner's Representative, shall be transit-mixed in accordance with ASTM C94. Concrete for water retaining structures that do not receive a waterproofing finish such as ceramic tile or swimming pool plaster shall receive a topical waterproofing finish.
  2. The control of concrete production shall be under the supervision of a recognized testing agency, selected by the Owner in accordance with Section 01 43 00 of the Specifications.
  3. Quality: All concrete shall have the following minimum compressive strengths at twenty-eight (28) days and shall be proportioned within the following limits:
    - a. 4,000 psi minimum compressive strength for cast-in-place concrete swimming pool structures.
    - b. 4,000 psi minimum compressive strength for cast-in-place swimming pool decks with Xypex C-500 waterproofing admixture.
    - c. 1" maximum size aggregate.
    - d. 6.0 minimum sacks of cement per cubic yard\*
    - e. Maximum water to cement ratio of 0.40 minimum-0.45 maximum

- f. 4" maximum slump.
  - g. Xypex Admix C-500 2% - 2.5% by weight of cement content. Contact Xypex Technical Services to confirm dosage. (To be used for swimming pool decks only.)
    - \* For estimate only: to be determined by mix design.
4. Cement: All cement shall be Portland Cement conforming to ASTM C-150, Type II or V and shall be the product of one manufacturer.
  5. Aggregates:
    - a. Shall conform to "Standard Specifications for Concrete Aggregates," ASTM C33, except as modified herein.
    - b. Coarse Aggregate: Clean sound washed gravel or crushed rock. Crushing may constitute not more than 30% of the total coarse aggregate volume. Not more than 5% flat, thin, elongated or laminated material nor more than 1% deleterious material shall be present. 1" aggregate graded from 1/4" to 1", fineness modulus 6.90 to 7.40. 1-1/2" graded from 1/2" to 1-1/2", fineness modulus 7.80 to 8.20.
    - c. Fine Aggregate: Washed natural sand of hard, strong particles and shall contain not more than 1% of deleterious material, fineness modulus 2.65 to 3.05.
    - d. Aggregate must be certified, non-expansive from a "known" good source.
  6. Water: ASTM C1602, Clean, fresh, free from acid, alkali, organic matter or other impurities liable to be detrimental to the concrete (potable).
  7. Admixtures: Admixtures shall be used upon approval of the Owner's Representative.
    - a. Air-entraining admixture: Conform to ASTM C260.
    - b. Water-reducing admixture: Conform to ASTM C494.
    - c. Waterproofing admixture for swimming pool decks only: Xypex Admix C-500, No substitutions permitted. Conform to ASTM C494.
  8. Xypex Admix C-500 Dosage: To be used for swimming pool decks only.
    - a. General: Xypex Admix must be added to concrete mix at time of batching. It is important to obtain a homogeneous mixture of Xypex Admix with the concrete. Do not add dry Admix powder directly to wet mixed concrete as this could cause clumping and thorough dispersion may not occur.
    - b. Dosage Rate: Under normal conditions, the crystalline waterproofing powder shall be added to the concrete mix at the following rates:
      - 1) Xypex Admix C-500 2% – 2.5% by weight of cement content
    - c. Weather Conditions: For mixing, transporting and placing concrete under conditions of high temperature or low temperature, follow concrete practices such as those referred to in ACI 305R (Hot Weather Concreting) and ACI 306R (Cold Weather Concreting) or other applicable standards.
    - d. Concrete Batching & Mixing Procedures: Procedures for the addition of Xypex admixture will vary according to type of batch plant operation and equipment. Prior to the placement of any concrete, the concrete batch plant and the contractor shall be responsible to consult with the local Xypex representative concerning additional procedures for the addition, mixing and to confirm dosage.
    - e. Note: For enhanced chemical protection or for meeting specific project requirements or where the concrete mix design contains higher than 25% type F fly ash content or includes a Portland cement/slag cement/type C fly ash blend, consult with manufacturer or its authorized representative to determine appropriate dosage rates.

- B. Construction Joints: Use keyform for slab pour joints. Either preformed galvanized or PVC construction joint forms of a standard manufacturer may be used. Install per manufacturer's recommendations and tool edges of slabs.
- C. Waterstops: PVC bulb-type for use between concrete pours / lifts, conforming with ASTM D 570, D 624, and D 638. Provide in configuration(s) as recommended by manufacturer for specific application. Greenstreak, W.R. Meadows, or approved equal.
- D. Curing Materials:
1. Liquid Membrane (covered slab): Chlorinated rubber membrane forming, curing-sealing compound conforming to ASTM C309.
  2. Liquid Membrane (exposed slab): Clear methyl and butyl methacrylate non-staining, membrane forming, curing-sealing compound conforming to ASTM C309.
- E. Cement Grout and Drypack:
1. Cement Grout: Mix 1 part by volume of Portland Cement, 1/2 part by volume of water and fine aggregate enough to make mixture flow under its' own weight.
  2. Drypack: Mix 1 part by volume of Portland Cement, 1/2 part by volume of water and fine aggregate enough to make a stiff mix that will mold into a ball. Mix no more than can be used in 30 minutes.
- F. Concrete Pool Deck Penetrating Sealer:
1. Manufacturer: PROSOCO, Inc., 3741 Greenway Circle, Lawrence, KS 66046. Phone: (800) 255-4255; Fax: (785) 830-9797. E-mail: CustomerCare@prosoco.com
  2. Typical Technical Data:
    - a. FORM: Clear liquid
    - b. SPECIFIC GRAVITY: 1.04
    - c. pH: not applicable
    - d. WEIGHT/GALLON.: 8.69 pounds
    - e. ACTIVE CONTENT: 11.47 percent
    - f. TOTAL SOLIDS: 9.21 percent ASTM D2369
    - g. FLASH POINT: 63 degrees Fahrenheit (53 degrees Celsius) ASTM D3278
    - h. FREEZE POINT: 38 degrees Fahrenheit (3 degrees Celsius)
    - i. SHELF LIFE: 2 years in tightly sealed, unopened container
    - j. VOC CONTENT: less than 100 grams per Liter
  3. Limitations
    - a. Not appropriate for use on limestone, marble, travertine or other calcareous stones. Always test other natural stone to ensure desired results.
    - b. Not suitable for application to synthetic resin paints, gypsum, plaster or other non-masonry surfaces.
    - c. May not be suitable for surfaces receiving paints or coatings. Always test.
    - d. May cause slight darkening on some surfaces.
    - e. May adhere to glass. Contact PROSOCO for removal recommendations.
    - f. Not suitable for protecting surfaces subject to constant water spray.
    - g. Will not compensate for structural or material defects.

h. Not recommended for below grade application.

4. Application: Provide two coats per manufacturer's requirements. Before applying, read "Preparation" in the Manufacturer's Product Data Sheet and all safety information in the Manufacturer's Safety Data Sheet for Saltguard® VOC. Refer to the Product Data Sheet for additional information about application of Saltguard® VOC. Do not dilute or alter

#### 2.04 JOINT SEALANT MATERIALS

- A. Caulking: Multipart, non-sag gun grade polyurethane-based sealant meeting the requirements of ASTM C920-02, Type S or M, Mamemco International, Pecora, Sika Corp., Sonneborn Building Products, Tremco or approved equal. Self-leveling caulking materials are not allowed.
- B. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- C. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- D. Sealant Backer Rod: Provide compressible polyethylene or polyurethane backer rod as recommended by the sealant manufacturer.
- E. Bond Breaker Tape: Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant.
- F. Sand: Cover the surface of the caulking with #30 silica sand.

#### 2.05 OTHER MATERIALS

- A. All other materials, not specifically described but required for proper completion of the work of this Section, shall be as selected by the Contractor subject to the advance review by the Owner's Representative.

### **PART 3 - EXECUTION**

#### 3.01 SURFACE CONDITIONS

- A. Inspection:
  1. Prior to all Work of this Section, carefully inspect the installed Work of other trades and verify that all such Work is complete to the point where this installation may properly commence.
  2. Verify that all Work may be constructed in accordance with all applicable codes and regulations, the referenced standards, the original design, and in accordance with site specific Geotechnical Report.
- B. Discrepancies:
  1. In the event of discrepancy, immediately notify the Owner's Representative.
  2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.

3. Failure to notify the Owner's Representative and give written notice of discrepancies shall constitute acceptance by the Contractor of existing conditions as fit and proper to receive work.

### 3.02 CONCRETE FORMWORK

#### A. Construction of Forms:

1. General: Construct all required forms to be substantial, sufficiently tight to prevent leakage of concrete paste, and able to withstand excessive deflection when filled with wet concrete.
2. Layout:
  - a. Form for all required cast-in-place concrete to the shapes, sizes, lines and dimensions indicated on the Drawings.
  - b. Exercise particular care in the layout of forms to avoid necessity for cutting concrete after placement.
  - c. Make proper provisions for all openings, offsets, recesses, anchorages, blocking and other features of the Work as shown or required.
  - d. Perform all forming required for Work of other trades and do all cutting and repairing of forms required to permit such installation.
  - e. Carefully examine the Drawings and Specifications and consult with other trades as required relative to providing for pipe and conduit penetrations, reglets, chases and other items in the forms.
3. Imbedded Items: Set all required steel frames, angles, bolts, inserts and other such items required to be anchored in the concrete prior to concrete being placed.
4. Bracings:
  - a. Properly brace and tie the forms together so as to maintain position and shape and to ensure safety to workmen.
  - b. Construct all bracing, supporting members and centering of ample size and strength to safely carry, without excessive deflection, all dead and live loads to which they may be subjected.
  - c. Properly space the forms apart and securely tie them together, using metal spreader ties that give positive tying and accurate spreading.
5. Wetting: Keep forms sufficiently wetted to prevent joints from opening up before concrete is placed.

#### B. Plywood Forms:

1. Design: Nail the plywood panels directly to studs and apply in a manner to minimize the number of joints.
2. Joints: Make all panel joints tight butt joints with all edges true and square.

#### C. Footing Forms:

1. Wood Forms: All footing forms shall be wood unless otherwise specifically approved by the Owner's Representative, or as specified in paragraph 3.02(C)(2).
2. Earth Forms:

- a. Side walls for footings may be of earth provided the soil will stand without caving and the sides of the bank are made with a neat cut to the minimum dimensions indicated on the Drawings.
- b. For excavation and backfill of earth forms, conform with applicable provisions of Section 13 11 01.

D. Reuse of Forms:

1. Reuse of forms shall be subject to advance approval of the Owner's Representative.
2. Except as specifically approved in advance by the Owner's Representative, reuse of forms shall in no way delay or change the schedule for placement of concrete from the schedule obtainable if all forms were new.
3. Except as specifically approved in advance by the Owner's Representative, reuse of forms shall in no way impart less structural stability to the forms nor less acceptable appearance to finished concrete.

E. Removal of Forms:

1. General:
  - a. In general, side forms of footings may be removed seven (7) days after placement of concrete, but time may be extended if deemed necessary by the Owner's Representative.
  - b. Forms for footings, foundations, grade beams, slabs, walls, and other formed concrete may be removed fourteen (14) days after placement of concrete.
2. Removal:
  - a. Use all means necessary to protect workers, passersby, the installed Work of other trades and the complete safety of the structure.
  - b. Cut nails and tie wires or form ties off flush, and leave all surfaces smooth and clean.
  - c. Remove metal spreader ties on exposed concrete by removing or snapping off inside the wall surface and pointing up and rubbing the resulting pockets to match the surrounding areas.
  - d. Flush all holes resulting from the use of spreader ties and sleeve nuts using water, and then solidly pack throughout the wall thickness with cement grout applied under pressure by means of a grouting gun; grout shall be one-part Portland Cement to 2-1/2 parts sand; apply grout immediately after removing forms.

### 3.03 CONCRETE REINFORCEMENT

A. Bending:

1. General:
  - a. Fabricate all reinforcement in strict accordance with the Drawings.
  - b. Do not use bars with kinks or bends not shown on the Drawings.
  - c. Do not bend or straighten steel in a manner that will injure the material. (When opposite end is already encased in concrete.)
2. Design:
  - a. Bend all bars cold.

- b. Make bends for stirrups and ties around a pin having a diameter of not less than two (2) times the minimum thickness of the bar.
- c. Make bends for other bars, including hooks, around a pin having a diameter of not less than six (6) times the minimum thickness of the bar.

B. Placing:

1. General: Before the start of concrete placement, accurately place all concrete reinforcement, positively securing and supporting by concrete blocks, metal chairs or spacers, or by metal hangers.
  2. Clearance:
    - a. Preserve clear space between bars of not less than one and one-half (1-1/2) times the nominal diameter of the round bars.
    - b. In no case let the clear space be less than one and one-half (1-1/2) inches nor less than one and one-third (1-1/3) times the maximum size of the aggregate.
    - c. Provide the following minimum concrete covering of reinforcement:
      - 1) Concrete deposited against earth: three (3) inches minimum.
      - 2) Concrete below grade deposited against forms: two (2) inches minimum.
      - 3) Concrete elsewhere: As indicated on Drawings or otherwise approved by the Owner's Representative.
  3. Splicing:
    - a. Horizontal Bars:
      - 1) Place bars in horizontal members with minimum lap at splices sufficient to develop the strength of the bars.
      - 2) Bars may be wired together at laps except at points of support of the member, at which points preserve clear space described above.
      - 3) Whenever possible, stagger the splices of adjacent bars.
      - 4) Splice forty (40) bar diameters minimum.
      - 5) Provide non-contact lap slices for shotcrete.
    - b. Wire Fabric: Make all splices in wire fabric at least one and one-half (1-1/2) meshes wide.
    - c. Other Splices: Make only those other splices that are indicated on the Drawings or specifically approved by the Owner's Representative.
  4. Dowels: Place all required steel dowels and securely anchor them into position before concrete is placed.
  5. Obstructions: In the event conduits, piping, inserts, sleeves and other items interfere with placing reinforcement as indicated on the Drawings or otherwise required, immediately consult with the Owner's Representative and obtain approval of a new procedure prior to placing concrete.
- C. Cleaning Reinforcement: Steel reinforcement, at the time concrete is placed around it, shall be free from rust scale, loose mill scale, oil, paint and all other coatings which will destroy or reduce the bond between steel and concrete. Bend down all tie wire away from the top of the pool deck. Maintain a 2" clear from top of concrete to the tie wire.

### 3.04 SHOTCRETE REINFORCEMENT

- A. Shotcrete reinforcement shall be in accordance with the requirements of CBC 1908A and ACI 318-19, along with the provisions of ACI 506R and ACI 506.2. For parallel nonprestressed reinforcement in shotcrete members, the clear spacing between bars shall be at least the greater of 6 bar diameters and 2-1/2 in. Where two curtains of reinforcement are provided, the clear spacing between bars in the curtain nearer the nozzle shall be at least 12 bar diameters; the clear spacing between bars in the remaining curtain shall be at least the greater of 6 bar diameters and 2-1/2 in. Adequate encasement of bars larger than No. 5 shall be demonstrated by a preconstruction test shotcrete mockup panel.
1. Subject to the approval of the building official, it shall be permitted to use a clear spacing that does not meet the clear spacing provisions listed above provided that shotcrete mockup panels are used to demonstrate the proper reinforcement encasement in accordance with the following:
    - a. The shotcrete mockup panels shall be representative of the most complex reinforcement configurations to be encountered.
  2. The licensed design professional shall specify the shotcrete mockup panel quantity, frequency of shooting per nozzleman and member type, and panel thickness to verify reinforcement encasement.
- B. Non-contact lap splices for reinforcement in shotcrete shall have clear spacing in accordance with the following:
1. For No. 6 and smaller bars, the clear spacing between bars shall be at least greater of 6 bar diameters and 2-1/2" in.
  2. For No. 7 and larger bars, the clear spacing shall be established using a shotcrete mockup panel to demonstrate that the reinforcement is properly encased.
- C. Subject to the approval of the building official, contact lap splices for reinforcement in shotcrete shall be oriented with the plane of the spliced bars perpendicular to the surface of the shotcrete and approved by the licensed design professional based on a shotcrete mockup panel to demonstrate that the reinforcement is properly encased.

### 3.05 CAST-IN-PLACE CONCRETE

- A. Conveying and Placing Concrete:
1. Before placing concrete, mixing and conveying equipment shall be well cleaned, and the forms and space to be occupied by concrete shall be thoroughly cleaned and wetted. Ground water shall be removed until the completion of the work.
  2. No concrete shall be placed in any unit of work until all formwork has been completely constructed, all reinforcement has been secured in place, all items to be built into concrete are in place, and form ties at construction joints tightened.
  3. Concrete shall be conveyed from mixer to place of final deposit in such a way to prevent the separation or loss of ingredients. It shall be placed as nearly as practicable in its' final position to avoid rehandling or flowing. Concrete shall not be dropped freely where reinforcing bars will cause segregation, nor shall it be dropped freely more than six (6) feet. Use tremies, spouts and dump boxes in deep sections. Vibrators are not acceptable for facilitating concrete transport.
  4. Concrete shall be tamped and spaded to insure proper compaction into all parts of forms and

- around reinforcement. A mechanical vibrator shall be used to thoroughly compact the concrete. Vibration must be by direct action in the concrete and not against forms or reinforcement.
5. Mixing and transport time as indicated in ASTM C94 is required. If air temperatures are between 85° and 90° F the delivery time is to be reduced to 75 minutes. When air temperatures are in excess of 90° F the delivery time should be reduced to 60 minutes.
  6. Truck mixes without batch certificates will be rejected.
- B. Construction Joints / Expansion Joints: Construction joints and expansion joints shall be provided at locations and in the manner shown on the Drawings. With exception of existing concrete / new shotcrete joints, use PVC bulb-type waterstops appropriate for design condition between all concrete pours / lifts to avoid cold joints. Waterstops shall be placed in such a way to protect reinforcing steel from rust and oxidation. All expansion joints must be the full depth of the concrete section in which they are located.
- C. Slab Finishes: Concrete slabs shall be compacted and screeded uniformly to grades shown. Push large aggregates below the surface with a screen tamper, screed and bull float. As soon as the surface becomes workable, it shall be wood floated, then finished as indicated on the Drawings to a uniform smooth, true surface in a neat and workmanlike manner. Carefully coordinate slab finish requirements with other trades (ceramic tile, pool plaster) to ensure concrete finish is appropriate substrate for final finish material.
1. Contractor shall provide three mock-up deck samples, minimum 3'x 3', with a wedge anchor installed in one sample. These (3) samples shall be constructed; one with a light broom finish, one (1) with a medium broom finish and one (1) with a heavy broom finish for determination and selection of an appropriate deck finish. Each sample shall be edged on all four sides to demonstrate a 3/4" radius edge. Anchor installation shall demonstrate acceptable interface between anchor and the top of deck. Deck samples shall remain on job site through final inspection for reference.
  2. Pool Floor Slab: Heavy Wire Broom Finish.
- D. Protection and Curing:
1. Concrete shall be protected from injurious action of the elements and defacement of any nature during construction.
  2. All forms must be kept wet to prevent drying out of the concrete.
  3. All concrete surfaces including footings must be kept wet for at least seven (7) days after concrete is placed.
  4. Apply the appropriate curing materials, as specified in 2.03 of this Section, immediately after finishing slabs. Application shall be as specified by the manufacturer.
- E. Form Removal:
1. Take care in removing forms so that surfaces are not marred or gouged and that corners are true, sharp and unbroken.
  2. No steel spreaders, ties or other metal shall project from or be visible on any concrete surfaces.
  3. Defective Work:
  4. Should the strength of any concrete for any portion of the work indicated by tests of molded cylinders and core tests fall below minimum 28 days strength specified or indicated, concrete will be deemed defective work and shall be replaced.

5. Concrete work that is not formed as indicated, is not true to intended alignment, not plumb or level where so intended, not true to intended grades or elevations, not true to specified or selected finish, contains sawdust shavings, wood, or embedded debris, which exhibits cracks or contains fine or coarse sulfide particles, or expansive aggregates detrimental to performance or appearance of the concrete shall be deemed defective.
6. Promptly perform work required to replace and properly clean (by sandblasting if necessary) any defective concrete panels (control joint or expansion joint to control joint or expansion joint), at Contractor's expense, including all expense of additional inspection, tests, or supervision made necessary as a result of defective concrete.

### 3.06 EXPANSION JOINTS

- A. Temperatures: Do not install sealants when air temperature is less than 40°F.
- B. Tooling: Tool exposed joints to a slightly concave surface using slicking materials recommended by the manufacturer. The tooling procedure shall press sealant against the sides of the joint. No materials shall be left "feathered" out or smeared on the abutting materials. Completed joints shall have a uniform professional appearance.
- C. Joint Construction: Sealant joint width, thickness and cross-sectional profile to be constructed in strict accordance with the sealant manufacturer's recommendations.
- D. Sand: At the appropriate time cover the sealant with sand to provide a sanded finish.

### 3.07 CLEAN-UP

- A. Upon completion of the Work of this Section, immediately remove all swimming pool concrete materials, debris and rubbish occasioned by this Work to the approval of the Owner's Representative.

END OF SECTION

## SECTION 13 11 03

## SWIMMING POOL SHOTCRETE

**PART 1 - GENERAL**

## 1.01 WORK INCLUDED

- A. Provide labor, materials and equipment as required to install structural wet mix shotcrete for swimming pool structures as indicated on the Drawings and herein specified.

## 1.02 QUALITY ASSURANCE

## A. Qualifications of Workers:

1. The entity performing the work of this Section shall have been successfully engaged in the respective trade for at least five (5) years immediately prior to commencement of the Work.
2. For actual construction operations, use only trained and experienced workers with a minimum of three (3) years experience with the materials and methods specified.
3. Provide at least one person who shall be present at all times during execution of the work of this Section, with a minimum of five (5) years experience with the type of materials being installed, the referenced standards, and who shall direct all Work performed under this Section.

- B. Standards: Except as otherwise indicated, provide shotcrete per American Concrete Institute Standard ACI 506R, ACI 506.2, ACI 318-19 and the California Building Code (2022 edition).

- C. Mix Design: The Contractor shall submit a mix design stamped and signed by a licensed engineer for approval by the Owner's Representative prior to any placement of shotcrete. Mix design shall indicate source of aggregate and brands of cement and admixtures used. All mix designs shall take character of locally available aggregate into consideration and make adjustments as necessary to conform with specified design criteria.

- D. Testing and Inspection: A test panel shall be shot, cured, cored or sawn, examined and tested (representing the most congested and difficult project scenario) prior to commencement of the project in accordance with ASTM C1140. All project conditions and personnel shall be represented in the test panel. Additionally, one test panel shall be provided for each 50 yards (or portion thereof) of shotcrete placed for each day or each nozzle man, whichever is greater. The size of the strength test panel shall be per the direction of the Special Shotcrete Inspector. At least three (3) cores shall be taken from each test panel. (At least three (3) cores shall be taken from the completed work for each day of shotcrete operation.) Testing shall be performed by the Owner's designated Testing Lab and comply with Section ACI 318-19 and CBC 2022 1705A.3.9. Continuous inspection of the shotcrete operation by a deputy inspector provided by the Owner shall be required.

- E. Tolerances: Construct all swimming pool shotcrete straight, true, plumb and square within a tolerance horizontally of one in 200 and a tolerance vertically of one in 2000.

## 1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Provide submittals in conformance with the requirements of Section 01 33 00 and ACI 506.2.

- B. Materials List: Within thirty (30) days after issuance of Notice to Proceed, and before shotcrete materials are delivered to the project site, submit to the Owner a complete list of materials proposed to be used in this portion of the Work, showing manufacturer's name and catalog number of all items such as admixtures and curing membranes, and the name and address of the supplier of cement and aggregate to be used.
- C. Submit proof of qualifications as specified in Article 1.02.A of this Section.

#### 1.04 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect shotcrete materials before, during and after installation and to protect the installed Work specified in other Sections.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner and at no additional cost to the Owner.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Cement: Cement shall be Type 1 Portland Cement conforming to ASTM C150. Cement type shall be the same for all shotcrete work.
- B. Aggregate: ASTM C33, washed hard dense durable clean sharp sand from approved pit, free of organic matter and opaline, feldspar, or silicious magnesium substances and containing not more than 3% by weight of deleterious substances. Maximum size aggregate for shotcrete is  $\frac{3}{4}$ " per ACI 318-19. When tested for organic impurities by ASTM C40 method, fine aggregate color not darker than reference standard color. When tested for soundness by ASTM C88 method, grading No. 2 of ASTM C1436, loss after 5 cycles not over 10% of fine aggregate.
- C. Water: Potable, clean, fresh, free from acid, alkali, organic matter or other impurities liable to be detrimental to the shotcrete.
- D. Admixtures: Admixtures shall conform to ASTM C1141 and only be used upon approval of the Owner's Representative.

### PART 3 - EXECUTION

#### 3.01 EXECUTION

- A. Inspection:
  - 1. Prior to all Work of this Section carefully inspect the installed Work of other trades and verify that all such Work is complete to the point where this installation may properly commence.
  - 2. Verify that items to be imbedded in shotcrete are in place and that shotcrete may be placed to the lines and elevations shown on the Drawings, with all required clearance from reinforcement.
- B. Discrepancies:
  - 1. In the event of discrepancy, immediately notify the Owner's Representative.

2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
3. Failure to notify the Owner's Representative and give written notice of discrepancies shall constitute acceptance by the Contractor of existing conditions as fit and proper to receive the Work.

### 3.02 PREPARATION

#### A. General:

1. Thoroughly clean all areas where shotcrete is to be placed to insure proper bonding of shotcrete.
2. Where shotcrete is to be placed against smooth surfaces (i.e., cast-in-place concrete), sandblast surfaces to receive shotcrete to provide clean aggregate surface, thereby insuring proper bond between materials.

- B. Ground Wires: Adequate ground wires, to be used as screeds, shall be installed to establish the thickness and surface planes of the shotcrete work. Ground wires shall be placed so that they are tight and true to line and grade and in such a manner that they can be easily tightened.

### 3.03 PROPORTIONING AND MIXING

- A. Accurately control proportion of water to Portland cement to produce thorough and uniform hydration of the shotcrete that, when shot, forms a homogeneous mass containing neither sags nor dry sand formation. Proportion by mass per ASTM C94 or by volume per ASTM C685.
- B. Shotcrete shall have a minimum compressive strength of 4,000 PSI at 28 days. Shotcrete material shall have a water/cement ratio of 0.40 minimum-0.45 maximum per ACI 506R, Chapter 6, Proportioning and Preconstruction Testing; Section 6.3.3, Wet Mix Process.
- C. Discontinue shotcrete work if the time between the addition of mixing water to cement and aggregate, or cement to aggregates, and placement of shotcrete exceeds ninety (90) minutes when the ambient temperature is below 85 degrees Fahrenheit, or exceeds sixty (60) minutes when the ambient temperature is above 85 degrees Fahrenheit. Batch, mix and deliver wet-mixture shotcrete per ASTM C94 or C685.
- D. Hot Weather Shotcreting – Unless otherwise specified, do not place shotcrete when shotcrete temperature is above 95°F, unless prequalification testing shows that the required quality of materials can be achieved at high temperatures. The temperature of reinforcement and receiving surfaces shall be below 90°F prior to shotcrete placement.
- E. Cold Weather Shotcreting – Unless otherwise specified, shooting may proceed when ambient temperature is 40°F and rising. Stop shooting when ambient temperature is 40°F and falling, unless measures are taken to protect the shotcrete. Shotcrete material temperature, when shot, shall not be less than 50°F. Do not place against frozen surfaces.

### 3.04 SHOTCRETE PLACING, FINISHING, AND CURING

- A. Operations: Utilize a standard type of air compressor, capable of providing a minimum of 250 cubic feet of air per minute per nozzle.
- B. Placing: Except when shooting reinforcing, hold the nozzle perpendicular to and 2-1/2 to 3 feet from surface. At reinforcing bars, hold the nozzle so as to direct shotcrete behind the bars, and shoot each side of each bars separately. A nozzleman's helper equipped with an air jet shall precede the nozzle and blow out rebound or sand lodged behind bars, on forms, or placed shotcrete. Placing shotcrete horizontal members from the top is not allowed unless approved methods are employed to eliminate all rebound. Material shall emerge from the nozzle in a uniform flow. If flow becomes intermittent for any reason, direct the nozzle away from the surface until the flow is again steady and constant. Do not reuse rebound or loose sand for any purpose.
- C. Puddled Shotcrete: Use of "puddled shotcrete" in which the air pressure is reduced and the water content is increased to facilitate placing in difficult locations is not allowed. Do not place shotcrete where nozzle stream cannot impinge directly on the involved surface. Where difficult shooting conditions occur, obtain proper results by maintaining correct air pressure and water ratio and reduce supply of material.
- D. Construction Joints: Form joints with sloping beveled edges. Clean and dampen the hardened joint surfaces before placing additional shotcrete. Square edged construction joints are not allowed. The film of laitance which forms on the surface of the shotcrete shall be removed within approximately two hours after application by brushing with a stiff broom. If this film is not removed within two hours, it shall be removed by thorough wire brushing or sand blasting. Construction joints over eight hours old shall be thoroughly cleaned with air and water prior to receiving shotcrete.
- E. Finishing: Rod exposed surfaces to true planes and lines on reaching the thickness and plane established by forms and ground wires. Tamp and wood float surfaces level and provide a rough raked finish. Carefully coordinate finish requirements with other trades (ceramic tile, pool plaster) to insure shotcrete finish is appropriate substrate for final finish material.
- F. Curing: Keep shotcrete continuously damp for not less than seven (7) days after placing. Use sealed curing sheeting or other approved curing method where water curing is not feasible. Do not use curing compound of any kind.

### 3.05 DEFECTIVE WORK

- A. Cut out, remove and replace, or repair to the satisfaction of the Owner's Representative, shotcrete not meeting minimum strength, not true, plumb or level, not to required elevations, containing cracks detrimental to performance or appearance, containing shavings, debris or with honeycombs or voids.
- B. Promptly perform Work required to repair, patch, replace, render properly cleaned surfaces (by sandblasting if necessary) or otherwise make good any defective shotcrete at Contractor's expense, including all expense of additional inspection, tests, or supervision made necessary as a result of defective shotcrete.

### 3.06 CLEAN-UP

- A. Upon completion of the Work of this Section, immediately remove all swimming pool shotcrete materials, debris and rubbish occasioned by this work to the approval of the Owner's Representative.

END OF SECTION



## SECTION 13 11 04

## SWIMMING POOL CERAMIC TILE

**PART 1 - GENERAL**

## 1.01 WORK INCLUDED

- A. Swimming pool ceramic tile detailed on the Drawings, including, but not limited to, the following:
1. Waterline Tile.
  2. Depth Marker Tile (at waterline).
  3. Depth / Caution Marker Tile (at pool deck).
  4. Lane Line / Target / 4'-6" Depth Tile:
  5. Pre-Cast Coping

## 1.02 QUALITY ASSURANCE

- A. Qualifications of Workers:
1. The entity performing the work of this Section shall have been successfully engaged in the respective trade for at least five (5) years immediately prior to commencement of the Work.
  2. For actual construction operations, use only trained and experienced workers with a minimum of three (3) years' experience with the materials and methods specified.
  3. Provide at least one person who shall be present at all times during execution of the work of this Section, with a minimum of five (5) years' experience with the type of materials being installed, the referenced standards, and who shall direct all Work performed under this Section.
- B. Standards: In addition to complying with all pertinent codes and regulations:
1. Manufacture of all tile shall be in accordance with ANSI A-137.1.
  2. Install ceramic tile in accordance with the recommendations contained in the 2024 "Handbook for Ceramic Tile Installation" of the Tile Council of America, Inc.
- C. Tolerances: Install all swimming pool ceramic tile straight, true, plumb and square within a tolerance horizontally and vertically of 1/8" in total distance. Waterline and gutter bullnose tile shall be level to 1/8" (+/- 1/16") around entire perimeter of swimming pools.

## 1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Provide submittals in conformance with the requirements of Section 01 33 00.
- B. Samples: Submit samples of each color and pattern in the specified groups. Character samples can be representative for review prior to screening of actual tile.
- C. Master Grade Certificate: Prior to opening ceramic tile containers, submit a Master Grade Certificate, signed by the manufacturer of the tile used and issued when the shipment is made, stating the grade, kind of tile, identification marks for the tile containers, and the name and location of the Project.

- D. Specifications: Submit manufacturer's recommended installation specifications for the Work.
- E. Submit proof of qualifications as specified in Article 1.02.A of this Section.

#### 1.04 PRODUCT HANDLING

- A. Delivery: Deliver all materials to the Project Site in the manufacturer's original unopened containers with all labels intact and legible.
- B. Storage: Store all materials under cover in a manner to prevent damage and contamination, and store only the specified materials at the Project site.
- C. Protection: Use all means necessary to protect swimming pool ceramic tile before, during and after installation and to protect the installed Work specified in other Sections.
- D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative.

### PART 2 - PRODUCTS

#### 2.01 TILE

- A. Waterline Face Tile
  - 1. Material: All waterline face tile shall be glazed ceramic tile (Group III standard) as manufactured by Dal-Tile or approved equal.
  - 2. Size: 6 x 6 inches. (Coordinate with Landscape Architect.)
  - 3. Color: Dal-Tile #D-129 'Sky blue'. Contact Kylee Midura at [kylee.midura@daltile.com](mailto:kylee.midura@daltile.com) (858)344-0019. (Coordinate with Architect.)
- B. Depth Marker Tile (At Waterline):
  - 1. Material: All depth marker tile shall be glazed ceramic tile as manufactured and/or distributed by Dal-Tile, Precision Tile Co., or approved equal.
  - 2. Size: 6 x 6 inches.
  - 3. Color: Dal-Tile #D-129 'Sky Blue' with Black silk screen numbers. (Coordinate with Architect.)
- C. Depth / Caution Marker (On Deck):
  - 1. Material: Group 3 quality, frost proof unglazed ceramic mosaic tile with absorption rate of less than 1% as manufactured by Dal-Tile or approved equal.
  - 2. Size: 1 x 1 inches.
  - 3. Color: Dal-Tile #D-311 'Black' letters and numbers on #D-014 'Light Gray' field.
- D. Lane Line / Target / 4'-6" Depth Tile:
  - 1. Material: Group 3 quality, frost proof non-slip unglazed ceramic mosaic tile with absorption rate of less than 1% as manufactured by Dal-Tile or approved equal.
  - 2. Size: 1 x 1 inches.
  - 3. Color: Dal-Tile #D-311 'Black' in 25-yard direction and #D-023 'Galaxy Blue' at 4'-6" depth

marker.

E. Pre-cast Coping:

1. Size and shape to match detail(s) on plans. Quickcrete Products or equal. (951) 737-6240.
2. Color: To match adjacent decking. (Coordinate with Architect prior to ordering.)

2.02 MORTAR

- A. Sand for Mortar: Comply with requirements of fine aggregate for concrete.
- B. Cement: Type I Portland Cement, conforming to ASTM C150.
- C. Hydrated Lime: Conforming to ASTM C206 or 207, Type S.
- D. Water: From a potable source.
- E. Mortar shall meet ASTM C270 standard.

2.03 THIN SET MORTAR

- A. Laticrete 254 Platinum. Laticrete, Custom or equal.
- B. Water: From a potable source.
- C. Mortar shall meet ASTM C627.

2.04 GROUT

- A. All tile grout shall be waterproof grout complying with the recommendations of TCA and ANSI A118.6 (4) standards. Grout color shall be grey for dark backgrounds, white for light backgrounds (verify colors with Architect).

2.05 OTHER MATERIALS

- A. All other materials, not specifically described but required for a complete and proper installation of ceramic tile as indicated on the Drawings, shall be new, first quality of their respective kinds, and subject to the approval of the Owner's Representative.

**PART 3 - EXECUTION**

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to all Work of this Section, carefully inspect the installed Work of other trades and verify that all such Work is complete to the point where this installation may properly commence.
2. Verify that ceramic tile can be installed in accordance with the original design and all referenced standards.

B. Discrepancies:

1. In the event of discrepancy, immediately notify the Owner's Representative.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
3. Failure to notify the Owner's Representative and give written notice of discrepancies shall constitute acceptance by the Contractor of existing conditions as fit and proper to receive its Work.

3.02 INSTALLATION

A. Method:

1. Install all ceramic tile in strict accordance with installation method P601-90 of the 2024 Handbook for Ceramic Tile Installation of the Tile Council of America, Inc.
2. Be certain to install all ceramic tile perfectly level, flush, plumb, and to the finish grades and elevations indicated on the Drawings.

B. Interface:

1. Carefully establish and follow the required horizontal and vertical elevations to insure proper and adequate space for the work and materials of other trades.
2. Coordinate and cooperate as required with other trades to insure proper and adequate interface of ceramic tile Work with the Work of other trades.

3.03 GROUTING

- A. Follow grout manufacturer's recommendations as to grouting procedures and precautions.
- B. Remove all grout haze, observing grout manufacturer's recommendations as to use of acid and chemical cleaners.

3.04 EXTRA STOCK

- A. Provide one (1) unopened box of extra tile for 2.01A and 2.01C for Owners use at a future time.

3.05 CLEAN-UP

- A. Upon completion of the swimming pool ceramic tile installation, thoroughly clean and polish the exposed surfaces of tile work. Completely clean work area of debris and rubbish occasioned by this Work and dispose of to the approval of the Owner's Representative.

END OF SECTION

SECTION 13 11 05

SWIMMING POOL PLASTER

**PART 1 - GENERAL**

1.01 WORK INCLUDED

- A. Swimming pool plaster and waterproofing of swimming pool structures as indicated on the Drawings and herein specified.
- B. Start-up and operation instructions to Owner's operations and maintenance personnel and properly balance swimming pool water chemistry until the Owner takes occupancy.

1.02 QUALITY ASSURANCE

- A. Qualifications of Workers:
  - 1. The entity performing the work of this Section shall have been successfully engaged in the respective trade for at least five (5) years immediately prior to commencement of the Work.
  - 2. For actual construction operations, use only trained and experienced workers with a minimum of three (3) years' experience with the materials and methods specified.
  - 3. Provide at least one person who shall be present at all times during execution of the work of this Section, with a minimum of five (5) years' experience with the type of materials being installed, the referenced standards, and who shall direct all Work performed under this Section.
- B. Standards: Swimming pool plaster shall conform with requirements of Chapter 31B of California Building Code, 2022 edition. In addition, meet requirements of applicable portions of most current edition of the "Technical Manual," National Plasterers Council, Wauconda, Illinois.
- C. Start-up:
  - 1. Furnish a swimming pool water chemistry consultant, with a minimum of five (5) years' experience, possessing either AFO (Aquatic Facility Operator) or CPO (Certified Pool Operator) certification(s), to supervise and properly balance swimming pool water chemistry.
  - 2. Demonstrate to the Owner that all systems are fully operational and that calcium hardness, total alkalinity, chlorine residual and pH levels are within specified limits.
  - 3. Standards: Furnish labor and chemicals as required to condition the water properly to the following specifications:
    - a. Calcium Hardness: 200-400 parts per million (PPM)
    - b. Total Alkalinity: 80-100 PPM, minimum
    - c. Chlorine Residual: 1.00 to 2.00 PPM
    - d. pH Factor: 7.2 to 7.6

1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Provide submittals in conformance with the requirements of Section 01 33 00.
- B. Submit proof of qualifications as specified in Article 1.02 and 1.02.C.1 of this Section.

#### 1.04 PRODUCT HANDLING

- A. Delivery: Deliver materials to the Project Site in the manufacturer's original unopened containers with all labels intact and legible.
- B. Storage: Store materials under cover in a manner to prevent damage and contamination, and store only the specified materials at the Project Site.
- C. Protection: Use all means necessary to protect the swimming pool plaster before, during, and after installation and to protect the installed Work specified in other Sections.
- D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner.

#### 1.05 ENVIRONMENTAL CONDITIONS

- A. No plastering shall be done under unsuitable conditions of weather or temperature. No plastering shall be done when prevailing temperature is 40 degrees Fahrenheit or less.
- B. Do not install plaster during rain and, if rain commences after plastering has begun, immediately protect the plaster from rain by all means necessary until the plaster has set.
- C. Do not install plaster during wind greater than 10 mph and, if wind commences after plastering has begun, immediately protect the plaster from wind by all means necessary until the plaster has set.

### **PART 2 - PRODUCTS**

#### 2.01 CEMENT / AGGREGATE

- A. Luna Quartz® tiny pebble finish by Wet Edge Technologies. Altima® quartz finish by Wet Edge Technologies. Pebble-Fina® pool finish by Pebble Technologies. Wet Edge Technologies, Pebble Technologies, Commercial Quartz or equal.

#### 2.02 COLOR

- A. All swimming pool plaster shall be white in color. Wet Edge Technologies shall be Luna Quartz® "Polar White". Wet Edge Technologies shall be Altima® "White". Pebble Technology shall be Pebble-Fina® "Classico". Commercial Quartz 'Commercial White'. Contractor to obtain written approval on selected pebble color from the local Health Department prior to installation. Submit cut sheet, color sample and written approval for review by Architect and Owner.

#### 2.03 WATER

- A. Water for swimming pool plaster shall be clean and free from injurious amounts of acid, alkali, and organics.

#### 2.04 PUMP PIT WATERPROOFING

- A. Xypex, Miracote Miraflex Membrane C, or approved equal. Mix and apply per manufacturer's recommendations for specific application. Color shall be Gray.

**PART 3 - EXECUTION****3.01 SURFACE CONDITIONS****A. Inspection:**

1. Prior to Work of this Section, carefully inspect the installed Work of other trades and verify that all such Work is complete to the point where this installation can properly commence.
2. Verify that swimming pool plaster can be installed in accordance with the original design and all referenced standards, including proprietary application techniques and application training/certifications.

**B. Discrepancies:**

1. In the event of discrepancy, immediately notify the Owner's Representative.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
3. Failure to notify the Owner's Representative and give written notice of discrepancies shall constitute acceptance by the Contractor of existing conditions as fit and proper to receive the Work.

**3.02 INSTALLATION OF PUMP PIT WATERPROOFING**

- A. Provide two (2) coats of the specified waterproofing prior to plastering the swimming pool. Prepare surfaces to receive waterproofing and cure in conformance with manufacturer's recommendations. Provide steel trowel application method to ensure uniform smooth, dense surface finish.

**3.03 INSTALLATION OF POOL PLASTER****A. Outdoor Pools or Spas:**

1. Completion of other work: DO NOT commence plastering of swimming pool(s) or spa(s) until the following conditions have been met:
  - a. The Health Department and/or other governing agencies have approved the pool(s) and/or spas) for plaster.
  - b. All concrete pool deck construction is complete and the pool decks have been thoroughly cleaned.
  - c. All landscaping in areas adjacent to the pool(s) or spa(s) is complete and the landscape irrigation system is operable.
  - d. All painting in the pool area is complete.
  - e. All welding and grinding in locations adjacent to the pool area are complete.
  - f. The backwash sewer connection is complete.
  - g. Pool(s) and/or spa(s) area(s) perimeter fencing installation is complete.
  - h. All trash and debris have been removed from areas adjacent to the pool(s) or spa(s), particularly those areas that are normally upwind from the pool(s) or spa(s).
  - i. All dust raising construction and/or activities in areas adjacent to the pool(s) or spa(s) are complete or mitigated.
  - j. The circulation pump(s) is/are operational.

- k. The mechanical system has been flushed sufficiently to remove all dirt and debris from the piping system.
- l. All necessary chemicals (Chlorine, pH adjuster, Sodium Bicarbonate and Calcium Chloride or any other required chemicals) are on site and ready for use.
- m. Obtain written approval from the Owner and the Architect.

B. Indoor Pools or Spas:

- 1. Completion of Other Work: DO NOT commence plastering of swimming pool(s) or spa(s) until the following conditions have been met:
  - a. The Health Department has approved the pool(s) and/or spa(s) for plaster.
  - b. All work above the pool(s) and/or spa(s) is complete.
  - c. All painting in the pool area is complete.
  - d. All welding and grinding in locations adjacent to the pool area are complete.
  - e. The backwash sewer connection is complete.
  - f. All concrete pool deck construction is complete and the pool decks have been thoroughly cleaned.
  - g. The circulation pump(s) is/are operation.
  - h. The mechanical system has been flushed sufficiently to remove all dirt and debris from the piping system.
  - i. All necessary chemicals (Chlorine, Acid, Sodium Bicarbonate and Calcium Chloride) are on site and ready to use.
  - j. Obtain written approval from the Owner and the Architect.

C. Contractor accepts all liability from damage done to the pool plaster if the pool(s) or spa(s) is (are) plaster before the completion of the above listed items or without the written approval of the Owner and the Architect.

D. POOL PLASTER AUTHORIZATION FORM:

- 1. The pool(s) and or spa(s) at John F. Kennedy High School is/are hereby approved for the installation of the pool plaster. Pursuant to the requirements of specification section 13 11 05, paragraph 3.03.

\_\_\_\_\_  
Owner

\_\_\_\_\_  
Date

\_\_\_\_\_  
Architect / Project Manager

\_\_\_\_\_  
Date

E. Preparation:

- 1. Do not apply plaster over dirt, rust, scale, grease, moisture, scuffed surfaces or conditions otherwise detrimental to the formation of a durable plaster finish.
- 2. Consult with manufacturer on application to specific surfaces being treated. Follow manufacturer's recommendation for curing of cast-in-place concrete or shotcrete surfaces prior to application of plaster.

3. Protect ceramic tile, decking, deck equipment, gratings, fittings and other items by suitable covering or masking.
4. Mask or remove all hardware, hardware accessories, machined surfaces, plates, lighting fixtures and similar items in place not to receive pool plaster. Following completion of plaster for each space or area remove masking. Re-install all removed items utilizing workers skilled in the trades involved.

F. Application:

1. Finish shall be applied to a uniform thickness of 3/8" to 1/2" over the entire surface. The walls shall be scratch-coated followed by a finish coat. Material applied to the floor after the walls have been applied shall be accelerated to assure uniform setting time throughout the pool surface.
2. Float the plaster to a uniform plane and trowel to a smooth, dense, impervious surface using extreme care to avoid stains.
3. Take special care in finishing around pool fittings, making sure to mask off or plug openings so as not to fill such openings with excess plaster. Be certain to completely enclose pool fittings with plaster to insure a leak-proof seal around pipes, fittings, lights, anchors, etc.
4. Accurately interface with the finish planes of items installed by other trades.
5. Quartz and pebble plaster finish is to be applied by a licensed applicator as approved by the manufacturer, and in accordance with manufacturer's training.

### 3.04 CURING

- A. Preparation: Anticipate the need for required equipment and have all such equipment immediately available for use upon completion of pool plastering.
- B. Pool Filling:
1. After the plaster has sufficiently dried and before drying has proceeded to a damaging point, cure the plaster by gradually filling the pool with water, preventing all damage to finished plaster surfaces.
  2. Flow the water continuously until the pool is filled.
  3. When the weather is hot and/or water pressure is low, keep the pool walls damp while the pool is filling.
  4. Coordinate with Contractor to ensure that the pool is continuously monitored while filling to prevent overflow.

### 3.05 EQUIPMENT ACTIVATION

- A. All water chemistry and filtration mechanical equipment shall be operational upon filling of pool after plaster. Chemicals and other related support items as supplied by Contractor, shall be in supply at start-up.
- B. For the first fourteen (14) calendar days after completion of the pool plaster, brush all plastered surfaces at least twice a day and coordinate with General Contractor to ensure that the plaster is carefully maintained after the initial fourteen-day period. In addition, coordinate with the Contractor to ensure that pool filtration equipment is continuously running during the initial fourteen-day period.

- C. Start-up and provide qualified personnel to operate pool equipment for a period not less than fourteen (14) days after the pool is placed in operation, or until the Owner takes occupancy of the facility or letter of substantial completion. During this time, Contractor shall instruct and supervise the Owner's personnel in the various operating and maintenance techniques involved. Contractor shall be responsible for supply of chemicals during this not less than fourteen (14) day period and at time of turnover to Owner, chemical storage tanks shall be full. (Owner's personnel shall be fully trained and capable of assuming swimming pool maintenance tasks, training may begin before Owner takes occupancy).

### 3.06 CLEAN-UP

- A. Upon completion of swimming pool plaster, remove all materials, equipment and debris occasioned by this Work and leave the job site in a clean and presentable condition. Perform all such clean-up to the approval of the Owner's Representative.

### 3.07 WARRANTY

- A. All applicators must provide a minimum of five (5) year warranty for application and workmanship additional to the manufacturer's warranty for product.

END OF SECTION

## SECTION 13 11 06

## SWIMMING POOL EQUIPMENT

**PART 1 - GENERAL**

## 1.01 WORK INCLUDED

- A. Swimming pool equipment items required for this Work as indicated on the Drawings and specified herein.

## 1.02 QUALITY ASSURANCE

## A. Qualifications of Workers:

1. The entity performing the work of this Section shall have been successfully engaged in the respective trade for at least five (5) years immediately prior to commencement of the Work.
2. For actual construction operations, use only trained and experienced workers with a minimum of three (3) years experience with the materials and methods specified.
3. Provide at least one person who shall be present at all times during execution of the work of this Section, with a minimum of five (5) years experience with the type of materials being installed, the referenced standards, and who shall direct all Work performed under this Section.

- B. All equipment supplied or work performed shall comply with regulations governing public swimming pools and spas as contained within Chapter 31 of California Building Code, 2022 edition.

## 1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Provide submittals in conformance with the requirements of Section 01 33 00.

## B. Required submittals include:

1. Swimming Pool Fittings, Deck and Mechanical Equipment as specified in Article 2.01-2.15 of this Section.

- C. Submit proof of qualifications as specified in Article 1.02.A of this Section.

- D. The equipment shown on the plans represent the first listed items in the technical specifications. The Contractor shall be responsible for all required field coordination and installation of any approved equal product to provide a fully working and warranted system. The Contractor shall submit detailed shop drawings for any products used other than the first listed specified items. Contractor provided shop drawings shall include details and quality equal to the original plans and construction documents. The Contractor shall provide any and all required engineering including but not limited to structural and anchorage requirements for any proposed equipment other than the first listed specified equipment. The Contractor is responsible to provide a factory certified representative(s) to start-up and provide on-site training for all swimming pool mechanical equipment provided.

## 1.04 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect swimming pool equipment items before, during and after installation and to protect the installed work specified in other Sections.
- B. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative.

## **PART 2 - PRODUCTS**

### **2.01 SAFETY EQUIPMENT**

- A. First Aid Kit for 50 Persons with two (2) wool blankets: Marine Rescue or approved equal. Quantity as required by the Department of Health, two (2) minimum.
- B. Rescue Tubes (minimum 49" long) and Life Ring Buoy (minimum 24" in diameter) U.S. Coast Guard Approved: Marine Rescue or approved equal. Quantity as required by the Department of Health, two (2) minimum.
- C. Throw Rope (3/16" diameter) complete with lemon foot, for use with Life Ring Buoy: Kiefer, United Industries, or approved equal. Quantity as required by the Department of Health, four (4) minimum.
- D. Rescue Hooks, 16' long x 1-1/2" aluminum pole and stainless steel mounting hardware: Kiefer, Pentair, or approved equal. Quantity as required by the Department of Health, four (4) minimum.
- E. Spine Board: C.J. Penton Aquatics long board with "L" bracket head immobilizer with foam pads and Velcro strap, 4 Velcro body straps, or equal, two (2) minimum.
- F. Pool Safety Signs: As required by the Department of Health. Submittal required. Placement at the pool site shall be in conformance with Health Department Inspector, two (2) sets minimum.

### **2.02 MAINTENANCE EQUIPMENT**

- A. Commercial Pool Vacuum: Commercial Pool Vacuum: Provide pool vacuum cart with a 155-square foot single-cartridge filter, lid-mounted handle, separate lid-mounted bracket for electrical cord, and two rubber-tired ball bearing wheels with grease fittings. Cart and filter shall be fabricated from schedule 304 stainless steel with welds treated and passified. Provide Whisperflo pump with a 1 1/2 hp, 115/230 volt, maximum 20-amp draw @ 120 volts, single phase motor and integral trap. Pump shall be UL and NSF listed, have 2" suction and 1 1/2" discharge fittings, and have a brass priming valve with hose bib. Entire pump assembly shall be anchored to vacuum cart with two stainless steel bolts. Provide a 100 foot 10 AWG 3/C SJ electrical cord with ground fault interrupter (GFI) plus. Cord shall be wired to a double pole, 30-amp switch which shall be mounted on pump motor. One (1) required.
- B. Heavy Duty Vacuum Hose: 2" x 50' with hose connector. Pentair, Smooth Bore or approved equal. One (1) required.
- C. Utility Pole: 24' fiberglass with connectors. Pentair, Skimlite or approved equal. One (1) required.
- D. Commercial Vacuum Head: 24" wide "flexible" vacuum head. Pentair Model #R201186 or approved equal. One (1) required.

- E. Pool Wall Brush: 36" wide professional quality. Pentair or approved equal. One (1) required.
- F. Leaf Skimmer: 30" x 8" x 12", professional quality. Pentair, Spectrum or approved equal. One (1) required.
- G. Water Quality Test Kit, Professional Grade, Taylor Technologies Model #1741C, LaMotte Model #PRO250-NJ, or approved equal. One (1) required.

## 2.03 FITTINGS

- A. Main Drain Frame and Grates: (18" x 18") 'Lawson Aquatics' MLD-FGD-1818, rated at 816 GPM, four (4) total. VGB Compliant, Provide four (4) Hayward #SP-1056 1-1/2" collector tubes and four (4) #SP-1055 Hayward 1-1/2" hydrostatic relief valve, one per main drain sump. Contractor shall provide to the Owner a Certificate of Compliance, signed by a licensed design professional, for main drain sump(s) and frame(s) and grate(s), as required by the Virginia Graeme Baker Act.
- B. Surface Skimmers: Remove and replace existing swimming pool skimmers with 'Waterway' 2 1/2" #540-6610 with solvent weld fittings. Waterway or approved equal. Twelve (12) required.
- C. Wall Inlet: Wall Return Inlet 1-1/2" Adjustable: StaRite #08429-0000, United Industries, or approved equal. Replace if damaged. Eighteen (18) at Swimming pool. Sixteen (16) at Dive Pool.
- D. Swimming Pool Underwater Lights: J & J Electronics, pure white #F5W-120-100-P, 87-watt LED. Stainless steel niches, Pentair #78210600 with one-inch hubs. Thirteen (13) required.
- E. Water Level Control System: PEM L104-46 Sensor in wall mounted box #463-0700 with PEM L104-100 controller or approved equal. Swimming Pool = 1 1/2" fill. Diving Pool = 1 1/2" fill. Two (2) total.

## 2.04 DECK EQUIPMENT

- A. Starting Platform Anchors: KDI Paragon 'Competitor' #23103, 6" deep, six (6) required, for concrete deck. 'Competitor' #23074, cover for dual wedge, 'Competitor' #23303, cover removal tool, two (2) required.
- B. Adjustable Starting Platforms: Track Start Competitor, side step #24514. Six (6) required.
- C. Stanchion Sockets: 1.90" I.D. Bronze. KDI-Paragon 38201TC, S.R. Smith, Paddock, or Spectrum. Six (6) required.
- D. Stanchion Posts: 1.90" O.D. x .145 wall. KDI-Paragon, four (4) #38106, and four (4) #3831. No known equal.
- E. Rope Anchors: Commercial cup anchor with insert. 'Spectrum' #58316 custom stainless steel. Replace any damaged or lost per plan. SR Smith, Paddock or Spectrum.
- F. Figure 4 Grab Rails: KDI Paragon #30102, 1.90" O.D. x .109" wall, Six (6) required.
- G. Recessed Steps, Set of 3: KDI-Paragon #3212, no known equal. Six (6) sets of three required.

- H. Cross Braced Ladder: 'Paragon' #42118, 29" wide 3-step, with custom 5" wide stairs treads, no known equal. One (1) total.
- I. Anchor Sockets for Grab Rails and Ladder: KDI-Paragon 28102, twenty-six (26) required.
- J. Stainless Steel Escutcheon Plates for Grab Rails and Ladder: Spectrum Model #35214. Twenty-six (26) required.
- K. 1 Meter Diving Stands: Remove existing and reinstall new Arcadia Air Products 'Durafirm' #70-231-400, Knorr Pool Systems. Complete with (N) anchors with stainless steel bolts, and mounting hardware. Two (2) total.
- L. 16 Foot Diving Board: Duraflex International Corporation, 'Maxiflex B' #66-231-330, Knorr Pool Systems or equal. Two (2) total.
- M. ADA Lift: Aqua Creek Mighty 400 F-MTY400 (350 lb. min and 400 lb. max lifting capacity) self-operated, or approved equal. Furnish complete with anchors, cover, extra battery pack and transporter cart #INV01902. All parts and accessories shall be 'Coastal Gray'. Two (2) required.
- N. Moveable Guard Chair: 1.90" O.D. x .065" wall stainless steel. KDI-Paragon 20302, Spectrum 20160 or equal with umbrella holders. Two (2) required.
- O. Backstroke Pennants: 'Champion' 3/16" diameter vinyl coated cable #50-175; 'Champion' hardware package #53-030, and 'Champion' 12" x 18" vinyl coated polyester pennants #53-020 Lincoln Equipment, Knorr Systems or equal.
- P. Racing Lanes, 25 Yard: Competitor #200-330, no known equal. Verify color with Owner's Representative prior to ordering. Seven (7) required. Competitor, Malmstrom, or equal.
- Q. Pool Cover System:
1. A pool cover system as described below shall be provided and shall include all the specified features, without exception. Submittal data must include complete documentation relating to all the specified features and include manufacturer's sales literature, specification sheets, and installation/operation/maintenance manuals. Upon written request by the specifying agent, the following samples must be provided: samples of tubing used for storage reel winding tubes and end frames; a sample winding tube bearing; a sample castor wheel assembly; and a cover sample measuring at least 8" x 11", including weighted side edge, reinforced end edge, and grommet.
  2. Cover Material:
    - a. Material shall be woven, 10 by 10 count per inch, high-density polyethylene, ultraviolet stabilized film fabric, laminated to both sides of 1/8" thick, closed cell, medium density, white, polyethylene foam. The woven polyethylene film fabric shall be coated on both sides with an ultraviolet stabilized, chemically resistant polyethylene coating. The combination of film, foam and woven components shall be non-toxic, non-absorbent, non-permeable and buoyant. Color shall be blue on upper surface and black on under surface. In addition to the above, cover must meet the following requirements:

Thickness

1/8 inch minus or plus 10%

Foam Density	2 lbs. per cubic foot
Weight	5 oz. per square foot
*Tensile Strength	318 lbs. (ASTM 1682264)
*Tear Strength	60 lbs. (ASTM D2261-71)
*Bursting Strength: (Mullen Tester)	425 psi (ASTM 751-73)
Service Temperature	-40°F to +160°F
K Factor	.25 BTU/sq. ft.-Hr – degrees F/inch (ASTM D2326)
Reinforced Edge Tear Strength	1225 lbs. pull strength, corner to corner
Open Seam Tear Strength	70 lbs.

3. Cover Design Criteria:

- a. Cover panels shall totally cover the surface of the pool without gaps or overlaps with reinforced cutouts to accommodate rounded corners, step areas, rails, etc. Cover panels shall be of the following quantities and sizes:

<u>Qty.</u>	<u>Size</u>
3	15'-0" x 75'-1"
3	12'-0" x 45'-0"

- b. Along end and side edges of each panel, a weighted material shall be sewn in and shall be continuous, non-corrosive and conform to the flat shape of the cover. End edges shall be reinforced with a double layer of polyethylene-coated film fabric and designed in such a manner as to prevent panels from dividing when the covers are being pulled across the water. On all corners, weighted edge shall wrap corners and be itself encapsulated by the two layers of end reinforcement. The entire corner construction shall be reinforced with an 1/8" thick load dispersion plate and non-corrosive grommet.
- c. Both ends of each cover panel shall be equipped with no less than three (3) non-corrosive grommets and quick-release loops for easy connection to the storage reel or to the next cover panel. All sewing shall be ultra-violet stabilized and chemically resistant 100% polyester thread. Main body seams shall be welded, glued or heat sealed. Complete mechanical attachment with lock-stitched thread shall be required. Warning labels consistent with the recommendations of the Federal Consumer Protection Agency shall be permanently affixed to each end of each cover panel and to the sides of perimeter panels.

4. Measuring and Training:

- a. A representative of the manufacturer shall visit pool site to confirm measurements prior to fabrication of cover, and once cover is delivered, train operating personnel and supervise initial installation of cover.

5. Warranty:

- a. Cover panels shall be provided with manufacturer's three- year full replacement warranty covering defects in material and workmanship. Storage reel shall be provided with manufacturer's 10-year warranty covering defects in material and workmanship

2.05 SWIMMING POOL / DIVING POOL STRAINER(S)

- A. 'Fluidrol' #RSW116106531 RSW Series reducing basket strainer: Two (2) 6" x 5" FRP molded with cast acrylic cover and two (2) FRP molded strainers each. (47 lbs.)

## 2.06 SWIMMING POOL / DIVING POOL CIRCULATION PUMP(S)

- A. 'Paco' #4012-9; 4" x 5" x 12" type LC end suction centrifugal pump; 1187 RPM 460V, 3PH; 15HP; rated at 410 GPM @ 60 Ft. TDH; 76% efficient; premium efficiency TEFC motor; epoxy coat all wet surfaces. (425 lbs.) Provide smart pump control system 'SPCS' SPCS015N4X4 19" x 8" x 10" drive and 24" x 24" x 10" panel. Two (2) total. Coordinate mounting location to maintain required clearances, 460V 3PH (102 lbs. combined weight)

## 2.07 SWIMMING POOL / DIVING POOL FILTERS

- A. 'EKO3' Systems Gen 2 #EKO-34153-0606-T-2 automatic filter control (AFC) fully automatic hi rate permanent media filter with 30.6 sq. ft. of filter area rated at 459 GPM at 15 GPM/sq. ft. Complete with 6" face piping, 6" backwash, seismic anchorage. Provide all utilities, piping, valving, etc. (3875 lbs. each tank) EKO3 Gen 2 or equal. Provide two (2) Signet P51530-PX flowsensor with digital readout. Two (2) systems total.

## 2.08 SWIMMING POOL HEATER

- A. Indirect fired pool heating package system; 'Raypak' control condensing modulating boiler, titanium heat exchanger with CPVC connections, factory assembled skid mounted package, California code controls, 1¼" natural gas connection, 6" influent and effluent water connections and 8" diameter vent size. 1,500,000 BTU per hour input. Provide ¾" cold water connection 'Raypak' #1505A X-Therm. Weight = 1,448 lbs. One (1) total.

## 2.09 DIVING POOL HEATER

- A. Indirect fired pool heating package system; 'Raypak' control condensing modulating boiler, titanium heat exchanger with CPVC connections, factory assembled skid mounted package, California code controls, 1¼" natural gas connection, 6" influent and effluent water connections and 6" diameter vent size. 999,000 BTU per hour input. Provide ¾" cold water connection 'Raypak' #1005A X-Therm. Weight = 1,343lbs. One (1) total.

## 2.10 CHLORINE FEED SYSTEM

- A. Provide one (1) 'Chem-Tainer' 350Gallon #TC5256DC; dual storage/containment tank with existing restraining system. Operating weight = (4,165 lbs.). Complies with Fed. Reg. #40CFR-264-163. Complies with Fed. Reg. #40CFR-264-163. Feed pump shall be 'Stenner' #45M5, 50 GPD at 25 PSI. Two (2) total.

## 2.11 ACID STORAGE/FEED SYSTEM

- A. 15-gallon acid carboy. Feed pump(s) 'Stenner' #45M5, 50 GPD at 25 PSI. Two (2) total. Provide PIG bladder poly spill containment deck. Ones (1) 55-gallon poly or steel drum., 26" x 30.38" x 5.75" sump capacity. Provide one (1) Acid Fume scrubber #11-250. Non-metallic module includes: media, vent assembly, and tank connection kit.

## 2.12 CARBON DIOXIDE STORAGE FEED SYSTEM

- A. Provide two (2) NOVO-750, 750 lb. cryogenic liquid CO2 storage tank with two (2) remote fill ports. 594 liquid lbs. (5195 cubic feet of gaseous CO2) at NTP. Two (2) total. Provide 'TEK' single tank

system #09-040 and CO2 solenoid unit #09-079. Include single tank regulator with pressure gauge, CO2 feed unit with flow meter, CO2 diffuser with check valve. CO2 tubing and fittings. 0 to 160 SCFH feed capacity. Two (2) systems total. (5 lbs. each.) Provide hard wired 'Analog' API KIT CO2 detector with audible and visual alarms in existing mechanical room. UL 1971 standard listed, one (1) total.

#### 2.13 SWIMMING POOL / DIVING POOL WATER CHEMISTRY CONTROLLER

- A. Provide ethernet connection to 'BecSys' Model BECSYS7-BP-E water chemistry controller. Two (2) total. Provide complete system control package. 'BecSys', 'Wallace & Tiernan' or approved equal.

#### 2.14 EYEWASH / SHOWER

- A. Haws model #8309WC CRP combination eyewash/shower with corrosion resistant protection. Two (2) required.

#### 2.15 SWIMMING POOL / DIVING POOL FILL SYSTEM

- A. Niche mounted 'PEM' model L104-46 wall mounted sensor unit with PEM L104-100A, 115V UL listed control panel, solenoid valves, etc. Two (2) total. Swimming Pool and diving pool = 1 ½" fill.

### PART 3 - EXECUTION

#### 3.01 SURFACE CONDITIONS

##### A. Inspection:

1. Prior to installing the items of this Section, carefully inspect the installed Work of other trades and verify that all such Work is complete to the point where this installation may properly commence.
2. Verify that the swimming pool equipment items may be installed in strict accordance with original design, pertinent codes and regulations, and the manufacturers' recommendations.

##### B. Discrepancies:

1. In the event of discrepancy, immediately notify the Owner's Representative's Representative.
2. Do not proceed with installation in areas of discrepancy until all such discrepancies are fully resolved.
3. Failure to notify the Owner's Representative's Representative and give written notice of discrepancies shall constitute acceptance by the Installer of existing conditions as fit and proper to receive its Work.

#### 3.02 INSTALLATION

- A. Supply and install items of swimming pool equipment in strict accordance with applicable codes and regulations, the original design, and the manufacturer's published recommendations, anchoring firmly and securely for long life under hard use.
- B. Coordinate with other trades to insure all imbedded items are set plumb and flush. Railing ends must have anchor sockets and escutcheon plates. Be certain that deck equipment and railings are properly bonded prior to imbedding.

- C. All equipment shall be braced and/or anchored to resist a horizontal force acting in any direction using the criteria shown on the Drawings.

### 3.03 INSTRUCTION

- A. The Contractor shall provide a factory certified representative(s) to start-up and certify proper installation, operation and full warranty status of all swimming pool mechanical equipment. The Contractor shall provide not less than two 8-hour days of on-site training for facility staff in the operation and maintenance of the swimming pool mechanical equipment and systems. The two 8-hour days shall be separated by a minimum of seven calendar days and be completed within the 14-day start-up period.

### 3.04 EQUIPMENT ACTIVATION

- A. All water chemistry and filtration mechanical equipment shall be operational upon filling of pool after plaster. Chemicals and other related support items as supplied by Contractor, shall be in supply at start-up.
- B. For the first fourteen (14) calendar days after completion of the pool plaster, brush all plastered surfaces at least twice a day and coordinate with General Contractor to ensure that the plaster is carefully maintained after the initial fourteen-day period. In addition, coordinate with the Contractor to ensure that pool filtration equipment is continuously running during the initial fourteen-day period.
- C. Start-up and provide qualified personnel to operate pool equipment for a period not less than fourteen (14) days after the pool is placed in operation, or until the Owner takes occupancy of the facility or letter of substantial completion. During this time, Contractor shall instruct and supervise the Owner's personnel in the various operating and maintenance techniques involved. Contractor shall be responsible for supply of chemicals during this not less than fourteen (14) day period and at time of turnover to Owner, chemical storage tanks shall be full. (Owner's personnel shall be fully trained and capable of assuming swimming pool maintenance tasks, training may begin before Owner takes occupancy).

### 3.05 CLEAN-UP

- A. Upon completion of swimming pool equipment, remove all debris, materials and equipment occasioned by this Work to the approval of the Owner's Representative.

END OF SECTION

## SECTION 13 11 07

## SWIMMING POOL MECHANICAL

**PART 1 - GENERAL**

## 1.01 WORK INCLUDED

- A. Swimming pool mechanical piping as indicated on the Drawings for circulation and filtration systems, pool water heating systems, chemical control systems, booster pump systems and appurtenances.
- B. Domestic water system from points of connection within swimming pool mechanical equipment room to make-up water system.
- C. Filter backwash piping to point of connection with backwash retention pit as required.

## 1.02 QUALITY ASSURANCE

- A. Qualifications of Workers:
  - 1. The entity performing the work of this Section shall have been successfully engaged in the respective trade for at least five (5) years immediately prior to commencement of the Work.
  - 2. For actual construction operations, use only trained and experienced workers with a minimum of three (3) years experience with the materials and methods specified.
  - 3. Provide at least one person who shall be present at all times during execution of the work of this Section, with a minimum of five (5) years experience with the type of materials being installed, the referenced standards, and who shall direct all Work performed under this Section.
- B. Standards:
  - 1. All equipment supplied or work performed shall comply with Chapter 31B of California Building Code, 2022 edition.
  - 2. Work shall be performed in accordance with the applicable editions of all National, State and local codes, laws, regulations and ordinances, including the following:
    - a. American National Standards Institute (ANSI).
    - b. American Society for Testing Materials (ASTM).
    - c. American Waterworks Association (AWWA).
    - d. American Welding Society (AWS).
    - e. Per CFC 5003.2.2, piping tubing, valves and fittings conveying hazardous materials shall be designed and installed in accordance with ASME B31.1.
  - 3. Do not construe anything in the Drawings or Specifications to permit Work not conforming to these requirements.

## 1.03 SUBMITTALS AND SUBSTITUTIONS

- A. Provide submittals in conformance with the requirements of Section 01 33 00.
- B. Required submittals include:

1. Pipe and Fittings as specified in Article 2.02 of this Section.
  2. Valves as specified in Article 2.03 of this Section.
  3. Pressure / Vacuum Gauges as specified in Article 2.04 of this Section.
  4. Pipe Hangers and Supports as specified in Article 2.05 of this Section.
  5. Sleeves and Waterstops as specified in Article 2.06 of this Section.
- C. Submit proof of qualifications as specified in Article 1.02.A of this Section.

#### 1.04 PRODUCT HANDLING

- A. Delivery: Deliver all materials to the Project Site in the manufacturer's original unopened containers with all labels intact and legible.
- B. Storage: Store all materials under cover in a manner to prevent damage and contamination, and store only the specified materials at the Project site.
- C. Protection: Use all means necessary to protect swimming pool mechanical items before, during and after installation and to protect the installed Work specified in other Sections.
- D. Replacements: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Owner's Representative and at no additional cost to the Owner.

#### 1.05 JOB CONDITIONS

- A. Cooperate with entities performing Work specified in other Sections to so that no conflict of new construction or occupied space may occur. Should any installation Work be done without such craft coordination, that Work so installed shall be removed and re-installed.

### **PART 2 - PRODUCTS**

#### 2.01 PRODUCT QUALITY

- A. Materials and equipment shall be new, of the best quality for the purpose intended, and shall be clearly marked with the manufacturer's name and nameplate data or stamp and rating. As far as practicable, materials and equipment shall be of one manufacturer.

#### 2.02 PIPE AND FITTINGS

- A. PVC Schedule 40: Type 1, normal impact, NSF approved for solvent welding applications, ASTM Specification D-1785, color shall be white. Dura, Lasco, or approved equal.
- B. PVC Schedule 80: Type 1, normal impact, NSF approved for solvent welding applications, ASTM Specification D-1785, color shall be gray. Dura, Lasco, or approved equal.
- C. CPVC Schedule 80 Influent/Effluent Heater Piping: Type 1, normal impact, NSF approved for solvent welding applications, ASTM Specification D-1785, color shall be gray. Dura, Lasco, or approved equal.

- D. PVC DR25: Conforming to ASTM D-1784, use with epoxy coated bell and spigot-type fittings or epoxy coated mechanical joint by flange adapters with epoxy coated cast iron fittings as specified in Article 2.02 (G), below. Johns-Manville "Big Blue", Diamond Plastics, or approved equal.
- E. Copper Tubing: ASTM Specification B-88, hard drawn, with ANSI Standard B16.22 wrought copper fittings.
- F. Steel: ASTM Specification A-120, Schedule 40 black or galvanized pipe with ASTM A-47 150 lb. banded malleable iron threaded fittings.
- G. Cast Iron: ASTM Specification B16.1, cast iron flanged fittings, provide epoxy coating as required for use with chlorinated water.

## 2.03 VALVES

### A. Ball Valves:

1. For pool system: True-Union design, PTFE seat material with FPM or FKM Double O-ring stem seals, locking handle, NSF certified. PVC schedule 80 body for below grade installation. PVC Schedule 80 body for above grade installation. Furnish ball valves on all pipe diameters 2½" or less with a rating of at least 200psi at 73°F. Asahi, Iplex, or Nibco.
2. For copper pipe system: 3-piece full-port Bronze body valve with Teflon seat, 'Apollo', 'Nibco' or approved equal.

### B. Butterfly Valves:

1. Epoxy coated cast or ductile iron body, 316 stainless steel disc and stem, viton seat material, furnish hand wheel/gear operators on all valves 8" and larger. DeZurick, Keystone, Iplex, or equal.
2. PVC body, PVC disc and EPDM construction suitable for chlorinated water applications. Stem shall be of 316 stainless steel and non-wetted. Valves shall be self-gasketed design with a convex sealing arrangement. Valves 1-1/2" – 10" shall be rated to 150 psi and 12" valves shall be rated to 100 psi at 70°F. Asahi Pool-Pro, no known equal.

- C. Check Valves: Wafer-type, epoxy coated cast or ductile iron body, 316 stainless steel plates and shaft, viton seat material. Centerline, Metraflex, or approved equal.

## 2.04 PRESSURE / VACUUM GAUGES

- A. Furnish and install pressure and vacuum gauges on the discharge and suction sides of all pumps. 2" or 2 ½" dial, bottom connection, chrome ring, shut-off cock and snubber. Ranges shall be selected to indicate between mid-point and two-thirds of maximum range under design conditions. Marsh, Trerice, or approved equal.

## 2.05 PIPE HANGERS AND SUPPORTS

### A. General:

1. The requirements of this Section relates to various requirements of the Agreement, General and Supplementary Conditions, Specifications, Drawings, and modifying documents which are part

of the Construction Contract. Responsibility for coordination of all such applicable requirements will be that of the Contractor.

B. Description:

1. This section provides guidelines and limitations for the support of all mechanical, electrical, plumbing or architectural items from the building structure, and for the seismic bracing of such items.
2. Design and install all support and bracing systems as required for the swimming pool systems. Provide for attachment to portions of the building structure capable of bearing the loads imposed. Design these systems to not overstress the building structure.

C. Quality Assurance:

1. Design and install all support systems to comply with the requirements of the California Building Code, Chapter 16A, 2022 edition
2. Seismic bracing is to be designed by a professional engineer licensed in the State of California.
3. For the seismic bracing of mechanical, electrical and plumbing system, refer to "Guidelines for Seismic Restraints of Mechanical Systems and Plumbing Piping Systems" by Sheet Metal and Air Conditioning Contractors National Association, Inc., (SMACNA) for guidelines only. Note: SMACNA hanger details for gravity supports are still acceptable.

D. Submittals:

1. Submit shop drawings for all substructures and attachment methods.
2. Submit proposed alternative methods of attachment for review and approval by the Architects, prior to deviating from the requirements given below.
3. For all pipe hangers and support systems, submit structural calculations and details which include all resultant forces applied to the building structure and are prepared and signed by the Contractor's licensed California professional engineer. Calculations will be reviewed for compliance with design criteria, not for arithmetic.

E. Materials:

1. Use Kin-Line, Grinnel, or approved equal.
2. Support all pipelines individually with hangers, each branch having at least one hanger. Lateral brace as noted and required.
3. Support piping near floor with steel stanchions welded to end plates secured to pipe and floor.
4. Support vertical piping at each floor level. Install coupling in piping at each support. Coupling shall rest on and transmit load to support. Isolate copper from steel supports with vinyl electrician's tape around pipe and coupling.
5. Use Stoneman "Trisolator," Unistrut, or approved equal, isolators at each hanger and other support points on bare copper tubing system.
6. For PVC pipe, space hangers four (4) feet apart for pipe sizes 1" and under, five (5) feet apart for pipe sizes 1-1/4" to 2", and six (6) feet apart for pipe sizes over 2". Space hangers for horizontal pipes at a maximum of six (6) feet for copper 2" and smaller and for steel 1-1/4" and smaller; ten (10) feet for copper 2-1/2" and larger and for steel 1-1/2" and larger.
7. Size hanger rods, screws, bolts, nuts, etc., according to manufacturer's sizing charts.
8. Trapeze hangers may be used for parallel lines.

9. Use galvanized or cadmium plated hangers, attachments, rods, nuts, bolts, and other accessories in pool mechanical room, high humidity areas, or where exposed to weather. Hot dip galvanize all items which are not factory furnished. Plating for hinged movements must be done at the factory.
10. Lateral Bracing: To prevent swaying of the piping systems, provide angle iron bracing and anchor into wall or overhead framing. Piping shall be braced or anchored in such a way as to resist a horizontal force of 50% of its operating weight in any direction.
11. Do not use wire or other makeshift devices for hangers.
12. Furnish all substructures and fasteners required to comply with the limitations given below. Use material as specified in the various sections and as appropriate to their use.

F. Guidelines & Limitations:

1. Each Contractor will coordinate the load requirements from all subcontractors so that no combination of loads overstresses the building structure or exceed the limitations given below.
2. Concrete Structure:
  - a. Support all loads hung from concrete structure with cast-in-place inserts, unless drilled-in anchors are specifically approved in writing prior to placing the concrete.
  - b. Concrete anchors must not penetrate into reinforcing bars. Where the anchors boring indicates the presence of reinforcing bar, patch hole with an epoxy type grout and relocate anchor 12 diameters away.
  - c. Individual expansion anchors cannot support any loads greater than 300 pounds or manufacturer's specified load capacity without approval

G. Seismic Bracing:

1. Design and install seismic bracing to not ground out vibration and sound isolation systems.
2. All items of mechanical and electrical equipment 60" or more in height are to be seismically braced whether such bracing is shown or not.

2.06 SLEEVES AND WATERSTOPS

- A. Provide sleeves where work of this Section passes through fire rated partitions, floors and ceilings, concrete slabs or exterior of structure. Caulk clearance space using sealant appropriate for application in conformance with manufacturer's recommendations and Title 24 of California Code of Regulations. 3m, Dow Corning, or approved equal. In lieu of sleeves and caulking, "Link Seal" products may be used.
- B. Provide prefabricated waterstops as indicated on the Drawings at all pipe penetrations through structures containing stored water (i.e., swimming pools, balance/surge tanks, etc.) to insure leak-proof seals.

**PART 3 - EXECUTION**

3.01 SURFACE CONDITIONS

A. Inspection:

1. Prior to Work of this Section, carefully inspect the installed Work of other trades and verify that

such work is complete to the point where this installation may properly commence.

2. Verify that items of this Section may be installed in accordance with the original design and referenced standards.
- B. Discrepancies:
1. In the event of discrepancy, immediately notify the Owner's Representative.
  2. Do not proceed with installation in areas of discrepancy until all such discrepancies have been fully resolved.
  3. Failure to notify the Owner's Representative and give written notice of discrepancies shall constitute acceptance by the Contractor of existing conditions as fit and proper to receive his work.

### 3.02 ABBREVIATIONS AND SYMBOLS

- A. Abbreviations and symbols on the Drawings are those most commonly used. Obtain clarification from the Owner's Representative on any questionable items before bid.

### 3.03 GENERAL PIPING REQUIREMENTS

- A. Size any section of pipe for which size is not indicated or any intermediate section erroneously shown undersized the same size as the largest pipe connecting to it. Sizes listed are nominal.
- B. Cut pipe accurately to job measurements and install without springing or forcing, true to line and grade, generally square with building and/or structures and adequately supported to prevent undue stress on pipe, fittings and accessories.
- C. Make changes of direction with manufactured fittings. Street ells, bushings, reducing flanges, close nipples or bending of pipe is not allowed.
- D. Use great care to install piping in accordance with best practice. Plastic pipe shall be "snaked" in trenches to allow for thermal expansion.
- E. All above grade, below grade and buried or imbedded PVC shall be installed using solvent weld fittings. Also, each and every fitting and pipe end shall be prepared with solvent primer. Fittings shall be joined individually and with enough time between assembly of adjacent joints to allow them to seal solidly. After joining, an even ring of primer must be visible around the entire fitting. If any fittings are installed without visible primer, the fitting shall be removed and discarded and piping recut, rechamfered and joint made up again using a new fitting. All procedures, methods and techniques used to make up solvent weld joints shall be in strict accordance with manufacturer's recommendations.
- F. Arrange pipe and hangers to allow for expansion, contraction and structural settlement. No pipe shall contact structure except penetrations as shown on the Drawings.
- G. Provide dielectric connections between copper and dissimilar metals. In copper systems, threaded piping including connections to equipment shall be brass pipe and fittings. Install dielectric connections in vertical sections of piping only.

- H. Run pipe full size through shut-off valves, balancing valves, etc. Change pipe size within three (3) pipe diameters of final connection to control valves, fixtures and other equipment.
- I. Provide unions or flanges at connections to equipment, on service side of valves and elsewhere as required to facilitate ease of maintenance.
- J. Locate equipment shut-off valves as close to equipment as possible maintaining easy valve access.
- K. Make all connections between domestic water systems and equipment or face piping with approved backflow prevention devices as required.
- L. All PVC pipe exposed to direct sunlight shall be painted with two coats of Exterior Acrylic Semi-Gloss Paint, Sherwin Williams or equal. Color to be selected by the Architect. Prior to painting the PVC pipes, the exterior of all PVC pipes shall be wiped with Methyl Ethyl Ketone, or an approved equal, to remove the glaze from the pipes.
- M. The Main Drain pipe must run either level or uphill from the main drain sump, through the surge pit (if applicable) and then to the circulation pump.

#### 3.04 TRENCH EXCAVATION AND BACKFILL

##### A. Excavation:

1. Excavate and backfill trenches as required for the Work of this Section. Conform to requirements of Section 13 11 01.
  - a. The Contractor shall perform all excavation of every description and of whatever materials encountered, to the depths indicated on the Drawings or as necessary. The Contractor shall dispose of the excavated materials not required or suitable for backfill as directed, and shall perform such grading as may be necessary to prevent surface water from flowing into the trenches. The Contractor shall provide adequate equipment for the removal of storm or subsurface waters, which may accumulate in the excavated areas.

##### B. Trenching:

1. Excavate trenches to lines and grades as indicated on the Drawings and with banks as nearly vertical as practicable.
2. Bottoms of trenches shall be accurately graded to provide uniform bearing on undisturbed soil for the entire length of each section of pipe.
3. The width of the trench at and below the top of the pipe shall be such that the clear space between the barrel of the pipe and the trench wall shall not exceed 8" on either side of the pipe. The width of trench above the top of pipe may be wider if necessary.
4. Over-depth excavations shall be filled with tamped sand to required grades.
5. Excavations of five (5) feet or more in depth shall be shored or supported in conformance with rules, and regulations of State and Federal Governments. Shoring shall be constructed, maintained and removed in a manner to prevent caving of the excavation walls or other load on the pipe.

##### C. Backfilling:

1. Material for backfilling of pipes shall be approved granular material less than two (2) inches in diameter obtained from the excavation. No material of a perishable, spongy or otherwise unsuitable nature shall be used as backfill.
2. Backfilling of pipe trenches shall commence immediately after installation and testing to preclude damage to the installed pipe. Backfill around pipe shall be carefully placed so as not to displace or damage the pipe, and shall be carried up symmetrically on each side of the pipe to one foot above the top of the pipe. The material shall be carefully compacted or consolidated before additional backfill is placed.
3. Backfill above an elevation of one foot above the top of pipe in conformance with requirements of Section 13 11 01. Material for balance of backfill shall be approved granular material less than six (6) inches in diameter taken from the excavation.
4. Unless otherwise indicated on the Drawings, all pipe shall have a minimum of eighteen (18) inches of cover.

### 3.05 GENERAL EQUIPMENT REQUIREMENTS

- A. Position equipment to result in good appearance and easy access to all components for maintenance and repairs.
- B. Install piping, flues, breeching and ducts so that they do not interfere with equipment access.
- C. Install level, secure and out of moisture. Provide shims, anchors, support straps, angles, grouted bases, or other items as required to accomplish proper installation.
- D. All screws, nuts, bolts and washers shall be galvanized, cadmium plated or stainless steel. After fabrication, hot-dip galvanize unfinished ferrous items for outdoor, below grade or other use subject to moisture.
- E. Extend 1/2" Schedule 40 black steel pipe lubrication tubes from all hard-to-reach locations to front of equipment or to access points. Terminate with proper type of lubrication fitting.

### 3.06 VALVES AND STRAINERS

- A. If no shut-off is indicated, provide ball valves at inlet connections and balance valves at outlet connections to fixtures and equipment. Provide proper valve trim for service intended.
- B. Use no solder end valves unless noted otherwise; provide adapters in copper tubing systems.
- C. Locate valves with stems above horizontal plane of pipe. In general, locate valves within six (6) feet of floor, out from under equipment, in accessible locations with adequate clearance around hand wheels or levers for easy operation.
- D. Provide all valves, cocks and strainers, full pipe size unless indicated otherwise.
- E. Provide hand wheel operators on all valves 6" and larger, under 6" lever operators may be used.
- F. Provide tool operated valve with stainless steel shaft extension and 'on deck' tool operation for surge chamber butterfly isolation valve.

### 3.07 IDENTIFICATION OF PIPING

- A. Identify each valve by a numbered brass tag with hole and brass chain mounted on valve stem or handle. Tag to be a minimum of 1" in diameter and numbers at least 1/4" high stamped into tag.
- B. Install an identification chart in a plastic or glass framed enclosure, which schematically illustrates the proper operation of all piping systems and indicates number and location of all valves and control devices within the system.
- C. The direction of flow for the recirculation equipment shall be labeled clearly with directional symbols such as arrows on all piping in the equipment area. Where the recirculation equipment for more than one pool is located on site, the equipment shall be marked as to which pool the equipment serves.

### 3.08 TESTS

- A. Perform tests in presence of Owner's Representative with no pressure loss or noticeable leaks.
- B. Do not include valves and equipment in tests. Include connection to previously tested sections if systems are tested in sections.
- C. Perform tests as follows:

System	Test	Test Medium	Duration
	Pressure		
Skimmer Lines and Lawson Main Drain sump lines	20psig	Water*	4 hours
Pool Piping	50 psig	Water*	4 hours
Pool Main Drains	30 psig	Water*	4 hours
Domestic Water	150 psig	Water*	4 hours

\*Never test PVC pipe or fittings with air or other gases, always use water.

### 3.09 PIPE MATERIAL APPLICATION

- A. PVC Schedule 40: Below grade swimming pool piping and domestic water piping up to 12" line size; use standard solvent weld fittings.
- B. PVC Schedule 80: Above grade swimming pool piping up to 12" line size; use solvent weld Schedule 80 or epoxy coated cast iron fittings.
- C. Type L Hard Copper: Above grade domestic water piping.
- D. CPVC Schedule 80; Pool Heater Piping.
- E. Schedule 40 Steel: Natural gas piping.

### 3.10 CUTTING AND DRILLING

- A. Cutting or drilling necessary for installation of Work of this Section shall be done only with approval of Owner's Representative.

### 3.11 CLOSING-IN OF UNINSPECTED WORK

- A. Do not cover or enclose Work before testing and inspection. Re-open Work prematurely closed and restore all Work damaged.

### 3.12 QUIETNESS

- A. Quietness is a requirement. Eliminate noise, other than that caused by specified equipment operating at optimum conditions, as directed by Owner's Representative.

### 3.13 FLUSHING OF LINES

- A. Flush or blow out pipes free from foreign substances before installing valves, stops or making final connections. Clean piping systems of dirt and dust prior to initial start-up.
- B. Just prior to plastering the pool, under the observations of the IOR, the pool mechanical system shall be flushed using the pool circulation pump. Circulate water through the mechanical system until the effluent water from the pool return heads runs clean.

### 3.14 CLEAN-UP

- A. After all Work has been tested and approved, the Swimming Pool Subcontractor shall thoroughly clean all parts of the equipment installations, including all pool pipe and fittings in the pool mechanical room. Exposed parts shall be cleaned of cement, plaster and other materials and all grease and oil spots removed with solvent.
- B. The Swimming Pool Subcontractor shall remove debris from the Project site. Cartons, boxes, packing crates and excess materials not used, occasioned by this work shall be disposed of to the satisfaction of the Owner's Representative.
- C. If the above requirements of clean up are not performed to the satisfaction of the Owner's Representative, the Owner reserves the right to order the work done, the cost of which shall be borne by the Swimming Pool Subcontractor.

END OF SECTION

SECTION 13 11 08

SWIMMING POOL ELECTRICAL

**PART 1 - GENERAL**

1.01 WORK INCLUDED

- A. Provide labor, materials and equipment as required to install the swimming pool electrical system including but not limited to:
1. A complete and operable system of service equipment, switchboards, panelboards, conduits, switches, time clocks and wiring for power and lighting, motor control centers.
  2. Junction and/or pull boxes, conduits, disconnects, starters, contactors, wiring and connection of all motors and mechanical equipment, including connection and wiring of line voltage controls associated with the mechanical systems.
  3. Swimming pool underwater lighting systems.
  4. Complete grounding system as required and shown on the Drawings.
  5. Complete equipotential bonding system as required and shown on the Drawings.
  6. Adjusting and preliminary operation of the completed electrical system as described in Article 3.06, A of this Section.
  7. Cleaning of all completed Work and installation adjustment of all trim and decorative items.

1.02 QUALITY ASSURANCE

- A. Qualifications of Workers:
1. The entity performing the work of this Section shall have been successfully engaged in the respective trade for at least five (5) years immediately prior to commencement of the Work.
  2. For actual construction operations, use only trained and experienced workers with a minimum of three (3) years experience with the materials and methods specified.
  3. Provide at least one person who shall be present at all times during execution of the work of this Section, with a minimum of five (5) years experience with the type of materials being installed, the referenced standards, and who shall direct all Work performed under this Section.
- B. Ordinances and Codes: Materials and construction shall conform with all applicable code requirements, including:
1. National Electrical Code, latest edition; Electrical Safety Orders of the State of California; Department of Industrial Relations; regulations of the State Fire Marshal; rules and regulations of the Board of Underwriters of the Pacific, UL 50, 50E and NEMA 250 rating.
  2. Chapter 31 of California Building Code, 2022 edition.
- C. Verification of Conditions:
1. The locations shown on the Drawings are diagrammatic only and the exact finish location of equipment and materials cannot be indicated. Therefore, locations of all Work and equipment shall be verified to avoid interferences, preserve head room and keep openings and passageways clear. Changes shall be made in locations of equipment and materials which may

be necessary to accomplish these purposes.

D. Preliminary Operations and Testing:

1. Motor driven equipment shall be tested for correct rotation and completion of all connections.

1.03 SUBMITTALS AND SUBSTITUTIONS

A. Provide submittals in conformance with the requirements of Section 01 33 00.

B. Required submittals include:

1. Conduit and Fittings as specified in Article 2.02 of this Section.
2. Panelboards as specified in Article 2.06 of this Section.
3. Circuit Breakers as specified in Article 2.07 of this Section.
4. Motor Starters as specified in Article 2.10 and 2.11 of this Section.
5. Fuses as specified in Article 2.13 of this Section.
6. Time Clocks as specified in Article 2.14 of this Section.
7. Ground Fault Circuit Interrupters as specified in Article 2.15 of this Section.
8. NEC required corrosion resistant enclosures, cabinets and boxes as specified in Article 2.08, 2.11, 2.16 & 218 of this Section.

C. Submit proof of qualifications as specified in Article 1.02.A of this Section.

1.04 PRODUCT HANDLING

A. Delivery: Deliver all materials to the Project Site in the manufacturer's original unopened containers with all labels intact and legible.

B. Storage: Store all materials under cover in a manner to prevent damage and contamination, and store only the specified materials at the Project site.

C. Protection: Use all means necessary to protect swimming pool electrical materials before, during, and after installation and to protect the installed Work specified in other Sections.

**PART 2 - PRODUCTS**

2.01 MATERIALS, GENERAL

A. Materials shall be new, in unbroken packages and bear the U.L. label of approval.

B. Equipment of one type shall be by same manufacturer. One type of equipment for classifications such as:

1. Switchboards, panels, buss duct, disconnect switches and allied items.
2. Conduit.
3. Wire.
4. Conduit fittings.
5. Fixtures of the same general type.
6. Wiring devices.

## 2.02 CONDUIT AND FITTINGS

- A. Conduit within or under buildings or where exposed outdoors shall be rigid metal threaded, hot dipped galvanized, or U.L. approved plastic except where noted otherwise on the Drawings. Metallic conduit shall be of the same metal between outlets or terminals.
- B. Use flexible metallic conduit only for short connections of motors and where specifically called for on Drawings. Maximum length shall be 40". Use only liquid tight flexible metal conduit. Install an unbroken #12 AWG insulated copper grounding conductor in each liquid tight flexible conduit with permanent connection at motor junction box and service panel ground.
- C. Protect, before installation, metallic conduit runs in all slabs laid on grade or in contact with the earth or exposed in damp locations, with two (2) heavy coats of asphaltum rust-resisting compound.
- D. Encase conduits 2-1/2" or larger run underground, outside, or under buildings, in concrete envelopes a minimum of 3" thick, except as indicated otherwise on Drawings or stubouts. Conduits 2" and smaller laid 18" below finish surface in soil.
- E. Low voltage runs underground outside buildings, 1-1/4" or smaller, may be G.I. or sherardized steel conduit, with machine applied wrapping equal to double wrap or Scotch-Wrap #50 tape, half lapped and quadrupled at joints in lieu of concrete encasement.
- F. Service conduits through foundations or concrete members shall run through metal sleeves with adequate clearances for full movement of the conduit. Do not run conduits through footings.
- G. Secure conduits run exposed on surfaces with one hole heavy-duty straps or fasten with matching fittings to inserts or trapezes, parallel to building walls and ceilings.
- H. Cap all conduit or duct stub-outs with standard factory caps; except cap threaded steel conduit with B.I. water pipe caps in outdoor locations.
- I. Use conduit fittings as manufactured by Crouse-Hinds Company, Appleton Electric Co., or approved equal.
- J. Employ U.L. liquid tight fittings for use with liquid tight flexible metal conduit.
- K. Use unions as manufactured by Appleton, O-Z/Gedney, or approved equal. The use of running threads will not be permitted.
- L. Exposed conduit and fittings in chemical rooms shall be nonmetallic rigid polyvinyl chloride, corrosion resistant rated suitable for installation in corrosive environments and in accordance with the latest NEC requirements.

## 2.03 EQUIPOTENTIAL BONDING/GROUNDING

- A. Bond together and ground to a common ground at a single point all metallic conduit, piping systems, pool reinforcing steel, metal parts of ladders, lifeguard stands, handrails and their supports and the like. The solid copper bonding conductor shall not be smaller than #8 copper.

## 2.04 WIRING CONNECTIONS

- A. Make connections without strain on conductors, allowing the conductors to take a natural position after connections or taps are made. Include all strand of wire in making the connection.
- B. Make connections for wiring by one of the following means:
  - 1. Make all taps or connections to conductors with compression type connectors except those smaller than #8 B&S gauge may have soldered connections. Solderless connections for #10 AWG or smaller may be used and shall be "Scotchlok", Buchanan, or approved equal. For #8 AWG or larger, they shall be T&B "LockTite", Burndy "Versitaps", or approved equal.
  - 2. All cable or conductor terminal lugs shall be Burndy "Quicklug", IlSCO, or approved equal. Two piece stamped lugs and solder lugs will not be approved.
  - 3. Paint taped splices in damp or outdoor locations with two (2) coats of insulating paint.
  - 4. Tag all branch circuit wires with circuit number at the panelboard and at each point of use with linen or plastic tags.

## 2.05 CONDUCTORS

- A. Copper RHW or THW. Do not make splices between boxes.

## 2.06 COLOR CODING

- A. Neutrals (identified conductors shall be white).
- B. Phase conductors shall be red for phase B; blue for phase C.
- C. Green shall be used for mechanical equipment and receptacle grounds only.

## 2.07 MOTOR WIRING

- A. Make final connections to motors with the required AWG (Minimum #12), Flamenol machine tool wire, 19 strand. Control wiring for equipment shall be Flamenol machine tool wire, 19 strand of required AWG. Provide corrosion resistant junction boxes at each item of equipment to change from standard building wiring to machine tool wire.
- B. Phase motors as proper in direction of rotation.

## 2.08 PANELBOARDS

- A. Panelboards shall be flush or surface mounting as indicated with circuit breakers as shown on panel schedule, hinged lockable doors, index card holders and proper bussing.
- B. Where indicated on the drawings, panelboards shall be furnished with subfeed breakers and/or lugs, split bussing, contractors, time switches, relays, etc., as required.
- C. All panelboards shall be keyed alike.
- D. All panelboard enclosures shall be corrosion resistant rated in accordance with the latest NEC requirements.

- E. Furnish corrosion resistant panelboard enclosures and terminal cabinets with Yale 46515 flush locks and LL806 keys except where indicated otherwise herein. Fasten the trim to panel boards and terminal cabinet by means of concealed, bolted or screwed fasteners accessible only when the door is open.
- F. Panelboards 208/120 volt, three phase, 4 wire, S/N or 120/240 volt, single phase, 3 wire, S/N.

Panelboard types as manufactured by:

Westinghouse	Type B10B
General Electric	Type NLAB
Square D	Type NQOB

- G. Panelboards for 480/277 volt, three panes, 4 wire, S/N.

Panelboard types as manufactured by:

Westinghouse	Type Pow-R-Line 2
General Electric	Type AE
Square D	Type NEHB
Sylvania	Type NH1B
I.T.E.	Type Approved Equal

- H. Panelboard for bussing sizes thru 400 amp shall be 20" wide surface mounted type. Recess mounted type shall have a 20" wide (maximum) recess metal enclosure with trim plate cover extending 1" on all sides of enclosure. Depth shall be 5-3/4" nominal. Height of panel as required for devices.
- I. Provide 6" additional gutter space in all panels where double lugs are required, or where cable size exceeds bus size. Minimum bottom gutter space shall be 6" high. 12" additional gutter space may be required for aluminum feeders where used.
- J. Panelboards shown on the drawings with relays, time clocks or other control devices shall have a separate metal barriered compartment mounted above panel with separate hinged locking door to match panelboard. Provide mounting sub-base in cabinet for control devices and wiring terminal strips.
- K. Panelboard shall have a circuit index card holder removable type, with clear plastic cover. Index card shall have numbers imprinted to match circuit breaker numbers.

2.09 CIRCUIT BREAKERS

- A. Breakers shall have a minimum short circuit interrupting rating of 10,000A symmetrical for panelboard voltage thru 240 volt and 14000A for panelboards thru 600 volts or as specified on the drawings. In no case shall the interrupting rating be less than the bus withstand rating unless noted otherwise on the drawings.
- B. Circuit breakers as manufactured by the following companies only are acceptable:
  - 1. General Electric Company
  - 2. Square D Company

3. Westinghouse Company
  4. I.T.E. Company
- C. Circuit breakers shall be arranged in the panels so that the breakers of the proper trip settings and numbers correspond to the numbering in the panel schedules on the drawings. Circuit numbers of breakers shall be black-on-white micarta tabs or other previously approved method. Circuit number tabs which can readily be changed from front of panel will not be accepted. Circuit number tabs shall not be attached to or be a part of the breaker.
  - D. Where two or three pole breakers occur in the panels, they shall be common trip units. Single pole breakers with tie-bar between handles will not be accepted.
  - E. All circuit breakers shall be padlockable in the "off" position. Locking facilities shall be riveted or mechanically attached to the circuit breaker (submit sample for approval). Other means of attachment shall not be accepted without prior written approval of Architect.
  - F. Where branch circuit breakers supply the power to motors and signal systems, the breakers shall be furnished with lockout clips, mounted in the "on" position. The breakers shall be able to trip automatically with lockout clips in place.
  - G. Panelboard circuit breakers shall be bolt-on type.

#### 2.10 BUSSING

- A. Bussing shall be rectangular cross section copper, or full length silver or tin-plated aluminum.
- B. Bussing shall be braces to withstand symmetrical short circuit ratings as follows or as noted on drawings. In no case shall bus short circuit bracing be less than specified circuit breakers.
- C. Each panelboard shall be equipped with a ground bus secured to the interior of the enclosure. The bus shall have a separate lug for each ground conductor. No more than one conductor shall be installed per lug.

#### 2.11 POOL MECHANICAL EQUIPMENT ENCLOSURES, TERMINAL CABINETS & MISC CABINETS

- A. All pool mechanical equipment enclosures, terminal cabinets and miscellaneous cabinets in the pool mechanical room or chemical storage rooms shall be corrosion resistant rated in accordance with the latest NEC requirements. Enclosures and all cabinets shall be flush mounted (except where noted a surface) of the size indicated on the drawings, and complete with hinged lockable doors and the number of 2-way screw terminals required for termination of all conductors. Terminal cabinet locks to operated form same key used for panelboards. The trim to terminal cabinets shall be fastened by means of concealed bolted or screwed fasteners accessible behind door to terminal cabinets. Terminal cabinets shall have 5/8" plywood backing.
- B. Provide engraved nameplate on each enclosure and cabinet indicating its designation and system (i.e., Swimming Pool - Panel 'SP').

#### 2.12 MOTOR CONTROL INDIVIDUAL STARTERS

- A. Manual Motor Starters:

1. Provide flush or surface mounting manual motor starters with number of poles and size of thermal overload heaters as required for the motor being controlled (equipped with overload heaters, one for each motor lead). Back boxes shall be supplied with all flush mounting starters whether they are toggle type requiring only a 4" square outlet box or the larger type requiring a special box and cover designed to accept the particular unit. All box types shall be corrosion resistant rated in accordance with the latest NEC requirements.
2. Unless otherwise noted on the drawings, all manual starters for single phase motors, smaller than 1 h.p., shall be the compact toggle type. Manual starters for all single phase motors, 1 to 5 h.p., and all three phase motors up to 5 h.p. shall be the heavy duty type.
3. Where manual motor starter is shown with pilot light, the pilot light shall be installed in a separate outlet box adjacent to the starter outlet, and engraved nameplate in indicate function of pilot light.
4. The following motor starters as manufactured by:

<b>Manufacturer</b>	<b>Single Phase 1HP and Below</b>	<b>Others</b>
Arrow Hart	Type RL	Type LL
General Electric	CR 101	Class CR 1062
I.T.E.	Class C10, C11 or C12	Class C20
Square D Company	Class 2510, Type A	Class 2510, Type B & C
Westinghouse	Type MS	Type A100
Allen Bradley	Approved Equal	Approved Equal.

**B. Individual Magnetic Motor Starters:**

1. Magnetic motor starters shall be A.C. line voltage, across-the-line units in a corrosion resistant rated enclosure in accordance with the latest NEC requirements.
2. All starters located outside of a building whether or not indicated shall be W.P. (weatherproof), and all starters noted W.P. shall be furnished in a corrosion resistant rated stainless steel enclosure in accordance with the latest NEC requirements.
3. Starter shall be horsepower rated for the motor controlled, and shall be equipped with properly sized overload elements. Every pole shall be with overload element.
4. Verify the exact motor current and voltage characteristics with the Contractor supplying the motor before installation of a starter.
5. Each starter shall be equipped with "Hand-Off-Auto" switch or stop-start pushbutton as required.
6. Coils shall be designed to operate on voltage indicated on control diagrams and have built-in-under the voltage release for coil circuit to drop motor starter off the line when the line voltage drops below normal operating voltage.
7. The coil control circuit shall be independently fused, sized to protect coil.
8. Starters to be equipped with running pilot light indication with a "Push-to-Test" feature.
9. Magnetic starters shall have a minimum of two auxiliary contacts. Additional auxiliary contacts shall be provided as required to comply with the requirements of the wiring diagrams on the electrical and mechanical drawings and the description of the function in the Mechanical Section of the Specifications.
10. Starters shall comply with NEMA standards, size and horsepower ratings as indicated on drawings.
11. The following types of magnetic motor starters as manufactured by:

<b>Manufacture</b>	<b>Type</b>
General Electric	Class CR 106
I.T.E.	Class A20
Square D Company	Class 8536
Westinghouse	Type A200 (Size 4 Max.) or Class II-200 (Sizes 5-8)

### 2.13 INDIVIDUAL COMBINATION MOTOR STARTERS

- A. Combination starter shall incorporate fused disconnect switch and individual magnetic motor starter. Combination starters shall be mounted in a corrosion resistant rated enclosure in accordance with the latest NEC requirements.
- B. Starters shall comply with NEMA standards, size and horsepower ratings as indicated on drawings General Electric, Square D, Westinghouse or I.T.E.
- C. The disconnect handle used on combination starters shall control the disconnect device with the door opened or closed. The disconnect handle shall be clearly marked as to whether the disconnect device is "ON" or "OFF", and shall include a two-color handle grip, the black side visible in the "OFF" position indicating a safe condition, and the red side visible in the "ON" position indicating an unsafe or danger condition.
- D. All starters used in combination starters shall be manufactured in accordance with the latest published NEMA standards, sizes, and horsepower ratings. These starters shall be furnished with three melting alloy type thermal overload relays.
- E. Thermal units shall be of one-piece construction and interchangeable. The starter shall be inoperative if a thermal unit is removed.

### 2.14 MOTOR CONTROL CENTER, INTERLOCKS AND CONTROL DEVICES

- A. Refer to mechanical and plumbing drawings and specifications and provide all control devices including timeswitches, relays and interconnection of starters as required.
- B. Mount all relays and timeswitches in a separate compartment in motor control center unless otherwise indicated.
- C. Whether shown on mechanical and plumbing drawings or control center schedules or not, where motors are controlled by external devices (i.e., thermostats, relays, float or pressure switches, etc.) or interlocked with other motors, each motor starter to be equipped with a "Hand-Off-Auto" selector switch in starter cover. Other starters equipped with a "Start' Stop" pushbutton station in starter cover. The Contractor shall be responsible to submit a complete and detailed set of shop drawings, electrical schematic design along with electrical component cut sheets from the MCC panel or the interlock control device manufacturer. RSD Total Control: Allan Pearson 949-380-7878, South Coast Controls: Anthony Ellis 714-998-5656 or approved equal.

### 2.15 FUSES

- A. Fuses shall be dual element, current limiting type, U.L. Class RK5 unless otherwise indicated on the drawings. Provide one spare set of fuses of each size and type in each motor control center.

#### 2.16 TIME CLOCKS

- A. Time clocks shall be provided for all underwater lighting systems and swimming pool circulation pumps not controlled by filter microprocessors.
- B. Contacts shall have a minimum rating of 40 amperes at 277V.
- C. Timing motor shall be heavy duty synchronous, self starting, high torque type, and shall be rated at 120, 208, 240, 277 volt 60 Hz.
- D. Motor shall operate normally at temperature range of -60 degrees Fahrenheit to +120 degrees Fahrenheit.
- E. Dial shall be 3" diameter, clearly calibrated with day/night zones and 24 hour rotation, with gear to provide one revolution yearly which automatically varies the on/off settings each day according to seasonal changes. Day and month of the year shall show clearly through calendar window on the dial.
- F. Time clocks shall be equipped with 7-spoke omitting wheel marked with days of the week.
- G. Time clocks shall be housed in a corrosion resistant rated enclosure in accordance with the latest NEC requirements.
- H. Acceptable manufacturers are Intermatic, Tork, Paragon, or approved equal.

#### 2.17 GROUND FAULT CIRCUIT INTERRUPTERS

- A. Minimum rating shall be 20 amperes, 125V, 5 milliampere trip setting, Class A per UL943.
- B. Manufacturer to be Crouse-Hinds, Leviton, or approved equal.

#### 2.18 BOXES

- A. Boxes shall be of the size required by ordinances or larger, must be corrosion resistant in accordance with the latest NEC requirements where concealed or exposed on ceilings or walls.
- B. Outlets to be surface where wiring is exposed and flush in areas where conduit is concealed.
- C. Provide surface outlets with proper corrosion resistant surface covers. Box and cover shall be deep enough to provide at least 1/4" clearance between back of device and back of box. Where box contains more than one device, use a corrosion resistant rated gang box with proper cover in accordance with the latest NEC requirements. Surface outlet boxes shall be of the threaded hub type wherever below 8'0".
- D. If necessary for cable installation, additional pull boxes or junction boxes may be installed in accessible locations. Exposed pull boxes and junction boxes shall be corrosion resistant rated in accordance with the latest NEC requirements.

- E. Where exposed to weather pull boxes larger than outlet boxes are required, galvanized code gauge sheet steel boxes may be used with covers attached by brass machine screws may be used. Boxes exposed to the weather shall be approved for the purpose, and conduit entrances shall be on the bottom made by means of an interchangeable hub with gasket and adapter nut. Pull boxes not shown on Drawings may be added only after approval of size and location is obtained.
- F. For outlets exposed to weather or where noted, cast outlet boxes shall be Crouse-Hinds, Appleton, or approved equal. Boxes shall have proper number and size hubs. Device plates, covers, adapters and boxes shall be as manufactured by Crouse-Hinds, Appleton, or approved equal.
- G. Exposed junction boxes, outlet boxes and pull boxes for pool chemical rooms shall be non-metallic suitable for a corrosive environment and in accordance with the latest NEC requirements.

## 2.19 IDENTIFICATION MARKINGS

- A. Plainly mark all motor and electrical appliance control equipment indicating the equipment controlled with engraved metal tags.
- B. Provide laminated plastic nameplates on panelboards on the outside of the door at the top indicating panel designation and feeder source.
- C. Provide laminated plastic nameplates on distribution switchboards and motor control centers at the top center indicating panel designation and feeder source.
- D. Identify each distribution switchboard and motor control center circuit breaker with a laminated plastic nameplate indicating its' use.
- E. Type panelboard directories on the forms provided with the equipment, indicating the use of each branch circuit breaker.
- F. Fasten all laminated plastic nameplates to surfaces with two (2) or more screws.

## PART 3 - EXECUTION

### 3.01 INSPECTION

- A. Verify conditions at the Project site before submitting bid. Be responsible for providing all necessary wiring for the new electrical systems. Wherever wiring is being disrupted due to remodeling or changes, reconnect existing and provide new wiring circuits to accomplish a fully operable system at no additional cost to the Owner.

### 3.02 COORDINATION

- A. The Drawings are essentially diagrammatic and indicate the desired location, size, routes, connection points, etc., and are to be followed as closely as possible. Proper judgment must be exercised in executing the Work so as to provide the best possible installation in the available space and to overcome difficulties, limitations or interference wherever encountered. Be responsible for the correct placement of this Work, the proper location and connection in relation to Work of other trades, for determining the exact location of all conduits, outlets and equipment, and for installing the conduits in such a manner as to conform to the structure, avoid obstruction, preserve headroom

and keep openings and passageways clear. Particular attention is directed to the close coordination required on exposed Work. Locations shown on Architectural or Mechanical Drawings if different than those shown on Electrical Drawings should be communicated to the Owner's Representative in writing for clarification.

### 3.03 INSTALLATION

A. Trenching and Backfill: Provide minimum cover as required by Code.

B. Conduit Installation:

1. Conduit and metallic raceway systems shall be mechanically and electrically continuous from sources of current to all outlets in a manner to provide a continuous grounding path. Close ends of conduit during construction to prevent entrance of dirt or moisture.
2. Securely fasten conduit to the building construction within three feet of each outlet and within every ten feet thereafter. Secure it to boxes, cabinets, pull boxes, terminals with two locknuts and ends equipped with bushings or a terminal fitting. Cut square with ends carefully reamed.
3. Make bends or elbows so that the conduit will not be injured or flattened.
4. Use insulated metallic bushings in all places where bushings are required.
5. Run exposed conduits level or plumb and parallel to the construction members of the building. No cutting across or diagonal runs will be permitted. Neatly surmount structural obstructions encountered on conduit runs by the use of fittings or pull boxes.
6. Identify feeder conduits by stamped metal tags secured to exposed section of conduit in main or sub-panels.
7. Make up all threaded conduit joints gas and watertight with conductive sealer except conduit above ground in dry indoor locations.
8. Rigidly support all boxes independently of the conduit system.

C. Connections to Equipment:

1. Fully connect, in an approved manner, all electrical outlets, apparatus, motors, equipment, fixtures, wiring devices and appliances whether they are installed under the Electrical Contract or not, which require electrical connections, to the corresponding electrical system outlet.
2. Where the Work of this Section requires connections to be made to equipment that is furnished and set-in-place under other Sections, obtain such roughing-in dimensions from the manufacturer or supplier of each item as required and assume full responsibility for the installation of the connections thereto.

### 3.04 ADJUSTMENT AND CLEAN-UP

A. Preliminary Operation: Should the Owner's Representative deem it necessary to operate the electrical installation or any part thereof prior to Substantial Completion of the Work, consent to such preliminary operation and supervise conduction of same. Subcontractor shall pay all costs occasioned by such operation. Preliminary operation shall not be construed as an acceptance of any Work installed under this Contract.

B. Clean-up: Upon completion of the Work of this Section, immediately remove all swimming pool electrical materials, debris and rubbish occasioned by this Work to the approval of the Owner's Representative.

END OF SECTION

## SECTION 22 00 50

## BASIC PLUMBING MATERIALS AND METHODS

**PART 1 - GENERAL**

## 1.01 SUMMARY

## A. Section Includes:

1. Electric motors.
2. Motor starters.
3. Strainers.
4. Valve boxes.
5. Gauges.
6. Thermometers.
7. Access Doors.
8. Expansion loops.
9. Flexible joints.
10. Insulation.

## 1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section is a part of each Division 22 Section.

## 1.03 ADDITIONAL REQUIREMENTS

- A. Furnish and install any incidental work not shown or specified which is necessary to provide a complete and workable system.
- B. Make all temporary connections required to maintain services during the course of this Contract without additional cost to the Owner. Notify the Owner seven days in advance before disturbing any service.
- C. Plumbing work done under this contract shall not adversely affect the operation of the existing plumbing systems.

## 1.04 REFERENCES AND STANDARDS

- A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
  1. CSA – Canadian Standards Association International.
  2. ANSI - American National Standards Institute.
  3. ASTM - American Society for Testing and Materials.
  4. CCR - California Code of Regulations.

- a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36.
  5. NCPWB - National Certified Pipe Welding Bureau.
  6. CEC - California Electrical Code.
  7. NEMA - National Electrical Manufacturers' Association.
  8. NFPA - National Fire Protection Association.
  9. OSHA - Occupational Safety and Health Act.
  10. UL - Underwriters' Laboratories, Inc.
- B. Requirements of Regulatory Agencies:
1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
    - a. California Building Code, 2022.
    - b. California Electrical Code, 2022.
    - c. California Energy Code, 2022.
    - d. California Fire Code, 2022.
    - e. California Green Building Standards Code, 2022.
    - f. California Mechanical Code, 2022.
    - g. California Plumbing Code, 2022.
    - h. California Code of Regulations, Title 24.
    - i. California Health and Safety Code.
    - j. CAL-OSHA.
    - k. California State Fire Marshal, Title 19 CCR.
    - l. National Fire Protection Association.
    - m. Occupational Safety and Health Administration.
    - n. Other applicable state laws.
  2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

#### 1.05 DRAWINGS

- A. Examine Contract Documents prior to bidding of work and report discrepancies in writing to Architect.
- B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The Plumbing Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.
  1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over Plumbing Drawings.
  2. Because of the small scale of Plumbing Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform

Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.

3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contactors' expense upon Architects' direction.
  4. Minor changes in locations of equipment, piping, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.
- C. Execute work mentioned in Specifications and not shown on Drawings, or vice versa, the same as if specifically mentioned or shown in both.

#### 1.06 FEES AND PERMITS

- A. Obtain and pay for all permits and service required in installation of this work; arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.
- B. Arrange for utility connections and pay charges incurred, including excess service charges.
1. Bear the cost of construction related to utility services, from point of connection to utility services shown on Contract Documents. This includes piping, excavation, backfill, meters, boxes, check valves, backflow prevention devices, general service valves, concrete work, and the like, whether or not Work is performed by Contractor, local water/sanitation district, public utility, other governmental agencies or agencies' assigns.
- C. Prior to the start of construction, contact local gas company representative and coordinate location of gas meter and piping. In addition, coordinate time required for installation, in order to avoid delay to the Project.
- D. Obtain permits to operate compressed air tanks required to be furnished under this Work. Pay costs, and perform tests required to obtain permits. Post permits under glass in a conspicuous place on or near tanks, or as required by authorities having jurisdiction.
- E. Coordination:
1. General:
    - a. Coordinate plumbing Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
  2. Electrical Coordination:
    - a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:
      - 1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
      - 2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate

120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.

- 3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.

3. Mechanical Coordination:

- a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
- b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during progress of construction.
- c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
- d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

1.07 SUBMITTALS - GENERAL

- A. Refer to Division 01 Submittals Section(s) for additional requirements.
- B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.
- C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
  1. Partial or incomplete submittals will not be considered.
  2. Quantities are Contractor's responsibility and will not be reviewed.
  3. Provide materials of the same brand or manufacturer for each class of equipment or material.
  4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
  5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
  6. Organize submittals in same sequence as in Specification Sections.
  7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
    - a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
    - b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.

- c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
  - d. Catalog cuts and published material may be included with supplemental scaled drawings.
- D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.
- E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect Shop Drawings or submittals on all items of equipment and materials provided. Provide submittal in at least seven copies and in complete package.
- 1. Shop Drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.
- F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

#### 1.08 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.
- B. Shop Drawings.
- C. Sustainable Design Submittals:
  - 1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.
  - 2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
- D. Pipe, pipe or plumbing fittings, fixtures, solder and flux installed in a system providing water for human consumption shall comply with lead free requirements of the California Health and Safety Code Section 11 68 75. Provide submittal information for products third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.
- E. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.

1. Calculations performed for use in selection of seismic supports, anchorages, and restraints shall utilize criteria indicated in Structural Contract Documents.
2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.
3. Supports, anchorages and restraints for piping, ductwork, and equipment shall be an HCAI pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
  - a. Bracing of Piping and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including details of anchorage to building. In-line equipment must be braced independently of piping, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation. Gas pipe bracing shall be designed in accordance with California Building Code Section 1615A.1.22 and ASCE 7-10 Section 13.6. Coefficient  $I_p = 1.5$  shall be used for gas piping bracing calculations.
  - b. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2022 California Building Code
4. Additional Requirements: In addition to the above, conform to all state and local requirements.

#### 1.09 INFORMATIONAL SUBMITTALS

- A. Provide layouts for plumbing systems, for inclusion in coordinated layout specified in Section 23 80 00. Comply with requirements for layouts specified in Section 23 80 00.

#### 1.10 CLOSEOUT SUBMITTALS

##### A. Operation and Maintenance Data:

1. Refer to Division 01 for complete instructions.
2. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.
  - a. Sets shall incorporate the following:
    - 1) Product Data.
    - 2) Shop Drawings.
    - 3) Record Drawings.
    - 4) Service telephone number, address and contact person for each category of equipment or system.

- 5) Complete operating and maintenance instructions for each item of plumbing equipment and systems.
  - 6) Copies of guarantees/warranties for each item of equipment and systems.
  - 7) Test data and system balancing reports.
  - 8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
  - 9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
  - 10) Control diagrams and literature.
  - 11) A complete list or schedule of all scheduled valves giving the number of the valve, location and the rooms or area controlled by the valve. Identify each valve with a permanently attached metal tag stamped with number to match schedule. Post list in frame under plastic on wall in mechanical room or where directed by Architect.
  - 12) Check test and start reports for each piece of plumbing equipment provided as part of the Work.
  - 13) Commissioning and Preliminary Operation Tests required as part of the Work.
- b. Post service telephone numbers and/or addresses in an appropriate place as designated by the Architect.

B. Record Drawings:

1. Refer to Division 01, Record Documents, for requirements governing Work specified herein.
2. Upon completion of the work, deliver to Architect the following:
  - a. Originals of drawings showing the Work exactly as installed.
  - b. One complete set of reproducible drawings showing the Work exactly as installed.
  - c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
  - d. Provide Contractor's signature, verifying accuracy of record drawings.
  - e. Obtain the signature of the Project Inspector for all record drawings.

1.11 SUBSTITUTIONS

- A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In the case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.
- B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.
- C. Substitutions will be interpreted to be all manufacturers other than those specifically listed in the Contract Documents by brand name, model or catalog number.
- D. Only one request for substitution will be considered for each item of equipment or material.
- E. Substitution requests shall include the following:
  1. Reason for substitution request.
  2. Complete submittal information as described herein; see "Submittals."

3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
  4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
  5. Explanation of impact on connected utilities.
  6. Explanation of impact on structural supports.
- F. Installation of reviewed substitution is the Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of reviewed substituted equipment or material must be made by the Contractor without additional cost to the Owner. Review by the Architect of the substituted equipment or material, including dimensioned Drawings will not waive these requirements.
- G. Contractor may be required to compensate the Architect for costs related to substituted equipment or material.

#### 1.12 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of plumbing systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with plumbing systems work similar to that required for this Project.
- C. California Health and Safety Code Compliance: For products covered under the scope of HSC 116875 for potable water service. Products for potable water service shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.
- D. Comply with applicable portions of California Plumbing Code pertaining to selection and installation of plumbing materials and products.
- E. All materials and products shall be new and shall match existing.

#### 1.13 DELIVERY, STORAGE, AND HANDLING

- A. Protect equipment and piping delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

#### 1.14 FIELD CONDITIONS

- A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.
- B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held

responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

#### 1.15 WARRANTY

- A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.
- B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.
- C. On failure to comply with the warranty requirements within a reasonable length of time after notification is given, the Architect/Owner shall have the repairs made at the Contractor's expense.

### **PART 2 - PRODUCTS**

#### 2.01 GENERAL

- A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.
- B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.
- C. Refer to Sections 22 10 00 and 23 80 00 for specific system piping materials.

#### 2.02 MATERIALS AND PRODUCTS

- A. No material installed as part of this Work shall contain asbestos.
- B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

#### 2.03 ELECTRIC MOTORS

- A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. U.S. Motors.
    - b. Century Electric.
    - c. General Electric.
    - d. Lincoln.
    - e. Gould.
- B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and

operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.

1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.
- C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.
1. Multispeed motors shall have separate windings for each speed.
- D. Polyphase Motors with Additional Requirements:
1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
  2. Motors Used with Variable Frequency Controllers:
    - a. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
    - b. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
    - c. Energy- and Premium-Efficient Motors: Class B temperature rise; Class F insulation.
    - d. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
    - e. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
    - f. Each motor shall be provided with a shaft grounding device for stray current protection.
  3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.
- E. Single-Phase Motors:
1. Select motors with service factor of 1.15.
  2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
    - a. Permanent-split capacitor.
    - b. Split phase.
    - c. Capacitor start, inductor run.
    - d. Capacitor start, capacitor run.
  3. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
  4. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.

5. Motors 1/20 HP and Smaller: Shaded-pole type.
- F. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

#### 2.04 MOTOR STARTERS

- A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.
- B. Provide magnetic motor starters for equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.
  1. All starters shall have the following:
    - a. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
    - b. Ambient compensated thermal overload.
    - c. Fused control transformer (for 120 or 24 volt service).
    - d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.
  2. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
  3. Starters for single-phase motors shall have thermal overloads. NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
  4. Provide OSHA label indicating the device starts automatically.

#### 2.05 STRAINERS FOR POTABLE WATER SYSTEMS

- A. Strainers: Full line size, conforming to lead-free requirements of California Health and safety Code Section 11 68 75. "Y" pattern, 125 psi SWP minimum, with 304 stainless steel screens. Install all strainers with a blow-off hose valve with hose adapter. Strainer shall have gasketed cover with straight thread.
  1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. 3 inches and smaller: bronze or brass body, threaded ends, with 20 mesh screen. Watts LF777SI, Wilkins SXL.
    - b. 4 inches and larger: Cast iron body, flanged ends, 1/16 inch or 1/8 inch screen as normally supplied for each size. Watts 77F-DI-125, Mueller 758.

#### 2.06 STRAINERS FOR NON-POTABLE WATER SYSTEMS

- A. Charles M. Bailey #100A, Armstrong, Muesesco, or equal, Fig. 11 "Y" pattern, 125 psi WP minimum, with monel screens with 20 square mesh for 2 inches and smaller and 3/64 inch perforations for

2-1/2 inches and larger. Install all strainers with a blow-off hose valve with hose adapter. Strainer shall have gasketed cover with straight thread.

## 2.07 VALVE BOXES

### A. General:

1. Where several valves or other equipment are grouped together, provide larger boxes of rectangular "vault" type adequately sized for condition and similar in construction to those specified above.
2. Provide valve box extensions as required to set bottom of valve box tight up to top of piping in which valve is installed.
3. Provide a tee handle wrench for each size, Alhambra Foundry Co. #A-3008, or equal.

B. Valve Boxes in Traffic Areas: Provide Christy No. G5 traffic valve box, Brooks, or equal, 10-3/8 inches inside diameter with extensions to suit conditions, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves.

C. Valve Boxes in Non-Traffic Areas: Provide Christy No. F22, Brooks, or equal, 8 inches inside diameter by 30 inches long, with cast iron or steel locking cover. Provide Owner with set of special wrenches or tools as required for operation of valves. Cut bottom of plastic body for operation of valves.

D. Valve Box (Rectangular Vault Type): Precast concrete or cast iron with cast iron or steel locking type covers lettered to suit service – Brooks No. 3-TL, Christy No. B3, Fraser No. 3, Alhambra A-3004 or A-3005, Alhambra E-2202, or E-2702, or equal, with extension to suit conditions.

## 2.08 GAUGES

A. Marsh "Series J", U.S. Gage, Danton 800, or equal, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at mid-scale. Provide a needle valve on each gauge connection. Supply a gauge piped with branch isolation valves across the inlet and outlet of each pump and where shown on the Drawings.

B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core {and gasketed cap}, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and where shown on Drawings.

## 2.09 THERMOMETERS

A. Marsh, Taylor, Palmer, or equal, 5 inch diameter bimetal dial, adjustable from face, with adjustable positioner, located to be easily read from normal personnel approach. Normal reading shall be at mid-scale.

1. Provide extension for insulation.
2. Provide thermometers with steel bulb chambers and brass separable sockets.

B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core, on inlet and outlet of each coil, boiler, and heat exchanger and provide two digital electronic test thermometers for each range of fluid temperature and where shown on Drawings.

## 2.10 ACCESS DOORS

- A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
  - 1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.
- B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.
- C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.
- D. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.
- E. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.
- F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
  - 1. Milcor
    - a. Style K (plaster).
    - b. Style DW (gypsum board).
    - c. Style M (Masonry).
    - d. Style "Fire Rated" where required.

## 2.11 THERMAL AND SEISMIC EXPANSION LOOPS

- A. Manufactured assembly consisting of inlet and outlet elbow fittings, two sections of flexible metal hose and braid, and 180-degree return bend. Return bend section shall have support lug and plugged FPT drain. Flexible hose shall consist of corrugated metal inner hose and braided metal outer sheath. Assemblies shall be constructed from materials compatible with the fluid or gas being conveyed and shall be suitable for the system operating pressure and temperature. Provide assembly selected for 4 inches of movement.
- B. Provide CSA certified expansion loops for use in natural or propane gas piping systems.
- C. Where used in potable water systems, provide expansion loops of certified lead-free construction.
- D. Basis-of-Design Product: Subject to compliance with requirements, provide Metraflex Inc., Metraloop series, or comparable product by one of the following, or equal:
  - 1. Flexicraft Industries.

## 2.12 FLEXIBLE JOINTS

- A. Where indicated on Drawings, provide Metraflex Metrasphere, Style R, Mason Industries, or equal, Spherical Expansion Joints. Provide control units at each expansion joint, arranged to limit both expansion and compression.
- B. Flexible joints at entry points to building shall be Barco Ductile iron, Advanced Thermal Systems, or equal, threaded style with stainless ball and mineral filled seal.

## 2.13 PIPE GUIDES

- A. Where flexible connections are indicated on Drawings, provide Metraflex style IV, B-Line, or equal, pipe guides in locations recommended by manufacturer. Maximum spacing from flexible connection to first pipe guide is 4 pipe diameters, and maximum spacing from second pipe guide is 14 pipe diameters.

## 2.14 EQUIPMENT IDENTIFICATION

- A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

## 2.15 PIPE IDENTIFICATION

- A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
- B. The legends and flow arrows shall conform to ASME A13.1.

## 2.16 INSULATION WORK

- A. General:
  - 1. For insulating domestic hot water pumps, refer to Section 22 50 00, Plumbing Equipment,
  - 2. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
  - 3. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
  - 4. The term "piping" used herein includes pipe, valves, strainers and fittings.
  - 5. Apply insulating cement to fittings, valves and strainers and trowel smooth to the thickness of adjacent covering. Cover with jacket to match piping. Extend covering on valves up to the bonnet. Leave strainer cleanout plugs accessible.
  - 6. Provide pre-formed PVC valve and fitting covers.
  - 7. Provide Calcium Silicate rigid insulation and sheet metal sleeve, 18 inch minimum length at each pipe hanger. Seal ends of insulation to make vapor tight with jacket.
  - 8. Test insulation, jackets and lap-seal adhesives as a composite product and confirm flame spread of not more than 25 and a smoke developed rating of not more than 50 when tested in accordance with UL723 or ASTM E84.

9. Clean thoroughly, test and have approved, all piping and equipment before installing insulation and/or covering.
  10. Repair all damage to existing pipe and equipment insulation whether or not caused during the work of this contract, to match existing adjacent insulation for thickness and finish, but conforming to flame spread and smoke ratings specified above.
- B. Insulation of Piping:
1. Insulate domestic hot and tempered water with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness shall be the following:
    - a. Pipe 3/4 inches and smaller: 1 inch thick.
    - b. Pipe 1 inch through 1-1/2 inches: 1-1/2 inches thick.
    - c. Pipe 2 inches and larger: 2 inches thick.
  2. Insulate domestic hot water piping under slab on grade with Owens Corning Foamglas, preformed pipe insulation, or equal. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Cover pipe and fittings with insulation manufacturer's recommended jacketing. Insulation thickness shall be the following:
    - a. Pipe 3/4 inches and smaller: 2 inches thick.
    - b. Pipe 1 inch and larger: 3 inches thick.
  3. Insulate domestic cold water piping located within building, outside of insulation envelope in outside walls, vented attic spaces, and unheated spaces, including equipment rooms and below raised floor with 1 inch thick molded fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.
  4. Insulate domestic cold water piping located outside building exposed to weather with minimum 3-1/2 pounds per cubic foot density fiberglass with ASJ-SSL jacket. Insulation thickness for all pipe sizes: 2 inches.
  5. Insulate roof drain and overflow drain bodies, horizontal sections of rainwater leader piping and overflow piping, and condensate drains within the building envelope with 1 inch thick fiberglass, minimum 3-1/2 pound per cubic foot density, with ASJ-SSL jacket.
  6. Insulate condensate drain piping in freezer with 3/4 inch thick Therma-Cel, Armaflex, or equal. Seal water tight per manufacturer's directions. Install heat tape prior to insulation of piping, in accordance with manufacturer's directions.
  7. Insulate electrically heat-traced grease waste piping under slab on grade with Owens Corning Foamglas, preformed pipe insulation, or equal. Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Cover pipe and fittings with insulation manufacturer's recommended jacketing. Insulation thickness for all pipe sizes: 3 inches.
  8. Exposed insulated piping within the building shall have a Zeston 2000 25/50, Proto Lo-Smoke, or equal, PVC jacket and fitting cover installed over the insulation, applied per manufacturer's instructions. Insulation shall be vapor tight before applying PVC jacket and fitting covers. Verify suitability with manufacturer of insulation. Insulation with pre-applied polymer jacket may be substituted at Contractor's option.
  9. Where insulated piping is exposed to the weather apply aluminum jacket secured with 1/2 inch stainless-steel bands on 12 inch centers. Insulation shall be vapor tight before applying metal jacket, and aluminum fitting covers. Install jacketing with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Cover fittings with glass cloth, two coats of Foster Sealfas 30-36, and factory-fabricated aluminum fitting covers, of same

material, finish, and thickness as jacket. Insulation shall be vapor tight before applying metal jacket and fitting covers.

a. Fitting covers:

- 1) Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
- 2) Tee covers.
- 3) Flange and union covers.
- 4) End caps.
- 5) Beveled collars.
- 6) Valve covers.
- 7) Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

b. Jacket thickness:

- 1) Pipes 10 inches diameter and smaller: Minimum .016 inch thick jacket with smooth finish.
- 2) Pipes 12 inches diameter and larger: Minimum .020 inch thick jacket with smooth finish.

### **PART 3 - EXECUTION**

#### **3.01 EXISTING MATERIALS**

- A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.
- B. Removed materials which will not be re-installed and which are not claimed by Owner shall become property of Contractor and shall be removed from Project site. Consult Owner before removing any material from Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.
- C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from Project premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.
- D. Existing piping, ductwork, and equipment modified or altered as part of this Work shall comply with the most recent applicable code requirements.

#### **3.02 FRAMING, CUTTING AND PATCHING**

- A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.
- B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.
- C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.

- D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.
- E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

### 3.03 PLUMBING DEMOLITION

- A. Refer to Division 01 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
  - 3. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
  - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### 3.04 ELECTRICAL REQUIREMENTS

- A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.
- B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.
- C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

### 3.05 PIPING SYSTEM REQUIREMENTS

- A. Drawing plans, schematic 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.

### 3.06 PRIMING AND PAINTING

- A. Perform priming and painting on the equipment and materials as specified herein.
- B. See Division 09 Painting Section(s) for detailed requirements.
- C. Priming and Painting:
  - 1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.
    - a. Black Steel Piping:
      - 1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
      - 2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
  - 2. Metal surfaces of items to be jacketed or insulated except piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
  - 3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

### 3.07 EXCAVATING

- A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.
- B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such that 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.
- C. Maintain all warning signs, barricades, flares, and red lanterns as required.

- D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

### 3.08 BACKFILLING

- A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.
- B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
  - 1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.
- C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.
- D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

### 3.09 PIPING SYSTEMS INSTALLATION

- A. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.
- B. General:
  - 1. All piping shall be concealed unless shown or otherwise directed. Allow sufficient space for ceiling panel removal.
  - 2. Installation of piping shall be made with appropriate fittings. Bending of piping will not be accepted.
  - 3. Install piping to permit application of insulation and to allow valve servicing.
  - 4. Where piping or conduit is left exposed within a room, the same shall be run true to plumb, horizontal, or intended planes. Where possible, uniform margins are to be maintained between parallel lines and/or adjacent wall, floor, or ceiling surfaces.
  - 5. Horizontal runs of pipes and/or electrical conduit suspended from ceilings shall provide for a maximum headroom clearance. The clearance shall not be less than 6'-6" without written approval from the Architect.
  - 6. Close ends of pipe immediately after installation. Leave closure in place until removal is necessary for completion of installation.

7. Each piping system shall be thoroughly flushed and proved clean before connection to equipment.
  8. Pipe the discharge of each relief valve, air vent, backflow preventer, and similar device to floor sink or drain.
  9. Install exposed polished or enameled connections with special care showing no tool marks or threads at fittings.
  10. Install horizontal valves with valve stem above horizontal.
  11. Use reducing fittings; bushings shall not be allowed. Use eccentric reducing fittings wherever necessary to provide free drainage of lines and passage of air.
  12. Verify final equipment locations for roughing-in.
  13. Service Markers: Mark the location of each plugged or capped pipe with a 4 inch round by 30 inch long concrete marker, set flush with finish grade. Provide 2-1/2 inch diameter engraved brass plate as part of monument marker.
  14. Furnish and install anchors or thrust blocks on PVC water lines in the ground, at all changes in direction of piping, and at all connections or branches from mains 1-1/2 inch and larger. Form anchors or thrust blocks by pouring concrete between pipe and trench wall. Thrust blocks shall be of adequate size and so placed as to take thrusts created by maximum internal water pressure. Sizing and placement shall be per manufacturer's recommendations, CPC, and IAPMO installation standards. Anchor piping to building construction.
  15. Sanitary Sewer and Storm Drain: Grade piping inside building uniformly 1/4 inch per foot if possible but not less than 1/8 inch per foot. Run piping as straight as possible. Make piping connections between building piping and outside service pipe with cast iron reducers or increasers. Slope sewers uniformly between given elevations where invert elevations are shown.
  16. Where piping is installed in walls within one inch of the face of stud, provide a 16 gauge sheet metal shield plate on the face of the stud. The shield plate shall extend a minimum of 1-1/2 inches beyond the outside diameter of the pipe.
- C. Expansion Loops:
1. Install expansion loops where piping crosses building expansion or seismic joints, between buildings, between buildings and canopies, and as indicated on Drawings.
  2. Install expansion loops of sizes matching sizes of connected piping.
  3. Install grooved-joint expansion joints to grooved-end steel piping.
  4. Materials of construction and end fitting type shall be consistent with pipe material and type of gas or liquid conveyed by the piping system in which expansion loop is installed.
- D. Sleeves:
1. Install Adjus-to-Crete, Pipeline Seal and Insulator, or equal, pipe sleeves of sufficient size to allow for free motion of pipe, 24 gauge galvanized steel. The space between pipe and sleeves through floor slabs on ground, through outside walls above or below grade, through roof, and other locations as directed shall be caulked with oakum and mastic and made watertight. The space between pipe and sleeve and between sleeve and slab or wall shall be sealed watertight.
  2. At Contractor's option, Link-Seal, Metraflex Metraseal, or equal, casing seals may be used in lieu of caulking. Wrap pipes through slabs on grade with 1 inch thick fiberglass insulation to completely isolate the pipe from the concrete.
- E. Floor, Wall, and Ceiling Plates:

1. Fit all pipes with or without insulation passing through walls, floors, or ceilings, and all hanger rods penetrating finished ceilings with chrome-plated or stainless escutcheon plates.

F. Firestopping:

1. Pack the annular space between the pipe sleeves and the pipe through all floors and walls with UL listed fire stop, and sealed at the ends. All pipe penetrations shall be UL listed, Hilti, 3M Pro-Set, or equal.
  - a. Install fire caulking behind mechanical services installed within fire rated walls, to maintain continuous rating of wall construction.
2. Provide SpecSeal Systems UL fire rated sleeve/coupling penetrators for each pipe penetration or fixture opening passing through floors, walls, partitions or floor/ceiling assemblies. All Penetrators shall comply with UL Fire Resistance Directory (Latest Edition), and in accordance with Chapter 7, CBC requirements.
3. Sleeve penetrators shall have a built in anchor ring for waterproofing and anchoring into concrete pours or use the special fit cored hole penetrator for cored holes.
4. Copper and steel piping shall have SpecSeal plugs on both sides of the penetrator to reduce noise and to provide waterproofing.
5. All above Systems to be installed in strict accordance with manufacturer's instructions.
6. Alternate firestopping systems are acceptable if approved equal. However, any deviation from the above specification requires the Contractor to be responsible for determining the suitability of the proposed products and their intended use, and the Contractor shall assume all risks and liabilities whatsoever in connection therewith.

G. Flashing:

1. Flashing for penetrations of metal or membrane roof for mechanical items such as flues and pipes shall be coordinated with the roofing manufacturer and roofing installer for the specific roofing type. The work of this section shall include furnishing, layout, sizing, and coordination of penetrations required for the mechanical work.
  - a. Furnish and install flashing and counterflashing in strict conformance with the requirements of the roofing manufacturer. Submit shop drawing details for review prior to installation.
  - b. Furnish and install counterflashing above each flashing required. Provide Stoneman, or equal, vandalproof top and flashing combination. Provide vandalproof top for each plumbing vent through roof. Elmdor/Stoneman Model 1540, 1550, 1570, or equal.
2. For all other types of roofing system, furnish and install around each pipe, where it passes through roof, a flashing and counterflashing. All flashing shall be made of four pound seamless sheet lead with 6 inch minimum skirt and steel reinforced boot. Counterflashing shall be cast iron. For vents, provide vandalproof top and flashing combination. Elmdor/Stoneman Model 1100-4, 1100-5, 1100-7, or equal.

H. Hangers and Supports:

1. General: Support equipment and piping so that it is firmly held in place by approved iron hangers and supports and special hangers. Hanger and support components shall support weight of equipment and pipe, fluid, and pipe insulation based on spacing between supports with minimum factor of safety of five based on ultimate strength of material used. Do not

exceed manufacturer's load rating. Pipe attachments or hangers, of same size as pipe or tubing on which used, or nearest available. Rigidly fasten hose faucets, fixture stops, compressed air outlets, and similar items to the building construction. The Architect shall approve hanger material before installation. Do not support piping with plumbers' tape, wire rope, wood, or other makeshift devices. Where building structural members do not match piping support spacing, provide "bridging" support members firmly attached to building structural members in a fashion approved by the structural engineer.

- a. Materials, design, and type numbers per Manufacturers' Standardization Society (MSS), Standard Practice (SP)-58.
  - 1) Provide copper-plated or felt-lined hangers for use on copper tubing.
- 2. Hanger components shall be provided by one manufacturer: B-Line, Grinnell, Unistrut, Badger, or equal.
- 3. Riser clamps: B-line model B3373, or equal.
- 4. Pipe Hanger and Support Placement and Spacing:
  - a. Vertical piping support spacing: Provide riser clamps for piping, above each floor, in contact with the floor. Provide support at joints, branches, and horizontal offsets. Provide additional support for vertical piping, spaced at or within the following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 3)</u>	<u>Steel Gas</u>	<u>Copper Brazed or Soldered (Note 3)</u>	<u>CPVC &amp; PVC (Note 2)</u>
1/2 - 1"	12 ft.	6 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
1-1/4 - 2"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft..	Base and Each Floor (Note 1)
2-1/2 - 3"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)
Over 4"	12 ft.	Each Floor, Not to Exceed 10 ft.	Each Floor, Not to Exceed 10 ft.	Base and Each Floor (Note 1)

- 1) Note 1: Provide mid-story guides.
- 2) Note 2: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
- 3) Note 3: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- b. Vertical cast iron piping support spacing: Base and each floor not to exceed 15 feet.
- c. Horizontal piping, hanger and support spacing: Locate hangers and supports at each change of direction, within one foot of elbow, and spaced at or within following maximum limits:

<u>Pipe Diameter</u>	<u>Steel Threaded or Welded (Note 2)</u>	<u>Steel Gas</u>	<u>Copper Brazed or Soldered (Notes 2, 3)</u>	<u>CPVC &amp; PVC (Note 1)</u>
1/2 - 1"	6 ft.	6 ft.	5 ft.	3 ft.
1-1/4 - 2"	7 ft.	10 ft.	6 ft.	4 ft.
2-1/2 - 3"	10 ft.	10 ft.	10 ft.	4 ft.
Over 4"	10 ft.	10 ft.	10 ft.	4 ft.

- 1) Note 1: For PVC piping, provide for expansion every 30 feet per IAPMO installation standard. For CPVC piping, provide for expansion per IAPMO installation standard.
- 2) Note 2: Spacing of hangers and supports for piping assembled with mechanical joints shall be in accordance with standards acceptable to authorities having jurisdiction.
- 3) Note 3: Includes all refrigerant piping, including vapor and hot gas pipes.
- d. Horizontal cast iron piping support spacing:
  - 1) Support piping at every other joint for piping length of less than 4 feet.
  - 2) For piping longer than 4 feet, provide support on each side of the coupling, within 18 inches of each joint.
  - 3) Hanger shall not be installed on the coupling.
  - 4) Provide support at each horizontal branch connection.
  - 5) Provide sway brace at 40 foot maximum spacing for suspended pipe with no-hub joints, except where a lesser spacing is required by the seismic design criteria used in delegated design for seismic systems. Refer to Article, Submittals.
  - 6) Provide a brace on each side of a change in direction of 90 degrees or more.
5. Suspended Piping:
  - a. Individually suspended piping: B-Line B3690 J-Hanger or B3100 Clevis, complete with threaded rod, or equal. All hangers on supply and return piping handling heating hot water or steam shall have a swing connector at point of support.

<u>Pipe Size</u>	<u>Rod Size Diameter</u>
2" and Smaller	3/8"
2-1/2" to 3-1/2"	1/2"
4" to 5"	5/8"
6"	3/4"

- b. Trapeze Suspension: B-Line 1-5/8 inch width channel in accordance with manufacturer's published load ratings. No deflection to exceed 1/180 of a span.
- c. Trapeze Supporting Rods: Shall have a safety factor of five; securely anchor to building structure.

- d. Pipe Clamps and Straps: B-Line B2000, B2400; isolate copper pipe with two thicknesses of 2 inches wide 10-mil polyvinyl tape. Where used for seismic support systems, provide B-Line B2400 series pipe straps.
  - e. Concrete Inserts: B-line B22-I continuous insert or B2500 spot insert. Do not use actuated fasteners for support of overhead piping unless approved by Architect.
  - f. Steel Connectors: Beam clamps with retainers.
6. Support to Structure:
- a. Wood Structure: Provide and install wood blocking as required to suit structure. Provide lag screws or through bolts with length to suit requirements, and with size (diameter) to match the size of hanger rods required.
    - 1) Do not install Lag screws in tension without written review and acceptance by Structural Engineer.

Side Beam Angle Clip	B-Line B3062---MSS Type 34
Side Beam Angle Clip	B-Line B3060
Ceiling Flange	B-Line B3199

- 2) Blocking for support of piping shall be not less than 2 inch thick for piping up to 2 inch size. Provide 3 inch blocking for piping up through 5 inch size, and 4 inch blocking for larger piping. Provide support for blocking in accordance with Structural Engineers requirements.
  - 3) Where lag screws are used, length of screw shall be 1/2 inch less than the wood blocking. Pre-drill starter holes for each lag screw.
  - b. Steel Structure: Provide and install additional steel bracing as required to suit structure. Provide through bolts with length to suit requirements of the structural components. Burning or welding on any structural member may only be done if approved by the Architect.
7. Rubber Neoprene Pipe Isolators:
- a. Pipe isolators shall comprise an internal rubber or neoprene material that isolates pipe from hanger and structure. Install at all piping located in acoustical walls. Refer to Architectural Drawings for location of acoustical walls.
  - b. Isolation material shall be either a rubber or neoprene material that prevents contact between the pipe and the structure. The rubber shall have between a 45 to 55 durometer rating and a minimum thickness of 1/2 inch.
  - c. Acceptable Suppliers:
    - 1) Vertical runs: Acousto-Plumb or equal.
    - 2) Horizontal runs: B-Line, Vibraclamp; Acousto-Plumb or equal.
- 8. Provide support for piping through roof, arranged to anchor piping solidly in place at the roof penetration.
  - 9. Provide rigid insulation and a 12 inch long, 18 gauge galvanized sheet iron shield between the covering and the hanger whenever hangers are installed on the outside of the pipe covering.
  - 10. Insulate copper tubing from ferrous materials and hangers with two thicknesses of 3 inch wide, 10 mil polyvinyl tape wrapped around pipe.

11. Provide a support or hanger close to each change of direction of pipe either horizontal or vertical and as near as possible to concentrated loads.
12. Suspend rods from concrete inserts with removable nuts where suspended from concrete decks. Power actuated inserts will not be allowed.

### 3.10 UNION AND FLANGE INSTALLATION

- A. Install Watts, Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain, waste, vent, or rainwater piping. Bushings or couplings shall not be used. Dielectric unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 68 75.
- B. Install unions in piping NPS 2" and smaller, and flanges in piping NPS 2-1/2" and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves. Unions installed in potable water systems shall conform to the lead-free requirements of the California Health and Safety Code Section 11 68 75.
- C. Locate the unions for easy removal of the equipment, tank, or valve.

### 3.11 ACCESS DOOR INSTALLATION

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

### 3.12 CONCRETE WORK

- A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.
- B. Thrust blocks, underground anchors, and pads for cleanouts, valve access boxes and washer boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

### 3.13 PIPE PROTECTION

- A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:
  1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Royston Products, or equal.

- a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Royston Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.
2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-10 or V-20", "Scotchwrap 50", Slipknot 100, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.
- B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.
- C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Razor Co. test machine (San Gabriel, CA - 818-287-5259), Pipeline Inspection Company (Houston, TX - 713-681-5837), or equal.
- D. Cleaning: Clean all piping thoroughly before wrapping.
  1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.
- E. Sleeve copper piping/tubing installed below slab with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping and orange for other piping. Install sleeve per manufacturer's recommendations and instructions.
- F. Sleeve copper piping/tubing installed outside building below grade with "Polywrap-C" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 6 mils thick, colored blue for domestic water piping. Install sleeve per manufacturer's recommendations and instructions.
- G. Sleeve cast iron and ductile iron pipe below grade and below slab with "Polywrap" polyethylene sleeve, as manufactured by Northtown Pipe Protection Products, or equal. Sleeve shall be a minimum of 8 mils thick, colored natural. Install sleeve per manufacturer's recommendations and instructions.
- H. Covering: No rocks or sharp edges shall be backfilled against the wrap or sleeve. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

### 3.14 PIPE IDENTIFICATION

- A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.

- B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
  - 1. Apply legend and flow arrow at approximately 10'-0" intervals in science classrooms and science prep rooms.
- C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.
- D. Each valve on non-potable water piping shall be labeled with a metal tag stamped "DANGER -- NON-POTABLE WATER" in 1/4 inch high letters.
- E. Apply markings after painting and cleaning of piping and insulation is completed.

### 3.15 EXPANSION ANCHORS IN HARDENED CONCRETE

- A. Refer to Structural Drawings.
- B. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. If the specific anchor satisfies cyclic testing requirements per Acceptance Criteria AC01, Section 5.6, the full allowable shear and tension loads listed in the current ICC-ES report and manufacturer's recommendations for the specific anchor may be used. Otherwise, the design shear and tension loads shall not be more than 80% of the listed allowable shear and tension loads for the specific anchor.
- C. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.
- D. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of a special inspector.
- E. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor or calibrated spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

### 3.16 PIPING SYSTEM PRESSURE TESTING

- A. General:
  - 1. Perform operational tests under simulated or actual service conditions, including one test of complete plumbing installation with fixtures and other appliances connected.
  - 2. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

- B. Piping Systems: Test piping systems in accordance with the following requirements and applicable codes:
  - 1. Authority having jurisdiction shall witness tests of piping systems.
  - 2. Notify Architect at least seven days in advance of testing.
  - 3. All piping shall be tested at completion of roughing-in, or at other times as directed by Architect.
  - 4. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
  - 5. Isolate from system equipment that may be damaged by test pressure.
  - 6. Make connections to existing systems with flanged connection. During testing of new work, provide a slip-in plate to restrict test pressure to new systems. Remove plate and make final connection to existing system at completion of testing.
    - a. Authority having jurisdiction shall witness final connection to system.
- C. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.
- D. Testing of Sanitary Sewer, Drain, Vent, and Storm Drain may be done in segments in order to limit pressure to within manufacturer’s recommendations. Test to 10 feet above highest point in the system.

<u>System Tested</u>	<u>Test Pressure PSI</u>	<u>Test With</u>
Sanitary Sewer, Drain, Vent	10 Ft. Hd.	Water
Storm Drain, Condensate Drains	10 Ft. Hd.	Water
Domestic Water	125	Water
Natural Gas (PE)	60	Air & Non-corrosive Leak Test Fluid
Natural Gas (Steel)	100	Air & Non-corrosive Leak Test Fluid
Compressed Air	200 lb.	Air & Non-corrosive Leak Test Fluid
Deionized Water	50	Water

- 1. Flush deionized water lines with deionized water after test and approval.
- 2. Non-corrosive leak test fluid shall be suitable for use with piping material specified, and with the type of gas conveyed by the piping system.

3.17 TRACER WIRES

- A. Provide tracer wire for non-metallic gas and water pipe in ground outside of buildings. Use AWG #14 tracer wire with low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape

at 18 inch intervals. Solder all joints. Tracer wire insulation shall be colored yellow for gas piping, blue for water piping.

- B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.
- C. Alternate: Use electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Reef Industries, Inc., Seton, Inc., Marking Services, Inc., or equal; tape 2 inches wide, continuously imprinted "CAUTION WATER (GAS, etc.) LINE BELOW". Install, with printed side up, directly over pipe, 18 inches below finish grade. Backfill material shall be as specified for the particular condition where pipe is installed, but avoid use of crushed rock or of earth with particles larger than 1/2 inch within the top 12 inches of backfill. Take precautions to insure that tape is not damaged or misplaced during backfill operations. Terminal boxes not required.

### 3.18 OPERATION OF SYSTEMS

- A. Do not operate any plumbing equipment for any purpose, temporary or permanent, until all of the following has been completed:
  - 1. Complete all requirements listed under "Check, Test and Start Requirements."
  - 2. Piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
  - 3. Filters, strainers etc. are in place.
  - 4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
  - 5. Equipment has been run under observation, and is operating in a satisfactory manner.
- B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.

### 3.19 CHECK, TEST AND START REQUIREMENTS

- A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of plumbing equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.
  - 1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
  - 2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
  - 3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
  - 4. When work has been completed, provide copies of reports for review, prior to final observation of work.

- B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.
- C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each operating and maintenance manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

### 3.20 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS

- A. Prior to observation to determine final acceptance, put all mechanical systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
  - 1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations.
  - 2. Correct rotation of motors and ratings of overload heaters are verified.
  - 3. Specified filters are installed and spare filters have been turned over to Owner.
  - 4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
  - 5. All equipment has been cleaned, and damaged painted finishes touched up.
  - 6. Missing or damaged parts have been replaced.
  - 7. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
  - 8. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
  - 9. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
  - 10. Preliminary test and balance work is complete, and reports have been forwarded for review.
  - 11. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
  - 12. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.
- B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.
  - 1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
  - 2. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
  - 3. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
  - 4. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.
- C. Review of Contractor's Tests:

1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.

D. Test Logs:

1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.

E. Preliminary Operation:

1. The Owner reserves the right to operate portions of the plumbing system on a preliminary basis without voiding the guarantee.

### 3.21 CERTIFICATES OF INSTALLATION

- A. Contractor shall complete applicable "Certificates of Installation" forms contained in the California Building Energy Efficiency Standards and submit to the authorities having jurisdiction for approval and issuance of final occupancy permit, as described in the California Energy Code.

### 3.22 DEMONSTRATION AND TRAINING

- A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.
1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
  2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
  3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:
    - a. Listing of Owner-designated personnel completing training, by name and title.
    - b. Name and title of training instructor.
    - c. Date(s) of training.
    - d. List of topics covered in training sessions.
  4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION



SECTION 22 10 00

PLUMBING PIPING SYSTEMS

**PART 1 - GENERAL**

1.01 SUMMARY

A. Section Includes:

1. Pipe and fittings.
2. Valves.
3. Domestic water piping specialties.
4. Gas piping specialties.
5. Drain and waste piping specialties.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.03 ACTION SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing piping systems materials and products.

1.04 INFORMATIONAL SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Provide welding certificate for all gas pipe welders.
- C. Gas Pipe Installer Qualifications: Provide evidence of current qualifications for individuals performing work requiring qualifications.

1.05 CLOSEOUT SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts lists for plumbing piping systems materials and products. Include this data in Operation and Maintenance Manual.

1.06 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish to Owner, with receipt, one valve key for each key operated hydrant, bibb, or faucet installed.

**1.07 QUALITY ASSURANCE**

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Gas Pipe Installer Qualifications: Individuals performing tasks requiring qualifications under Federal and State regulations shall be qualified by the gas utility supplying Project site. The qualifications shall be current at the time of performing the Work.
- C. NFPA/ANSI Compliance: Fabricate and install natural gas systems in accordance with adopted edition of NFPA 54/ANSI Z223.1 "National Fuel Gas Code."
- D. Pipe Welding: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.
- E. Fabricate and install natural gas systems in accordance with California Plumbing Code.
- F. Utility Compliance: Fabricate and install natural gas systems in accordance with local gas utility company requirements.

**PART 2 - PRODUCTS****2.01 MATERIALS AND PRODUCTS**

- A. Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as indicated. Provide materials and products complying with California Plumbing Code. Where more than one type of material or product is indicated, selection from materials or products specified is Contractor's option.
- B. Potable-water piping and components shall comply with NSF 14, NSF 61, and NSF 372. Plastic piping components shall be marked with "NSF-pw."

**2.02 PIPE AND FITTINGS ATTACHED TO AND BELOW BUILDINGS INCLUDING 5 FEET FROM BUILDINGS**

- A. Piping and fittings attached to covered walkways and corridors shall comply with the requirements of this article.
- B. Drain and Waste Pipe Above Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard (CISPI) 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, vertical piping above floor from lavatories, sinks, and drinking fountains may be Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV weld pipe and fittings.
  - 1. Joints above grade: No-Hub pipe conforming to ASTM A888 and CISPI 301. Couplings conforming to ASTM 1277 and CISPI 310, with stainless steel bands. Provide products by ANACO-Husky, Tyler, Ideal or equal. Provide sway brace at 20'-0" maximum spacing for suspended pipe with No-Hub joints. Provide a brace on each side of a change in direction of 90 degrees or more. Brace riser joints at each floor and at 15 foot maximum intervals (also see Specification Section 22 00 50).
    - a. HCAI Projects: Provide sway brace at each joint per CBC.

- b. Joints located over critical areas including food preparation, food storage, food serving, and eating areas shall be ANACO-Husky SD 4000, Clamp-All 125, or equal, meeting the requirements of FM 1680, SD Class I and ASTM C1540.
  - c. Joints located over operating and delivery rooms, nurseries, food preparation centers, food-serving facilities, food storage areas, and other sensitive areas shall be ANACO-Husky SD 4000, Clamp-All 125, or equal, meeting the requirements of FM 1680, SD Class I and ASTM C1540.
- C. Drain and Waste Pipe Below Grade: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and CISPI 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler Pipe, or equal. Pipe and fittings shall be the products of a single manufacturer. At Contractor's option, hub and spigot cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A-74 and so marked, may be used.
- 1. Joints below grade: ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540.
  - 2. Joints below grade (hub and spigot option): Neoprene gaskets conforming to ASTM C564, as manufactured by Ty-Seal, Dual-Tite, or equal.
- D. Vent Pipe:
- 1. 3 inch and larger: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe above grade.
  - 2. 2-1/2 inch and smaller: Cast iron soil pipe and fittings as specified for sizes 3 inch and larger, Schedule 40 galvanized steel pipe with black cast iron drainage fittings, or DWV copper pipe and fittings.
  - 3. Vent pipe buried in ground and to 6 inches above ground: Cast iron soil pipe and fittings conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Joints in cast iron vent pipe shall be the same as specified for cast iron waste pipe below ground.
- E. Type DWV copper tubing or No-Hub cast iron pipe and fittings may be used for concealed rainwater leaders. Where no-hub piping is used, the fittings and couplings shall match those used for waste piping.
- F. Grease Waste (GW) and Vent (GV) Pipe Underground to 6 Inches Aboveground: George Fisher Sloane, Inc., "Fuseal PP," Orion Fittings, Inc., "Rionfuse CF," IPEX, Inc., "Enfield," or equal, Schedule 40 polypropylene pipe and fittings assembled with electrofusion joints. Piping shall comply with ASTM F1412.
- G. Grease Waste (GW) and Vent (GV) Pipe Aboveground:
- 1. In inaccessible spaces or within walls, George Fisher Sloane, Inc., "Fuseal PP," Orion Fittings, Inc., "Rionfuse CF," IPEX, Inc., "Enfield," or equal, flame-retardant schedule 40 polypropylene pipe and fittings assembled with electrofusion joints. Piping shall comply with ASTM F1412.
  - 2. In accessible areas: George Fisher Sloan, Inc. "Fuseal PP," Orion Fittings, Inc. "Blueline," IPEX, Inc. "Labline," or equal, flame retardant Schedule 40 polypropylene drainage pipe and fittings, with mechanical joints. Piping shall comply with ASTM F1412.

3. Vent pipe aboveground: 3 Inches and Larger: Service weight cast iron soil pipe and fittings; 2-1/2 inches and smaller: Schedule 40 galvanized steel pipe with black cast iron drainage fittings.
- H. Acid Waste (AW) and Vent (AV) Pipe Underground to 6 Inches Aboveground: George Fisher Sloane, Inc., "Fuseal PP," Orion Fittings, Inc., "Rionfuse CF," IPEX, Inc., "Enfield," or equal, Schedule 40 polypropylene pipe and fittings assembled with electrofusion joints. Piping shall comply with ASTM F1412.
- I. Acid Waste (AW) and Vent (AV) Pipe Aboveground:
1. In inaccessible spaces or within walls, George Fisher Sloane, Inc., "Fuseal PP," Orion Fittings, Inc., "Rionfuse CF," IPEX, Inc., "Enfield," or equal, flame-retardant Schedule 40 polypropylene pipe and fittings assembled with electrofusion joints. Piping shall comply with ASTM F1412.
  2. In accessible areas: George Fisher Sloan, Inc. "Fuseal PP," Orion Fittings, Inc. "Blueline," IPEX, Inc. "Labline," or equal, flame retardant Schedule 40 polypropylene drainage pipe and fittings, with mechanical joints. Piping shall comply with ASTM F1412.
- J. Water Pipe (Tempered Water, Tempered Water Return, Hot Water, Hot Water Return and Cold Water): ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass. Water piping below slab: ASTM B88, Type K copper tubing, hard temper, with wrought copper fittings. At Contractor's option, pipe runs below slab having no branches may be ASTM B88, Type K annealed copper tubing without joints. See Section 22 00 50 for pipe protection requirements for below slab copper piping.
- K. Temperature and Pressure Relief Valve Piping: ASTM B88, Type L copper tubing, hard-temper, with wrought copper fittings. Provide full solder cup for all fittings. Capped or plugged outlets shall be Schedule 40 screwed brass.
- L. Gas Pipe: Schedule 40 black steel conforming to ASTM A53, with malleable iron threaded fittings above grade for piping 2 inch and smaller; welded piping below grade and for above grade piping larger than 2 inches, with Class 150 welding fittings.
1. Appliance Flexible Connectors for Indoor Equipment Without External Spring Isolation:
    - a. Contractor may choose one of the following:
      - 1) Direct gas pipe connection.
      - 2) Appliance flexible connector:
        - a) Comply with ANSI Z21.24.
        - b) Polymer or hot-dipped PVC coated corrugated 304 stainless steel.
        - c) Operating-Pressure Rating: 0.5 psig.
        - d) End Fittings: Zinc-coated steel.
        - e) Maximum Length: 30 inches.
        - f) Manufacturers: Dormont, Series 30C, 31, 40C, 41, and 51, Brasscraft model ProCoat, or equal.
    - b. Provide with end connections compatible with equipment and piping system.
    - c. Equipment located in spaces normally accessible to building occupants, other than maintenance personnel, shall utilize direct gas pipe connection.
    - d. Provide anti-microbial PVC coating for use with appliances located in kitchen areas.

2. Flexible Gas Connector for Outdoor Equipment Without External Spring Isolation:
    - a. Contractor may choose one of the following:
      - 1) Direct gas pipe connection.
      - 2) Corrugated stainless steel hose with 304 stainless steel braid covering, CSA certified. Metraflex model GASCT, Unisource Manufacturing series 400, or equal. Provide with end connections compatible with equipment and piping system.
  3. Flexible Gas Connector for Equipment with External Spring Isolation, Indoors and Outdoors:
    - a. Where Drawings indicate installation of mechanical equipment on spring isolation rails spring mounted curbs, or spring hangers, provide metal flexible connectors, Metraflex Metraloop, or equal by Unisource Mfg. Co., or Flexicraft Industries, CSA certified for 4 inches of movement in all directions.
  4. Flexible Gas Connection System for Movable Gas-Fired Cooking Equipment:
    - a. System shall include flexible PVC coated braided stainless steel hose, quick disconnect fitting, full port CSA certified ball valve, 2 swivel elbows, coiled steel restraining cable and mounting hardware. Assembly shall be certified per ANSI Z21.69/CSA 6.16, "Connectors for Movable Gas Appliances." Size as required for appliance connection, 48" minimum hose length. Install per manufacturer's instructions. Connectors shall be Dormont Safety System, T&S Safe-T-Link, or equal.
- M. Compressed Air Pipe: Type K copper tubing, hard temper, with wrought copper fittings. Capped or plugged outlets shall be screwed brass.
- N. Condensate Drain Piping:
1. Inside buildings provide ASTM B88, Type L copper tubing and fittings. Provide Wye fittings with capped cleanout plug for tubing up to 1 inch size. Provide wrought or cast DWV fittings for sizes 1-1/4 inch and larger.
  2. Outside buildings provide ASTM B88, Type L copper pipe and fittings, cast iron drain pipe and fittings or Schedule 40 galvanized steel pipe and cast iron drain or vent fittings.
  3. Connect condensate drains to mechanical equipment per equipment manufacturer's recommendations; provide P-trap where required. Slope piping to drain, with 1 inch in 10 foot minimum pitch. Provide di-electric couplings or unions at connections to dissimilar materials.
  4. Where Drawings indicate installation of mechanical equipment on spring isolation rails spring mounted curbs, or spring hangers, provide threaded metal connector at mechanical equipment, Metraflex Model SST, or equal by Unisource Mfg. Co., or Flexicraft Industries. Arrange flexible connection to ensure drainage of condensate, and support flexible connection at each end of connector, to ensure proper alignment.
  5. Where condensate drain P-traps are required, install trap using Wye fitting on inlet and outlet of trap. Provide cap on top of each Wye, made removable for cleaning and inspection. Drill 1/8 inch diameter hole in cap at outlet of the trap to allow venting of the system. Minimum depth of trap should be 4 inches, or as recommended by the manufacturer in printed literature.
  6. Provide cleanout tees or "Y" at each change in direction.
- O. Condensing-Type Equipment Condensate Drain Pipe: CPVC pipe and fittings conforming to ASTM D-2846.

1. Provide CPVC condensate drain pipe for condensing water heaters, furnaces, and where shown on Drawings.
2. Piping and fittings shall be as manufactured by Spears Manufacturing, Charlotte Pipe and foundry Co., or equal.

P. Deionized Water Piping:

1. Polyvinylidene Fluoride (PVDF) Pressure Rated Pipe and Fittings: Schedule 80 PVDF pressure rated pipe and fittings. Pipe and fittings shall meet ASTM D-1785. Threaded fittings shall comply with ASTM D-2464. The pipe and fittings shall be sterilized and capped or packaged immediately after production and all seals shall be intact when the material is delivered to the jobsite.
2. Provide continuous channel support under all horizontal piping, B-line, Grinnell, or equal PVC coated channel systems, series B11 through B72 with matching pipe clamps as appropriate, or equal.

2.03 SITE PIPING AND FITTINGS TO 5 FEET FROM BUILDINGS

A. Buried Drain, Waste, and Vent Piping:

1. Install piping from street connection to the property line in accordance with local requirements.
2. 4 inches and larger: PVC, ASTM D3034 - SDR 35; use matching Ring Tite fittings.
3. 3 inches and smaller: Cast iron soil pipe and fittings, asphaltic coated, conforming to ASTM A888 and Cast Iron Soil Pipe Institute Standard 301 and so marked. Pipe and fittings shall be as manufactured by AB&I, Charlotte, Tyler pipe, or equal. Provide ANACO-Husky SD 4000, Clamp-All 125, or equal couplings and No-Hub fittings, meeting the requirements of FM 1680, SD Class I and ASTM C1540. Pipe and fittings shall be the product of a single manufacturer.

B. Grease Waste (GW) and Vent (GV) Pipe: George Fisher Sloane, Inc., "Fuseal PP," Orion Fittings, Inc., "Rionfuse CF," IPEX, Inc, "Enfield," or equal, polypropylene pipe and fittings assembled with electrofusion joints. Piping shall comply with ASTM F1412.

C. Acid Waste (AW) and Vent (AV) Pipe: George Fisher Sloane, Inc., "Fuseal," Orion Fittings, Inc., "Rionfuse CF," IPEX, Inc., "Enfield," or equal, polypropylene pipe and fittings assembled with electrofusion joints. Piping shall comply with ASTM F1412.

D. Water Service Piping:

1. Sizes 2 inches and larger (not under building): Gasket style PVC conforming to ASTM D2241-SDR21, Class 200 with gasket type fittings or ductile iron mechanical joint couplings. Gasket fittings shall be one piece injection molded PVC fittings, equal to Flo-Seal water main fittings for PVC pressure pipe, 200 psi, ASTM D-3139.
2. Sizes less than 2 inches: Type K copper tubing, hard temper, with wrought copper fittings. See Section 22 00 50 for pipe protection requirements for below grade copper piping.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. J.M. Eagle.
  - b. P.W. Pipe.
  - c. Ipex Series Pipe.

E. Water Service Piping Above Grade:

1. Sizes 3 inches and larger: Class 150 flanged ductile cast iron water pipe conforming to AWWA/ANSI C150/A21.50 and manufactured in accordance with AWWA/ANSI C151/A21.51. Fittings shall conform to AWWA/ANSI C110/A21.10, Class 250 pattern. Pipe and fittings shall have factory applied cement-mortar lining in accordance with AWWA/ANSI C104/A21.4. Flanges shall conform to ASME/ANSI B16.1.
2. Piping 2-1/2 inches and smaller: Type K copper tubing, hard temper, with brazed wrought copper fittings.

F. Gas Piping Underground: Performance Pipe, "DriscoPlex" 6500 PE 2708 (yellow), Polypipe, Inc., "Polypipe", or equal, polyethylene gas distribution pipe, ASTM D2513, ASTM D3261, and ASTM D2683 fittings with fusion welded joints. Provide piping labeled for natural gas in accordance with CPC.

1. Electrically isolate underground ferrous gas piping from the rest of the gas system with listed or approved isolation fittings installed a minimum of six inches above grade.
2. Provide Central Plastics Corp., Perfection, or equal, anodeless, single seal riser for transition from below grade polyethylene to schedule 40 steel piping above grade. Minimum horizontal length shall be 30 inches. Minimum vertical length shall be 30 inches, or greater as required. Provide fusion connection to polyethylene pipe below grade, and screwed connection to steel pipe above grade.

G. Gas Piping Aboveground to 30 inches Belowground: Schedule 40 black steel with beveled ends for welding, with Class 150 welding fittings. Mitering to form elbows or tees will not be permitted; where branch tee connections of welded piping are required, Bonney "Weldolet" Allied Pipe Fittings, or equal fittings may be used if the branch is one-half of the diameter of the main or less.

H. Drainage Pipe, Perforated or Un-perforated: J-M PVC, P.W. Pipe, or equal drainage pipe and fittings or non-reinforced concrete sewer pipe ASTM C14.

I. Pool Piping:

1. PVC Pipe: ASTM D 1785, Schedule 40.
2. PVC Socket Fittings: ASTM D 2466 for Schedule 40.

2.04 FIRE PROTECTION PIPING

- A. Refer to specification Section 21 10 00 "Fire Protection."

2.05 PIPE JOINING MATERIALS

- A. Refer to piping Articles in this Section for special joining materials not listed below.
- B. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.
1. ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated
    - a. Full-Face Type: For flat-face, Class 125, cast iron and cast bronze flanges.

- b. Narrow-Face Type: For raised-face, Class 250, cast iron and steel flanges.
  - 2. AWWA C111, rubber, flat face, 1/8-inch (3.2mm) thick, unless otherwise indicated; and full-face or ring type, unless otherwise indicated.
  - 3. Flange Bolts and Nuts: AWWA C111, carbon steel, unless otherwise indicated.
  - 4. Plastic, Pipe-Flange Gasket, Bolts and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
- C. Solder Filler Metals: ASTM B 32, 100 percent lead free alloys. Include water-flushable flux according to ASTM B813.
- D. Brazing Filler Metals: AWS A5.8, BCup-5 Series, copper-phosphorus unless otherwise indicated. Sil-Fos 15, or equal.
- E. Welding Filler Metals: Comply with ASME B31.1 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.
- F. Solvent Cements for Joining CPVC Piping: ASTM F 493.
- 1. CPVC solvent cement shall have VOC content of 490 g/L or less.
  - 2. Adhesive primer shall have VOC content of 550 g/L or less.
  - 3. Solvent cement and adhesive primer shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.
- G. Solvent Cements for Joining PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.
- 1. PVC solvent cement shall have VOC content of 510 g/L or less.
  - 2. Adhesive primer shall have VOC content of 550 g/L or less.
  - 3. Solvent cement and adhesive primer shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

## 2.06 VALVES AND FITTINGS FOR POTABLE WATER SYSTEMS

### A. General:

- 1. Provide valves and fittings conforming to lead-free requirements of California Health and Safety Code Section 11 68 75.
  - a. Provide valves listed to NSF/ANSI 61-G or NSF/ANSI 372 for valve materials for potable-water service.
    - 1) Exception: Main distribution gate valves above 1-1/2 inches located underground outside building are not required to conform lead-free requirements of California Health and Safety Code Section 11 68 75.

### B. Gate Valves:

- 1. General: Furnish valves in copper lines with adapters to suit valve/line requirements.
- 2. 1-1/2 inches and smaller: Minimum 200 psi CWP, bronze body, threaded bonnet, rising or non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Milwaukee UP148, UP149, Nibco T-113-LF, S-113-LF, or equal.

3. 2 inches through 3 inches: Minimum 200 psi CWP, bronze body, threaded bonnet, non-rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Nibco T-113-LF, S-113-LF, or equal.
  4. Main distribution gate valves underground outside building above 1-1/2 inches:
    - a. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.
      - 1) Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
      - 2) Furnish and deliver to Owner one wrench of each size required for operating underground valves.
- C. Ball Valves:
1. 2 inches and smaller: 600 psi CWP, cast bronze or brass body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T-685-80-LF, Milwaukee UPBA400, Apollo 77C-LF10, Kitz 868, or equal.
  2. 2-1/2 inches: Apollo 77C-LF10, or equal.
- D. Swing Check Valves:
1. Minimum 200 psi CWP, bronze or brass body, suitable for regrinding, threaded ends, conforming to MSS SP-80. Milwaukee UP509, Nibco T-413LF, Kitz 822T, or equal.
- E. Butterfly Valves:
1. General: Tight closing, full lug type, with resilient seat suitable for minimum working pressure of 200 psig, conforming to MSS SP-67. Bi-direction dead end service with downstream flange removed.
  2. Provide valves with the following:
    - a. Seats: suitable for 40 degrees F for cold water service and 250 degrees F for hot water service. Seats shall cover inside surface of body and extend over body ends.
    - b. Bodies: ductile iron or cast iron.
    - c. Discs: Bronze or stainless steel.
    - d. Stems or Shafts: Stainless steel. Install valves with stems horizontal.
    - e. Control Handles: Suitable for locking in any position or with 10 degree or 15 degree notched throttling plates to hold valve in selected position. Provide extended necks to compensate for insulation thickness. Provide gear operator for valves 5 inches and larger.
  3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. 2 through 12 inches: Watts Regulator Co., model DBF-03.
- F. Silent Check Valves (for use on pump discharge):
1. General: Provide spring loaded check valves at pump discharge of all pumps.
    - a. 2 inches and smaller: Minimum 300 psi CWP, bronze body, Apollo 61LF, Milwaukee UP548-T, or equal.

- b. 2-1/2 inches and larger: Class 250, cast iron body, suitable for regrinding, Mueller 103MAP, or equal.

G. Thermostatic Balancing Valves:

1. General: Adjustable thermostatically controlled domestic water recirculation balancing valve.
  - a. Body: Stainless steel or dezincification resistant brass.
  - b. Seal: EPDM.
  - c. Spring: Stainless steel.
  - d. Thermostatic Element: Wax.
  - e. End connections: Threaded.
  - f. Temperature Gage Test Ports: Integral seal for portable testing instruments and sensors.
  - g. Maximum Working Pressure: 145 psig.
  - h. Maximum Inlet Temperature: 195 deg. F.
  - i. Temperature Adjustment: Settings from 95 deg. F. to 140 deg. F.
  - j. Provide with field-installed check valve.
2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. 1/2 Inch and 3/4 Inch:
    - 1) Bell & Gossett; a Xylem Brand, model Temp Setter.
    - 2) Caleffi North America, Inc., model ThermoSetter.

2.07 VALVES AND FITTINGS FOR NON-POTABLE WATER, COMPRESSED AIR, AND GAS SYSTEMS

A. Gate Valves:

1. 2-1/2 inches and smaller: Class 150, bronze body, union bonnet, rising stem, solid wedge, threaded or solder ends, conforming to MSS SP-80. Hammond IB641, IB648, Nibco T-134, S-134, Milwaukee 1151, 1169, or equal.
2. 3 inches and larger: Class 125, iron body, bronze mounted, bolted bonnet, non-rising stem, solid wedge, flanged ends, conforming to MSS SP-70. Hammond IR-1138, Nibco F619, Milwaukee F2882A, Stockham G-612, or equal.
3. Underground valves 2 inches thru 12 inches: 250 psi, iron body, Non-rising stem, bolted bonnet, resilient wedge valves, conforming to AWWA C509, equipped with operating nuts, Mueller Series 2360, Nibco F-619-RW-SON, or equal.
  - a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
  - b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.

B. Ball Valves:

1. 2 inches and smaller: 600 psi CWP, 150 psi SWP, cast bronze body, full port, two piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco T585-70, Milwaukee BA-400, Stockham T-285, or equal.
2. 2-1/2 inches and larger: Class 150, carbon steel body, full port, two piece, stainless steel vented ball, flanged ends, and reinforced PTFE seal, conforming to MSS SP-72. Nibco F-515-CS-F-66-FS, Milwaukee F20-CS-15-F-02-GO-VB, or equal.

3. Compressed Air Services: 600 psi CWP, 150 psi SWP, bronze body, full port, three piece, threaded ends, and reinforced PTFE seal, conforming to MSS SP-110. Nibco Model T-595-Y, Milwaukee BA-300, or equal.
- C. Swing Check Valves: Class 125 or 150, bronze body, suitable for regrinding, threaded ends, conforming to MSS SP-80. Stockham B-321, Milwaukee 509, Nibco T-433, or equal.
- D. Butterfly Valves:
1. General: Tight closing, full lug type, with resilient seat suitable for minimum working pressure of 200 psig, conforming to MSS SP-67. Bi-direction dead end service with downstream flange removed.
  2. Provide valves with the following:
    - a. Seats: Suitable for 40 degrees F for cold water service and 250 degrees F for hot water service. Seats shall cover inside surface of body and extend over body ends.
    - b. Bodies: Ductile iron or cast iron.
    - c. Discs: Bronze or stainless steel.
    - d. Stems or Shafts: Stainless steel.
    - e. Control Handles: Suitable for locking in any position or with 10 degree or 15 degree notched throttling plates to hold valve in selected position. Provide extended necks to compensate for insulation thickness. Provide gear operator for valves 5 inches and larger.
  3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. 2 through 12 inches: Milwaukee Valve, CL series, Nibco, Inc., Model LD2000-3, or equal.
- E. Silent Check Valves (for use on pump discharge):
1. General: Provide spring loaded check valves at pump discharge of all pumps.
  2. 2 inches and smaller: 250 psi CWP, bronze body, Nibco Model T-480, Milwaukee 548-T, or equal.
  3. 2-1/2 inches and larger: Class 250, cast iron body, wafer style, suitable for regrinding. Nibco Model F960, Milwaukee 1400, Mueller 103MAP, or equal.
- F. Calibrated Balance Valves (Symbol CBV): Provide globe style valves for precision regulation and control rated 175 psi for sizes 2-1/2 inches through 12 inches and rated 240 psi for bronze sizes 2 inches and below. Each valve shall have two metering/test ports with internal check valves and protective caps. All valves must be equipped with visual position readout and concealed memory stops for repeatable regulation and control.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Bell & Gossett Circuit Setter Plus.
    - b. Armstrong CBV.
    - c. Flow Design Inc. Accusetter.
    - d. Tour & Andersson.
    - e. Circuit Sensor with butterfly valve above 3 inches.
    - f. Illinois Series 5000 through 2 inches.

- G. Flow Control Valves: Automatic pressure compensating flow control valves shall be Griswold, Flow Design, Inc., or equal.
- H. Building Gas Shut-Off Valves:
1. 2 inches and smaller: Provide 175 psi SWP ball valve, CSA listed, full port, lockwing type, with AGA painted grey finish. Jomar 175-LWN, or equal.
  2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, lubricated plug cock, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
  3. Provide valves same size as upstream piping. Make any reduction in size of gas piping downstream of shutoff valves.
- I. Gas Shut-off Valve Above Grade:
1. 2 inches and smaller: Provide Milwaukee BB2-100, Jomar T-100NE, or equal, ball valve, CSA listed, full port.
  2. Above 2 inches: Provide ReSun D-126, Key Port, or equal, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
  3. Provide valves same size as upstream piping. Make any reduction in size of gas piping downstream of shutoff valves.
- J. For Gas Service Below Grade:
1. Lubricated plug cocks: ReSun Model D-126, Key Port, or equal, lubricated plug cock, CSA listed, rectangular port, full pipe area, 125 psi SWP, flanged ends. Provide extended lubrication stem, arranged to allow for lubrication of the valve from grade. The extension must be constructed to allow for lubrication of the valve and for operation of the valve from grade. Provide T-Handle socket wrench and adapter fittings as required for operation of valves. Provide one package of spare lubricant sticks, sizes as required for valve sizes. Lubricant shall be the product recommended by valve manufacturer for use with type of gas conveyed by the piping system.
    - a. Provide flanged ends on valves installed below grade. Connect to polyethylene piping with flanges and stainless steel bolts.
    - b. Anchor each valve flange to valve box with welded angle iron, or provide vertical stiff leg, minimum 18 inches into earth.
    - c. Provide Central Double O Seal Transition Fittings, or equal, flanged style for connection between valve and piping system.
    - d. Wrap valve, flanges and exposed pipe with PASCO Specialty & Mfg., Inc., or equal tape wrap, installed in accordance with requirements listed under "Pipe Protection".
  2. Molded polyethylene body ball valves: Nordstrom Valves - Polyvalve II for sizes 1-1/4 inches to 2 inches, and Polyvalve for sizes 2 inches and larger, or equal. Valves 1 inch and smaller shall be listed lubricated plug cocks, with transition fittings..

- a. Provide stub ends to match SDR of the piping, arranged for butt fusion welding. Provide valve body material to suit the adjacent piping system.
  - b. Provide wrench to suit the valve operator.
- K. Seismic Gas Shut-Off Valves: Certified by State of California and compliant with ASCE 25. Provide standard or high pressure model as required to match site gas pressure. Provide unit arrangement per Drawings schedule and details.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Little Firefighter Corporation, models NAGV, VAGV, and AGV.
    - b. Seismic Safety Products, LLC, Northridge series.

## 2.08 DOMESTIC WATER PIPING SPECIALTIES

### A. Hose Bibbs:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. Acorn Engineering Co.
  - b. Woodford Manufacturing Co.
2. Hose Station: Leonard THS-25-VB-CW, Symmons, or equal.

### B. Wall Hydrants:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. Acorn Engineering Co.
  - b. Woodford Manufacturing Co.
  - c. Mifab, Inc.

### C. Water Hammer Arrestors:

1. Provide water hammer arrestors conforming to lead-free requirements of California Health and Safety Code Section 11 68 75, with nesting type bellows contained within a casing having sufficient displacement volume to dissipate the calculated kinetic energy generated in the piping system. Water hammer arrestors shall be sized for type and number of fixtures served. Provide all stainless steel shell construction with stainless steel bellows and threaded connection to water system.
2. Water hammer arrestors shall be certified under P.D.I. Standard WH201 and by ASSE Standard 1010.
3. Select units in accordance with the requirements of Plumbing and Drainage Institute Standard P.D.I. WH201. Install above ceilings or behind wall access door at each plumbing fixture, or where plumbing fixtures are installed in groups, at each group of fixtures.
4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

- a. Josam Company, series 75000.
- b. Smith (Jay R.) Mfg. Co., Hydrotrol 5005-5050.
- c. Mifab, series WHB.

D. Water Filters:

1. Provide Cuno Incorporated, Aqua Pure model AP510, or equal, point of use water filters, conforming to lead-free requirements of California Health and Safety Code Section 11 68 75, in locations indicated on Drawings.
  - a. Provide model AP517 filter cartridge at each location, with 5 micron rating and 2,000 gallon rating, to remove sediment, rust, scale and chlorine taste and odor from incoming water. 2 gallon per minute capacity.
  - b. Provide one spare cartridge for each unit provided.

E. Reduced Pressure Backflow Preventers for Potable Water Systems:

1. Provide reduced pressure principle backflow preventer conforming to lead free requirements of California Health and Safety Code Section 11 68 75.
  - a. Reduced-pressure principle backflow preventer assembly, consisting of shutoff valves on inlet and outlet, and strainer on inlet., Backflow preventer shall include test cocks, and pressure differential relief valve located between two positive seating check valves. Construct in accordance with ASSE Standard 1013.
  - b. Manufacturers: Subject to compliance with requirements and local water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - 1) 2 inches and smaller: Wilkins 975XL2, Febco LF825YRP, Watts LF919.
    - 2) 2-1/2 thru 10 inches: Wilkins 475AXL, Febco LF860RP.
    - 3) 2-1/2 and 3 inches: Watts LF009.
2. Provide LeMeur, Hot-Box, WattsBox, or equal, two piece reinforced aluminum, fiberglass, welded angle with expanded metal, backflow preventer enclosure, sized to suit the size of backflow preventer. Install on concrete pad, in accordance with manufacturer's written installation instructions.
3. Provide substantial padlock and chain to lock valves in open position, and turn key over to Project Inspector.
  - a. Padlocks shall be as specified under Section 08 70 00.
  - b. Chain shall be of carbon steel, 3/8 inch wire diameter, fully welded links and weight of 140 pounds per 100 lineal feet. Chain shall be hot galvanized.
4. Provide capped connections at each test cock. Install in accordance with requirements of Authority Having Jurisdiction.
5. For units installed within buildings, provide drain, connected to unit, to collect spillage from atmospheric vent. Run drain to nearest floor sink or drain.
6. Provide two concrete filled, 6-inch diameter pipe bollards to protect all exposed piping from motor vehicle damage.

F. Reduced Pressure Backflow Preventers for Non-Potable Water Systems:

1. Refer to Section 21 10 00 for backflow preventers for fire protection service.

2. Provide reduced-pressure principle backflow preventer consisting of assembly, including shutoff valves on inlet and outlet, and strainer on inlet, equal to Febco 825Y or 880, as required Wilkins, Aames, or equal. Backflow preventer shall include test cocks, and pressure differential relief valve located between two positive seating check valves. Construct in accordance with ASSE Standard 1013.
  3. Provide LeMeur, Hot-Box, or equal, two piece backflow preventer enclosure, sized to suit the size of backflow preventer. Install on concrete pad, in accordance with manufacturer's written installation instructions.
  4. Provide substantial padlock and chain to lock valves in open position, and turn key over to Project Inspector.
    - a. Padlocks shall be as specified under Section 08 70 00.
    - b. Chain shall be of carbon steel, 3/8 inch wire diameter, fully welded links and weight of 140 pounds per 100 lineal feet. Chain shall be hot galvanized.
  5. Provide capped connections at each test cock. Install in accordance with requirements of Authority Having Jurisdiction.
  6. For units installed within buildings, provide drain, connected to unit, to collect spillage from atmospheric vent. Run drain to nearest floor sink or drain.
  7. Provide two concrete filled, 6-inch diameter pipe bollards to protect all exposed piping from motor vehicle damage.
  8. Manufacturers: Subject to compliance with requirements and local water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Ames.
    - b. Febco Sales, Inc.
    - c. Watts Regulator Company.
    - d. Clow.
- G. Double Check Valve Backflow Preventers:
1. Refer to Section 21 10 00 for backflow preventers for fire protection service.
  2. Provide double detector check valve assembly consisting of two spring loaded brass check valves, two cast iron bronze fitted gate valves and four test cocks, equal to Febco Model 856 or 876 as required. Construct in accordance with ASSE Standard 1048.
  3. Provide LeMeur, Hot-Box, or equal, two piece backflow preventer enclosure, sized to suit the size of backflow preventer. Install on concrete pad, in accordance with manufacturer's written installation instructions.
  4. Provide substantial padlock and chain to lock valves in open position and turn key over to Project Inspector.
    - a. Padlocks shall be as specified under Section 08 70 00.
    - b. Chain shall be of carbon steel, 3/8 inch wire diameter, fully welded links and weight of 140 pounds per 100 lineal feet. Chain shall be hot galvanized.
  5. Provide capped connections at each test cock. Install in accordance with requirements of Authority Having Jurisdiction.
  6. Provide two concrete filled, 6 inch diameter pipe bollards to protect all exposed piping from motor vehicle damage.

7. Provide Christy, or equal, utility box sized as required to suit backflow assembly, complete with two piece reinforced concrete lid, concrete extensions, insulation and other construction details shown on the drawings.
  8. Manufacturers: Subject to compliance with requirements and local water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Ames.
    - b. Febco Sales, Inc.
    - c. Watts Regulator Company.
    - d. Clow.
- H. Potable Water Pressure-Regulating Valve:
1. Provide pressure-regulating valves, single-seated, direct-operated type, bronze body, integral strainer, complying with requirements of ASSE Standard 1003, and the lead-free requirements of California Health and Safety Code Section 11 68 75. Size for maximum flow rate and inlet and outlet pressure indicated on Drawings.
  2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Cla-Val Company.
    - b. Watts Regulator Company.
- I. Thermostatic Water Temperature Control Valve:
1. Provide thermostatic water temperature control valve conforming to lead free requirements of California Health and Safety Code Section 11 68 75, with size as noted on Drawings, complete with union angle strainer checkstops. Valves shall be thermostatic type, with a maximum temperature setting as follows:
  2. Provide surface recessed semi-recessed mounted, white enameled or stainless steel cabinet with locking door for control valves. Including:
    - a. Control valve cabinet and valve shall be provided as a package, and include thermostatic water mixing valve, thermometer, safety checkstops, volume control valve and internal piping.
  3. Where indicated on drawings, provide a temperature alarm system, utilizing a micro-processor based controller and solid state temperature controller. Provide audible and visual indication of high and low temperature set points. Provide required hardware and wiring for a complete operating system.
    - a. Provide isolation transformer for control of the alarm system.
    - b. Provide solenoid valve and shock absorber, installed and wired to the alarm module.
  4. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Leonard Valve Company.
    - b. Lawler Manufacturing Co., Inc.
    - c. Powers.
- J. Relief Valves:

1. Provide relief valves as indicated, of size and capacity as selected by Contractor for proper relieving capacity, in accordance with ASME Boiler and Pressure Vessel Code.
2. Combined Pressure-Temperature Relief Valves: Bronze body, test lever, thermostat, complying with ANSI A21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 degrees F, and pressure relief at 150 psi.
3. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Watts Regulator Company.
  - b. Cash (A.W.) Valve Manufacturing Corporation.
  - c. Zurn Industries, Inc.; Wilkins-Regulator Division.

K. Trap Primers:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. MiFab, Inc.
  - b. Precision Plumbing Products.
  - c. Sioux Chief Manufacturing Company.

L. Water Meter:

1. Provide and install prefabricated water meter and bypass assembly, sized as indicated on the Drawings, complete with strainer, adapter, couplings, spool piece and test nipple. The meter shall be compound type, with two measuring chambers and a single billing register. Pipe materials used in construction of the assembly shall be ductile iron, and the meter shall be bronze with stainless steel trim.
2. Install the meter and accessories in a Christy, Brooks, or equal, series "R" pit Model R37, 4 feet by 7 feet by 3 feet deep; complete with 4 piece checker plate parkway lid (screw down type), and 8 inch round meter reading lid. Install meter in accordance with the requirements of the Authority Having Jurisdiction.
3. Manufacturers: Subject to compliance with requirements and local water authorities having jurisdiction, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Badger Meter, Inc.
  - b. Sensus North America Water.
  - c. Neptune Technology Group.
  - d. Hershey Meters.

## 2.09 GAS PIPING SPECIALTIES

A. Gas Pressure Regulating Valves:

1. Provide single-stage, spring-loaded, corrosion-resistant gas pressure regulators, with die-cast aluminum or cast iron body, complying with ANSI Z21.80. Unit shall be with atmospheric vent, internal relief overpressure protection, threaded ends for 2 inches and smaller, flanged ends for 2-1/2 inches and larger. For inlet and outlet gas pressures, specific gravity, and volume flow refer to Drawings schedule.

2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:

<u>Size</u>	<u>Manufacturer/Model</u>
1/2 inch	Elster (American, Singer) model 1213B Itron (Actaris, Slumberger, Sprague) model B42R.
3/4 thru 1-1/4inches	Elster (American, Singer) model 1813C Sensus (Ivensys, Equimeter, Rockwell) model 143-80-12 Itron (Actaris, Slumberger, Sprague) models B42R, B57R, B58R
1-1/2 thru 2 inches	Elster (American, Singer) models 1813, 1813B Sensus (Ivensys, Equimeter, Rockwell) model 243 Itron (Actaris, Slumberger, Sprague) models B43SR, B34R, B38R

2.10 DRAIN AND WASTE PIPING SPECIALTIES

A. Cleanouts:

1. General: Install cleanouts of same diameter as pipe (4 inch maximum) in all horizontal soil and waste lines where indicated and at all points of change in direction. Cleanouts shall be located not less than 18 inches from building construction so as to provide sufficient space for rodding. No horizontal run over 50 feet inside buildings or 100 feet outside buildings shall be without cleanout, whether shown on Drawings or not. Provide two-way cleanouts where indicated on drawings, and where required for satisfactory use.
  - a. Provide cleanouts in waste drop from each sink and urinal.
  - b. Provide one wrench for each size and type of cleanout used. Turn over to Owner at completion of the project, and obtain receipt. Place receipt in Operation and Maintenance Manuals.
2. Cleanouts in floor and in concrete sidewalks: Ducco Cast Iron with nickel bronze top, clamping collar and ABS plastic plug: Zurn ZN-1400-KC, or equal, with square or round top to suit floor construction.
3. Cleanouts in composition floors: Zurn ZN-1400-X-DX, or equal (nickel bronze top).
4. Cleanouts in concealed, aboveground cast-iron soil or waste lines: Zurn Z-1440A, or equal, with ABS plastic plug.
5. Cleanouts in walls: Zurn Z-1441 or Z-1443, or equal, with stainless steel cover. Provide long sweep elbow or combination wye at connection to riser and install with surface of cleanout within 1/2 inch of front face of finished wall.
  - a. Where space does not permit the above installation, provide Zurn Z-1446, or equal, with stainless steel access cover, and vandal resistant screw.
  - b. Install face of cleanout plug within 1/2 inch of front face of finished wall.

6. Cleanouts exterior to building in landscaped areas: Zurn Z-1449-BP, or equal, cleanout ferrule with tapered bronze plug. Where located at grade, provide 18 by 18 by 6 inch concrete pad; Trowel concrete smooth and edge; set flush with finished grade.
7. Cleanouts in drive areas: Zurn -1400-HD-KC, or equal, with heavy-duty top and ABS plastic plug.
8. Cleanouts in acid waste systems: Zurn ZN-1404, or equal, cleanout access housing, with ductile cast iron body and nickel bronze top. Extend acid waste piping within the cleanout, and terminate with threaded cap. Secure acid waste pipe inside cleanout access housing with setscrews provided.

B. Floor Drains:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. J.R. Smith.
  - b. MIFAB.
  - c. Watts.
  - d. Zurn.

C. Floor Sinks:

1. Floor Sinks: Provide anchoring flange (seepage pan) at all floor sinks, and provide flashing clamp in locations where floor membrane is used. Provide cast iron "P" trap and trap primer connection at P-Trap.
2. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. J.R. Smith.
  - b. MIFAB.
  - c. Watts.
  - d. Zurn.

D. Hopper Drains:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. Zurn.
  - b. J.R. Smith.

E. Area Drain:

1. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. Brooks.
  - b. J.R. Smith.
  - c. Old Castle Precast.
  - d. Watts.

e. Zurn.

F. Backwater Valves:

1. Provide Zurn Model Z-1090 J. R. Smith 7012, or equal flapper type backwater valve where indicated on drawings. Install in accordance with manufacturer's recommendations.
2. Provide Christy Model B16, Brooks, or equal utility box, 12 inches by 22 inches size, for installation of backwater valve.
3. Provide Zurn Model Z-1091, J.R. Smith 7070, or equal terminal type backwater valve, and install in catch basin piping at the outlet of the catch basin.

G. Roof Drains and Overflow Drains:

1. See Architectural Drawings for drain style to be used.
2. Provide offset downspout boots where required for connection of exposed sheet metal downspouts to underground cast iron or PVC piping.
3. Provide rainwater leader nozzles on overflow piping. Nozzle body shall be bronze with threaded inlet and bronze wall flange with mounting holes. Size nozzle to match connected rainwater leader.
4. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following, or equal:
  - a. J.R. Smith.
  - b. Mifab.
  - c. Zurn.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Examine areas and conditions under which plumbing piping systems are to be installed. Do not proceed with Work until unsatisfactory conditions have been corrected in manner acceptable to Contractor.
- B. Make all arrangements for the utilities required. Pay all costs involved in obtaining the services including gas service and meter, water meter, pressure reducing valve, access boxes, street work. Connect to site utilities. Verify the location of all services. No extra cost will be allowed if services are not as shown.
- C. Determine sanitary sewer and storm drain location and elevation at all points of connection before installing any piping. Notify Architect immediately if indicated grades cannot be maintained.
- D. At time of final connection, and prior to opening valve to allow pressurization of water and gas piping from existing systems, on site or off site, perform a pressure test to indicate static pressure of existing systems. If pressure on water piping is greater than 80 psi, or gas pressure is not as indicated on Contract Documents, inform Architect immediately. Do not allow piping systems to be pressurized without written consent of the Architect.

### 3.02 INSTALLATION OF WATER PIPING

- A. Run all water piping generally level, free of traps or unnecessary bends, arranged to conform to the building requirements, and to suit clearance for other mechanical work such as ducts, flues, conduits, and other work. No piping shall be installed so as to cause unusual noise from the flow of water therein under normal conditions.
- B. Provide manufactured water hammer arrestors, sized and installed in accordance with Plumbing and Drainage Institute Standard PDI WH201.
  - 1. Locate water hammer arrestors at every plumbing fixture, or, where fixtures are located in groups, at every group of fixtures, and as indicated on Drawings.
  - 2. Install water hammer arrestors above accessible ceilings, or install access doors for service.
- C. In freezing locations arrange water piping to drain as shown.
- D. Install piping on room side of building insulation.
- E. Check final location of rubber rings within couplings on PVC water piping with gauge or as recommended by manufacturer. Make connection to valves with cast iron adapters connected to water pipe with cast iron couplings. Furnish and install anchors or thrust blocks.
- F. For all faucets, hose bibbs, or other water outlets delivering industrial hot and/or cold water, provide a sign, permanently mounted, indicating "CAUTION: NON-POTABLE WATER, DO NOT DRINK". Each sign shall be permanently engraved with black uppercase letters on a yellow background. Letters shall be minimum 1-1/4 inch high.

### 3.03 INSTALLATION OF SANITARY AND STORM DRAINAGE SYSTEMS

- A. Make joints in PVC sewer pipe with PVC-type couplings and rubber rings.
- B. Check final location of rubber rings within the couplings with gauge or as recommended by the manufacturer. Make joints between PVC pipe and cast iron pipe or fittings using cast iron adapter fittings, installed as recommended by the manufacturer.
  - 1. Ring-Tite cast iron pipe fittings may be used in lieu of standard fittings. Make connection to valves with cast iron adapters connected to the pipe with PVC couplings.
- C. Sewer Piping: Run all horizontal sanitary drain piping inside of building on a uniform grade of not less than 1/4 inch per foot unless otherwise noted or later approved. Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.
- D. Storm Drain Piping: Run all horizontal storm drain piping inside of building on a uniform grade of not less than 1/4 inch per foot. Unless otherwise noted on the plans, piping shall have invert elevations as shown and slope uniformly between given elevations.
- E. Install rainwater leader nozzles at exposed bottom of leaders where they spill onto grade.
- F. Run all drainage piping as straight as possible and provide easy bends with long turns; make all offsets at an angle of 45 degrees or less.

- G. Grade all vent piping so as to free itself quickly of any water condensation.
- H. Where possible, join groups of vent risers together with one enlarged outlet through roof. Maintain minimum of 10 foot horizontal or 3 foot vertical clearance from air intakes.
- I. Install drip pan under storm drain piping, sanitary drain piping, and vent piping that must be run over kitchen areas.
- J. Hubless Cast Iron Joints: Comply with coupling manufacturer's installation instructions.

#### 3.04 INSTALLATION OF GREASE WASTE PIPING SYSTEMS

- A. Install to comply with all manufacturers' recommendations.
- B. All buried pipe shall be bedded in and backfilled with 4 inches of sand, and installed as recommended by manufacturer.
- C. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Maintain continuous pressure test on piping installed below grade, until all work has progressed to above grade.
- D. Electrofusion joints: Make polypropylene drainage piping joints according to ASTM F 1290.

#### 3.05 INSTALLATION OF ACID WASTE PIPING SYSTEMS

- A. Install to comply with all manufacturers' recommendations.
- B. All buried pipe shall be bedded in and backfilled with 4 inches of sand, and installed as recommended by manufacturer.
- C. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Maintain continuous pressure test on piping installed below grade, until all work has progressed to above grade.
- D. Electrofusion joints: Make polypropylene drainage piping joints according to ASTM F 1290.
- E. Connection to Building Sewer: At point of connection of acid waste piping to building sewer, provide fitting of same material as acid waste piping.

#### 3.06 INSTALLATION OF NATURAL GAS PIPING

- A. Install natural gas piping in accordance with Division 22 Basic Plumbing Materials and Methods sections.
- B. Use sealants on metal gas piping threads that are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.
- C. Remove cutting and threading burrs before assembling piping.

- D. Do not install defective piping or fittings. Do not use pipe with threads that are chipped, stripped, or damaged.
- E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping or equipment connections are completed.
- F. Ground gas piping electrically and continuously within project, and bond tightly to grounding connection.
- G. Install drip-legs in gas piping where indicated and where required by code or regulation.
  - 1. Install "Tee" fitting with bottom outlet plugged or capped at bottom of pipe risers.
  - 2. Where gas supply is connected to equipment with flexible connectors, install drip-leg in piping on downstream side of flexible connector, and install shut off valve on piping on upstream side of flexible connector.
- H. Install piping with 1/64 inch per foot (1/8 percent) downward slope in direction of flow.
- I. Install piping parallel to other piping.
- J. Paint all gas piping installed in exposed exterior locations. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods, article, Painting.
- K. Provide shutoff valve downstream of meter.
- L. Provide exterior shutoff valve at each building. Provide sign affixed to wall at valve location reading: "Gas Shut-Off." Size and location of the sign shall be as required by the Authority Having Jurisdiction. Where gas piping enters a building in more than one location, exterior shutoff valves shall have a permanently attached metal tag identifying the area served by that valve, in addition to sign on wall.
- M. Provide watertight Schedule 40 PVC conduit to protect gas piping installed below covered walk, covered driveways, and where noted on Drawings. Extend sleeve at least 12 inches beyond any area where it is required to be installed, and terminate with valve box extended to grade, and marked "GAS".
- N. Maintain minimum of 12 inch clearance between gas piping and steam piping above 200 degrees F.

### 3.07 PIPE JOINTS AND CONNECTIONS

- A. General:
  - 1. Cutting: Cut pipe and tubing square, remove rough edges or burrs. Bevel plain ends of steel pipe.
  - 2. Remove scale, slag, dirt and debris from inside and outside of pipe before assembly.
  - 3. Boss or saddle type fittings or mechanically extracted tube joints will not be allowed.
- B. Threaded Pipe: 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 thread compound to external pipe threads: Rectorseal No. 5, Permatex No. 1, or equal.
  2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- C. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.
- D. Joint Construction for Solvent-Cemented Plastic Piping: Clean and dry joining surfaces. Join pipe and fittings according to the following:
1. Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements. Apply primer.
  2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
  3. PVC Piping: Join according to ASTM D 2855.
- E. Copper Pipe and Tubing (Except pneumatic control piping): All joints shall be brazed according to ASME Section IX, Welding and Brazing Qualifications, except domestic water piping 1-1/4 inches and smaller when not buried in the ground or concrete and type DWV plumbing piping may be soldered.
1. Soldered joints: Apply water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828.
- F. Cast Iron Soil Pipe:
1. No-Hub fittings shall be made with a torque wrench.
  2. Hub joints shall be with Ty-Seal couplings.
  3. Wrought iron, steel, or copper pipe shall have a ring or part of a coupling screwed on to form a spigot end if caulked into a joint.
  4. Connect cast iron sewer piping to outside service pipe with cast iron or vitrified LOP reducers or increasers as required. Caulking of smaller pipe into the larger without a reducer or increaser will not be permitted.
- G. Welded Pipe:
1. Make up with oxyacetylene or electric arc process.
  2. All line welds shall be of the single "V" butt type. Welds for flanges shall be of the fillet type.
  3. Where the branch is two pipe sizes smaller than the main or smaller, Bonney Weldolets, Thredolets, Nibco, or equal, may be used in lieu of welding tees.
- H. PVC Sewer and Drainage Pipe (outside building as allowed only): Four inches and larger shall be bell and spigot, assembled in accordance with manufacturer's recommendations. Joint shall be tested in accordance with ASTM D3212. Solvent weld joints below 4 inches in size, schedule 40 PVC with matching fittings, assembled per manufacturer's instructions.
- I. PVC Pool Pipe: Assemble main recirculation piping with flanged joints. Assemble joints in strict accordance with manufacturer's instructions. PVC Drain Pipe: Make joints with PVC couplings and rubber rings, except deck drain pipe shall be solvent welded.

- J. Polyethylene and Polypropylene Pipe: Assemble with fusion joints in strict accordance with manufacturer's instructions.
- K. Make joints in PVC water pipe with PVC couplings and rubber rings, Manville Ring-Tite, PW Pipe, or equal. Check final location of rubber rings with the couplings with gauge or as recommended by the manufacturer. Make joints between PVC pipe and cast iron pipe or fittings using cast iron or PVC adapter fittings, installed as recommended by the manufacturer. Ring-Tite PVC or cast iron pipe fittings may be used in lieu of standard fittings. Make connection to valves with cast iron adapters connected to the water pipe with PVC couplings.
- L. Flexible Connections:
  - 1. Furnish and install Thermo Tech., Inc. F/J/R, Metraflex, or equal, flexible couplings with limiter bolts on piping connections to all equipment mounted on anti-vibration bases, on each connection to each base mounted pump and where shown. Couplings shall be suitable for pressure and type of service.
  - 2. Anchor piping securely on the system side of each flexible connection.

### 3.08 INSTALLATION OF VALVES

- A. Install valves as indicated on Drawings and in the following locations:
  - 1. Shutoff Valves: Install on inlet of each plumbing equipment item, and on inlet of each plumbing fixture, and elsewhere as indicated.
  - 2. Drain Valves: Install on each plumbing equipment item located to completely drain equipment for service or repair. Install at base of each riser, at base of each rise or drop in piping system, and elsewhere indicated or required to completely drain potable water system.
  - 3. Provide gate or globe valves on inlet and outlet of each water heater or pump.
- B. General:
  - 1. Valves shall be full line size unless indicated otherwise on Drawings.
  - 2. Install horizontal valves with valve stem above horizontal, except butterfly valves.
  - 3. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
  - 4. Locate valves for easy access and provide separate support where necessary.
  - 5. Install valves in position to allow full stem movement.
  - 6. Install exposed polished or enameled connections with special care showing no tool marks or exposed threads.
  - 7. Butterfly valves conforming to the paragraph "Butterfly Valves" may be used in lieu of gate or globe valves for locations above grade.
  - 8. Ball valves conforming to the paragraph "Ball Valves" may be used in lieu of gate valves for locations above grade for services 2-1/2 inches and smaller.
  - 9. Valves 2-1/2 inches and smaller (except ball valves) in nonferrous water piping systems may be solder joint type with bronze body and trim.
  - 10. Rigidly fasten hose bibbs, hydrants, fixture stops, compressed air outlets, and similar items to the building construction.
- C. Gate Valves:

1. Furnish valves in copper lines with adapters to suit valve / line requirements.
2. Underground gate valves:
  - a. Underground valves 3 inches and smaller may be furnished with operating nuts or hand-wheels, and with Ring-Tite joint ends.
  - b. Furnish and deliver to Owner one wrench of each size required for operating underground valves.
- D. Swing Check Valves: Install in horizontal position with hinge pin level.
- E. Butterfly Valves: Install with stems horizontal.
- F. Silent Check Valves: Install in horizontal or vertical position between flanges.
- G. Calibrated Balancing Valves: Install calibrated balancing valves per manufacturers' recommendations, including requirements for straight pipe lengths at valve inlet and outlet.
- H. Gas Shut-Off Valves:
  1. Provide line size ball valve in gas line to each appliance.
  2. Provide line size ball valve in gas line, to be used as emergency shut-off for science classrooms. Install valve in locking box where indicated on the drawings.
  3. Provide line size electric solenoid gas valve in gas line to kitchen equipment (if not supplied with appliance) under Type 1 hood. Interlock with hood fire alarm system.
- I. Valve Adjustment: Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

### 3.09 INSTALLATION OF CLEANOUTS

- A. Cleanouts: Install in piping as indicated, as required by California Plumbing Code, at each change in direction of piping greater than 45 degrees. Install at maximum intervals of 50 feet for piping 4 inches and smaller and 100 feet for larger piping inside buildings, and at base of each conductor.
- B. Flashing Flanges: Install flashing flange and clamping device with each cleanout passing through water resistant membrane.

### 3.10 INSTALLATION OF FLOOR DRAINS AND FLOOR SINKS

- A. Install drains in accordance with manufacturer's written instructions and in locations indicated. Install floor drains with lip of drain slightly below finished floor to ensure drainage. Install floor sinks flush with finished floor. Coordinate with other trades to ensure that floor slopes to drain. Provide flashing flange and clamping device with each drain passing through water resistant membrane.
- B. Install vented P-trap below each drain. Where trap primers are indicated, install trap primer connection in the P-trap.

### 3.11 INSTALLATION OF ROOF DRAINS AND OVERFLOW DRAINS

- A. Install roof drains and overflow roof drains in accordance with manufacturer's written instructions and in locations indicated.

- B. Coordinate with roofing as necessary to interface roof drains with roofing work.

### 3.12 INSTALLATION OF HOPPER DRAINS

- A. Install hopper drain in wall, in sheet metal box, with access door.
  - 1. Size access door and box to suit the size required for hopper drain and trap primer, and solder all seams of box. Seal all penetrations to box with non-hardening waterproof sealant. Provide locking door in occupied spaces.
- B. Grind top and sides of funnel, if required, to suit wall thickness.

### 3.13 BACKFLOW PREVENTER INSTALLATION

- A. Install backflow preventers where indicated on Drawings. Provide drain connection available from the manufacturer at drain connection, pipe drain outlet to the nearest floor drain.
  - 1. Where drain pans are shown on the Drawings, pipe drain pan outlet to nearest floor drain.

### 3.14 TRAP PRIMER INSTALLATION

- A. Install as indicated in manufacturers printed literature, with 1/2 inch, Type L, hard copper piping to trap primer connection on floor drains and floor sinks where indicated on Drawings. At Contractor's option, Type K annealed copper tubing without joints may be used below slab only. See Section 22 00 50 for pipe protection requirements for below slab copper piping/tubing.
- B. Install trap primer piping with 1/4 inch per foot slope, to insure that the line will drain fully to the floor drain or floor sink.
  - 1. Provide ball valve to the inlet at each trap primer location.
- C. Install trap primer and distribution unit exactly as called for in manufacturers printed installation instructions. Connect to domestic water piping from the top of the water line, in order to prevent foreign material from entering directly into primer assembly.
- D. Mount trap primer in wall, in sheet metal box, with Karp or equal access door. Size access door and box to suit valve operation, and solder all seams of box. Seal all penetrations to box with non-hardening waterproof sealant. Provide locking door where installed in occupied spaces.
- E. Where one trap primer will be used for more than one trap, provide a distribution unit with feeder piping for a maximum of four traps sized for equal pressure drop to each trap.

### 3.15 INSTALLATION OF GAS PRESSURE REGULATING VALVES

- A. Install as indicated; comply with utility requirements. In locations where regulators are installed in confined spaces, pipe atmospheric vent to outdoors, full size of outlet. Install gas shutoff valve upstream and downstream of each pressure-regulating valve.

### 3.16 GAS PIPING EQUIPMENT CONNECTIONS

- A. Connect gas piping to each gas-fired equipment item, with union, drip leg and shutoff gas cock full size of supply line shown. Reduce only at connection to equipment. Comply with equipment manufacturer's instructions.
  - 1. Route gas vent and gas relief to outside.
  - 2. Gas shutoff valve shall be placed as close as possible to equipment in a location where it can be serviced. Distance from equipment to valve shall not exceed 6 feet.

### 3.17 EQUIPMENT CONNECTIONS

- A. Piping Runouts to Fixtures: Provide hot and cold water piping runouts to fixtures of sizes indicated.
- B. Mechanical Equipment Connections: Connect hot and cold water piping system and gas piping system to mechanical equipment as indicated, and provide with shutoff valve and union for each connection.

### 3.18 DOMESTIC WATER SYSTEM STERILIZATION

- A. Clean and disinfect new or altered hot and cold water piping connected to domestic water systems using methods prescribed by the Health Authority. If the Health Authority does not prescribe methods, clean and disinfect new or altered hot and cold water piping using methods given in the California Plumbing Code.
  - 1. A water treatment company that has a current state EPA license to apply disinfectant chlorine in potable water shall perform the procedure.

### 3.19 CARE AND CLEANING

- A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment, fixtures, and trim that are installed as part of this work. Remove labels from stainless steel sinks, except 316 stainless steel sink labels should be retained to confirm that the correct material has been provided. Leave systems and equipment in satisfactory operating condition.

### 3.20 OPERATIONAL TESTS

- A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

### 3.21 TESTING AND BALANCING

- A. See Section 23 05 93 of Specifications for testing and balancing requirements.

3.22 CLEANING UP

- A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

END OF SECTION



SECTION 22 40 00

PLUMBING FIXTURES

**PART 1 - GENERAL**

1.01 SUMMARY

A. Section Includes:

1. Water supplies and stops.
2. Plumbing fixture hangers and supports.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.03 ACTION SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Product Data: Submit manufacturer's specifications for plumbing fixtures and trim, including catalog cut of each fixture type and trim item furnished.

1.04 INFORMATIONAL SUBMITTALS

- A. Refer to Section 22 00 50, Basic Plumbing Materials and Methods.

1.05 CLOSEOUT SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts lists for each fixture type and trim item, including instructions for care of finishes. Include this data in Operation and Maintenance Manual.

1.06 QUALITY ASSURANCE

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Plumbing Fixture Standards: Comply with applicable portions of the following codes and requirements for all work in this Section:
  1. California Building Code – CBC
  2. California Plumbing Code – CPC
  3. California Health and Safety Code
  4. American National Standards Institute - ANSI
  5. Federal Standards - F.S.

- 6. National Sanitary Foundation – NSF International
- C. ANSI Standards: Comply with ANSI/NSF 61, “Drinking Water System Components – Health Effects.”
- D. PDI Compliance: Comply with standards established by Plumbing and Drainage Institute pertaining to plumbing fixture supports.
- E. Americans with Disabilities Act (ADA).
- F. California Green Building Standards Code Requirements:
  - 1. Tank-type water closets shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Tank-Type Toilets.
  - 2. Single Showerheads shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Showerheads.

## **PART 2 - PRODUCTS**

### **2.01 PLUMBING FIXTURES**

- A. General: Provide factory fabricated fixtures of type, style and material indicated. For each type fixture, provide fixture manufacturer's standard trim, carrier, seats, and valves as indicated by their published product information; either as designed and constructed, or as recommended by the manufacturer, and as required for a complete, installation. Where more than one type is dedicated, selection is Contractor's option; but, all fixtures of same type must be furnished by single manufacturer.
  - 1. Take special care with the roughing-in and finished plumbing where batteries of fixtures occur.
  - 2. Take location and mounting heights for roughing-in from Architectural Drawings.
  - 3. Follow schedule on Plumbing Drawings for roughing-in connections. Set roughing-in for all fixtures exactly as per measurements furnished by the manufacturers of the fixtures used.
  - 4. Roughing-in for lavatories and sinks shall be brought in through the wall under the centerline of the drain from the fixture wherever possible and as close to the fixture as possible.

### **2.02 MATERIALS**

- A. Provide materials that have been selected for their surface flatness and smoothness. Exposed surfaces that exhibit pitting, seam marks, roller marks, foundry sand holes, stains, discoloration, or other surface imperfections on finished units are not acceptable.
- B. Where fittings, trim and accessories are exposed or semi-exposed, provide, chromium plated 17 gauge seamless brass and match faucets and fittings. Provide 17 gauge seamless copper or brass where not exposed.
- C. Handles on all faucets and stops shall be all metal chromium plated.
- D. NSF Standard: Comply with NSF 61 and NSF 372 for supply-fitting materials that will be in contact with potable water.

### 2.03 PLUMBING FITTINGS, TRIM AND ACCESSORIES

- A. Water Outlets: At locations where water is supplied (by manual, automatic or remote control), provide commercial quality faucets, valves, or dispensing devices, of type and size indicated, and as required to operate as indicated.
  - 1. Include manual shutoff valves and connecting stem pipes to permit outlet servicing without shut-down of water supply piping systems.
- B. P-Traps: Include IAPMO approved removable P-traps where drains are indicated for direct connection to drainage system. P-Traps shall be less trap screw cleanout, and incorporate a chrome plated cast brass body, brass connection nuts, 17 gauge seamless brass wall return and chrome plated wall escutcheon to match trap finish.
- C. Carriers: Provide cast iron supports for fixtures of graphitic gray iron, ductile iron, or malleable iron as indicated. Where the carrier for wall mounted water closets are installed more than 6 inches behind the finished wall, provide water closet support for wide pipe chase.
- D. Fixture Bolt Caps: Provide manufacturer's standard exposed fixture bolt caps finished to match fixture finish.
- E. Escutcheons: Where fixture supplies and drains penetrate walls in exposed location, provide chrome-plated cast brass escutcheons with setscrews.
- F. Aerators: Provide aerators of types approved by Health Departments having jurisdiction. Delete aerators where not allowed by CPC for health care occupancies.
- G. Comply with additional fixture requirements contained in Fixture Schedule shown on the drawings.

### 2.04 MANUFACTURERS

- A. In accordance with California Plumbing Code, provide indelibly marked or embossed manufacturers name or logo, arranged so as to be visible after installation.
- B. Manufacturers: Drawing schedules indicate Basis of Design products. Subject to compliance with requirements, provide product indicated on Drawings, or comparable product by one of the following:
  - 1. Vitrified China Plumbing Fixtures:
    - a. American Standard, U.S. Plumbing Products.
    - b. Eljer Plumbingware Div., Wallace-Murray Corp.
    - c. Kohler Co.
    - d. Vitra.
  - 2. Plumbing Trim:
    - a. McGuire Manufacturing Co., Inc.
    - b. Delta Commercial.
    - c. Chicago Faucet Co.
    - d. T&S Brass and Bronze Works, Inc.

3. Faucets:
    - a. Chicago Faucet Co.
    - b. Symmons Scott.
    - c. T&S Brass and Bronze Works, Inc.
    - d. Delta Commercial.
  
  4. Fixture Seats:
    - a. Church Seat Co.
    - b. Bemis Mfg. Co.
    - c. Beneke Corp.
  
  5. Water Coolers and Drinking Fountains:
    - a. Haws Corporation.
    - b. Halsey Taylor Mfg. Co.
    - c. Elkay Mfg. Co.
    - d. Acorn Aqua.
  
  6. Service Sinks:
    - a. American Standard.
    - b. Kohler Co.
    - c. Williams Serviceptor.
    - d. Florestone.
    - e. Acorn.
  
  7. Emergency Equipment:
    - a. Haws Corporation.
    - b. Gardian.
    - c. Symmons.
    - d. Bradley.
    - e. Encon.
- 2.05 FIXTURE CONNECTIONS
- A. Make connection between fixtures and flanges on soil pipe absolutely gastight and watertight with neoprene type gaskets (wall hung fixtures) or bowl wax (floor outlet fixtures). Rubber gaskets or putty will not be permitted.
  
  - B. Provide fixtures not having integral traps with P-traps of chromium-plated 17 gauge cast brass, with 17 gauge seamless brass wall return, connected to concealed waste in wall and sanitary fittings. Provide IAPMO approval for trap, and provide less trap screw cleanout.
    1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
      - a. Dearborn Brass, Commercial series with brass nuts.
      - b. Delta Commercial.
      - c. McGuire Manufacturing Co., Inc.

- C. Connections from stacks or horizontal wastes to wall or floor finish for wastes from lavatories, urinals, sinks, and drinking fountains and connection between floor drains and traps shall be IPS 85 percent red brass pipe.
- D. Plumbing fixture traps connected to special waste systems shall be constructed of materials to suit the waste system.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Orion.
    - b. Enfield
- E. Unions on waste pipes on fixture side of traps may be slip or flange joints with soft rubber or lead gaskets. Traps shall rough in full size to waste and vent connection, using deep escutcheon plate to cover wall penetration. Compression adaptor extensions or sweat adaptors are not acceptable.

## 2.06 WATER SUPPLIES AND STOPS

- A. Provide 85 percent IPS threaded red brass nipple, conforming to the lead-free requirements of California Health and Safety Code Section 11 68 75, securely anchored to building construction, for each connection to stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have stop valves installed on water supply lines.
- B. Provide water supplies to fixtures with compression shut-off stops with threaded inlets and lock shield-loose key handles. Provide combination fixtures with compression stop and threaded inlet on each water supply fitting. Provide lock shield-loose key handle for each stop.
- C. Provide 1/2 inch riser tubes with reducing coupling for fixtures, unless otherwise noted.
- D. Provide cast brass escutcheon.
- E. Furnish shut-off valves on hose bibbs where directly connected to mains with no intervening valves.
- F. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1. McGuire Manufacturing Company, Inc., model LFH2167LK.
  - 2. T & S Brass and Bronze Works, Inc., model B-1305.

## 2.07 PLUMBING FIXTURE HANGERS AND SUPPORTS

- A. Floor-affixed supports for off-the-floor plumbing fixtures shall comply with ASME A112.6.1M.
- B. Residential type fixture supports are not acceptable.
- C. Install wall mounted water closets with combination support and waste fittings, with feet of support securely anchored to floor.
- D. Install floor mounted water closets with J.R. Smith, Zurn, or equal government pattern cast iron closet flanges with brass bolts, nuts, washers, and porcelain caps secured with Spackle.

- E. Install the following fixtures on concealed support with feet of support securely anchored to floor. Anchor top of support to wall construction in an approved manner.
  - 1. Wall hung lavatories.
  - 2. Wall mounted urinals.
  - 3. Drinking fountains.
  - 4. Electric water coolers.

## 2.08 PLUMBING FIXTURES

- A. Install all plumbing fixtures at height indicated on Architectural Drawings. Where mounting height is not indicated, install at height required by Code.
- B. Special Requirements For Accessible Fixtures:
  - 1. Operating handle or valve for accessible water closets, urinals, lavatories, and sinks shall operate with less than 5 pounds force. Metering faucets shall be adjusted to operate between 10 and 15 seconds.
  - 2. Insulate exposed waste piping and domestic water supplies below accessible fixtures with CBC access code compliant molded "closed-cell" vinyl covers. Covers shall be installed using vandal resistant fasteners and must be removable. Covers shall meet flame spread rating not to exceed 25 and smoke density not to exceed 50 when tested in accordance with ASTM E-84, and shall comply with the requirements of California Code of Regulations, Title 24. Plumberex – Handy Shield, Johns Manville – Zeston 2000, or equal.

## PART 3 - EXECUTION

### 3.01 PRODUCT HANDLING AND PROTECTION

- A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

### 3.02 PREPARATORY PROVISIONS

- A. The Contractor is responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section. Do not proceed until all unsatisfactory conditions have been corrected. Commencing work will be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

### 3.03 INSPECTION AND PREPARATION

- A. Examine roughing-in work of domestic water and waste piping systems to verify actual locations of piping connections prior to installing fixtures. Also examine floors and substrates, and conditions under which fixture work is to be accomplished. Correct any incorrect locations of piping, and other unsatisfactory conditions for installation of plumbing fixtures. Do not proceed with work until unsatisfactory conditions have been corrected.
- B. Install plumbing fixtures of types indicated where shown and at indicated heights; in accordance with fixture manufacturer's written instructions, roughing-in drawings. Ensure that plumbing

fixtures comply with requirements and serve intended purposes. Comply with applicable requirements of the National Standard Plumbing Code pertaining to installation of plumbing fixtures.

- C. Fasten plumbing fixtures securely to supports or building structure; and ensure that fixtures are level and plumb. Secure plumbing supplies to blocking behind or within wall construction so as to be rigid, and not subject to pull or push movement.
- D. Install CBC accessible fixtures in accordance with Chapter 4 California Plumbing Code, and Chapters 11A and 11B California Building Code.

#### 3.04 FAUCET INSTALLATION

- A. Provide 85 percent IPS red brass pipe, conforming to lead-free requirements of California Health and Safety Code Section 11 68 75, securely anchored to building construction, for each connection to faucets, stops, hose bibbs, etc. Each fixture, except hose bibbs, shall have a stop valve installed on water supply lines to permit repairs without shutting off water mains.
- B. Adjust metering faucets to run for 10 to 15 seconds.

#### 3.05 CLEAN AND PROTECT

- A. Clean plumbing fixtures of dirt and debris upon completion of installation.
- B. Protect installed fixtures from damage during the remainder of the construction period.
- C. Grout voids between all fixtures and adjacent surfaces with white Dow Silicone Sealant, arranged to shed water.

#### 3.06 FIELD QUALITY CONTROL

- A. Upon completion of installation of plumbing fixtures and after units are water pressurized, test fixtures to demonstrate capability and compliance with requirements. When possible, correct malfunctioning units at site, then retest to demonstrate compliance; otherwise, remove and replace with new units and proceed with retesting.

#### 3.07 EXTRA STOCK

- A. General: Furnish special wrenches and other devices necessary for servicing plumbing fixtures and trim to Owner with receipt. Furnish one device for every ten units.

END OF SECTION



SECTION 22 50 00  
PLUMBING EQUIPMENT

**PART 1 - GENERAL**

1.01 SUMMARY

A. SECTION INCLUDES

1. Commercial electric water heaters.
2. Instantaneous electric water heaters.
3. Gas fired water heaters.
4. Expansion tanks.
5. In-line domestic hot water recirculation pumps.
6. Neutralizing basin.
7. Catch basin.
8. Insulation.

1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Section 22 00 50 Basic Plumbing Materials and Methods.

1.03 ACTION SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Product Data: Submit manufacturer's plumbing equipment specifications, installation and start-up instructions, capacity and ratings, with selection points clearly indicated.

1.04 INFORMATIONAL SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.

1.05 CLOSEOUT SUBMITTALS

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Maintenance Data: Submit maintenance data and parts lists for each item of plumbing equipment. Include "trouble-shooting" maintenance guides. Include this data in Operation and Maintenance Manual.

1.06 QUALITY ASSURANCE

- A. For additional requirements, refer to Section 22 00 50, Basic Plumbing Materials and Methods.
- B. Trade names or catalog numbers stated herein indicates grade or quality of materials desired.

- C. Dimensions, sizes, and capacities shown are minimum and shall not be changed without permission of Architect.
- D. UL and NEMA Compliance: Provide electric motors and electrical components required as part of plumbing equipment, which have been listed and labeled by Underwriters Laboratories and comply with NEMA standards.
- E. Pump types and sizes regulated by the US Department of Energy's "Energy Conservation Standards for Pumps" 10 CRF Parts 429 and 431 shall be marked with a compliant PEI<sub>CL</sub> or PEI<sub>VL</sub> (Pump Energy Index, constant or variable load) value, basic model number, and RPM on the nameplate. Regulated pumps shall be listed in the Hydraulic Institute (HI) Energy Rating database (er.pumps.org) and be assigned an Energy Rating as defined in the HI 40.5 program guide.
- F. CEC Compliance: Comply with California Electrical Code (Title 24, Part 3) as applicable to installation and electrical connections of ancillary electrical components of plumbing equipment.
- G. ANSI Compliance: Comply with ANSI Z223.1 (NFPA 54) "National Fuel Gas Code", as applicable to installation of gas-fired water heaters.
- H. CSA/UL Labels:
  - 1. Provide gas-fired water heaters that have been listed and labeled by CSA International or Underwriters Laboratories, certifying design according to ANSI Z21.10.1-CSA 4.1 standards governing storage-type water heaters with input ratings of 75,000 BTU/hr. or less.
  - 2. Provide gas-fired water heaters that have been listed and labeled by CSA International or Underwriters Laboratories, certifying design according to ANSI Z21.10.3-CSA 4.3 standards governing storage-type water heaters with input ratings of greater than 75,000 BTU/hr.
- I. ASME Relief Valve Stamps: Provide water heaters with safety relief valves bearing ASME valve markings.
- J. ASME Code Symbol Stamps: For the following equipment, comply with ASME Boiler and Pressure Vessel Code for construction, and stamp with ASME Code symbol:
  - 1. Water Heaters 200 MBH and greater.
- K. California Energy Commission Compliance: Provide written confirmation of listing of all water heaters in the "Appliance Efficiency Database."

#### 1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver packaged materials in their original, unopened wrapping with labels intact. Protect materials from water, the elements and other damage during delivery, storage and handling.

#### 1.08 WARRANTY

- A. Commercial Electric Water Heaters: Three-year minimum limited warranty on tank leakage.
- B. Atmospheric Gas Fired Water Heaters: Three-year minimum limited warranty on tank.

- C. Power Gas Fired Water Heaters: Three-year minimum limited warranty on tank.
- D. Direct Vented Sealed Combustion Condensing Gas-Fired Water Heater: Three-year minimum limited warranty on tank.
- E. Instantaneous Gas-Fired Water Heater: three-year minimum limited warranty on heat exchanger and parts.

## **PART 2 - PRODUCTS**

### **2.01 MATERIALS**

- A. NSF Compliance: Fabricate and label equipment components that will be in contact with potable water to comply with NSF 61 and NSF 372.
- B. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).

### **2.02 COMMERCIAL ELECTRIC WATER HEATERS**

- A. General: Provide commercial electric water heaters of size, capacity, and electrical characteristics indicated on Drawings. Comply with ASHRAE 90.1 for energy efficiency. Provide UL listing. Relief valve dip tube shall extend to within 3 inches of tank.
- B. Heater: Working pressure of 150 psi, magnesium anode rod; glass lining on internal surfaces exposed to water.
- C. Heating Elements: Heavy-duty, medium watt density, with incoloy sheath or zinc plated copper, thermostat stepped through magnetic contactor.
- D. Safety Controls: Double-pole, manual-reset, high-limit, probe type electric water low water cutoff; both factory wired.
- E. Jacket: Equip with full size control compartments with front panel opening. Insulate tank with vermin resistant polyurethane or glass fiber insulation. Provide outer steel jacket with bonderized undercoat and baked enamel finish.
- F. Provide the following accessories:
  - 1. Brass drain valve.
  - 2. 3/4 inch temperature and pressure relief valve.
  - 3. Thermometer.
- G. Provide equal flow manifold for piping entering and leaving the water heaters. Manifold shall be provided as a standard option for the heaters proposed.
- H. Controls: Adjustable immersion thermostat or surface mounted therm-o-disc; power circuit fusing.

- I. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
1. Bradford White Corporation.
  2. Lochinvar Corporation.
  3. PVI Industries, LLC.
  4. Rheem Manufacturing Company.
  5. Smith, A.O. Water Products Co.; a division of A.O. Smith Corporation.

## 2.03 INSTANTANEOUS ELECTRIC WATER HEATERS

- A. General: Wall mounted, microprocessor-controlled, electric heating style.
- B. Standard: UL 499 for electric, tankless, (domestic-water heater) heating appliance.
- C. Construction: Copper piping or tubing complying with NSF 61 and NSF 372 barrier materials for potable water, without storage capacity.
1. Connections: ASME B1.20.1 pipe thread.
  2. Pressure Rating: 150 psig .
  3. Heating Element: Resistance heating system.
  4. Temperature Control: Flow-control fitting.
  5. Safety Control: High-temperature-limit cutoff device or system
  6. Jacket: Aluminum or steel with enameled finish or plastic.
- D. Support: Bracket for wall mounting.
- E. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
1. Chronomite Laboratories, Inc.
  2. Eemax, Inc.

## 2.04 GAS FIRED WATER HEATERS

- A. General: All units shall comply with the emissions requirements of the Air Quality Management District (AQMD) in which they are to be installed.
- B. Atmospheric Gas Fired Water Heaters:
1. General: Provide commercial atmospheric gas-fired water heater of size, capacity, and electrical characteristics indicated on Drawings. Comply with ASHRAE 90.1 for energy efficiency. Provide UL or CSA International listing.
  2. Heater: Working pressure of 150 psi, rigidly supported magnesium anode rod, glass lining on internal surfaces exposed to water. Provide gas pressure regulator, adjusted for operation on natural gas, with pressure rating to suit heater listing. Provide hand-hole cleanout through tank and jacket.
  3. Jacket: Insulate tank with rigid polyurethane foam or fiberglass insulation. Provide heavy-gauge steel jacket and baked enamel finish.
  4. Accessories: Provide brass drain valve and 3/4 inch temperature and pressure relief valve. Provide thermometer, installed in the top 1/3 of the tank or at hot water discharge at the tank.

5. Controls: Adjustable immersion thermostat with safety shutoff.
6. Vent: Furnish and install "Metalbestos", Selkirk, or equal, Type B vent, UL listed. Furnish complete with roof support, flashing, Briedert Type L, Metalbestos, or equal stainless stack cap, and all supports and accessories required for a complete installation.
7. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Bradford White Corporation.
  - b. Lochinvar Corporation.
  - c. PVI Industries, LLC.
  - d. Rheem Manufacturing Company.
  - e. Smith, A.O. Water Products Co.; a division of A.O. Smith Corporation.

C. Power Gas Fired Water Heaters:

1. General: Provide commercial power gas-fired water heater of size, capacity, and electrical characteristics as noted on Drawings. Comply with ASHRAE 90.1 for energy efficiency. Provide UL or CSA International listing. Units with gas input above 200 MBH shall be ASME constructed and listed, stamped for 125 PSIG.
2. Heater: Working pressure of 150 psi, magnesium anode rod, glass lining on internal surfaces exposed to water.
3. Jacket: Insulate tank with vermin-proof glass fiber or polyurethane foam insulation. Provide heavy-gauge steel jacket and baked enamel finish.
4. Accessories: Provide brass drain valve and 3/4 inch temperature and pressure relief valve. Provide thermometer, installed in the top 1/3 of the tank or at hot water discharge at the tank.
5. Provide equal flow manifold for piping entering and leaving the water heaters. Manifold shall be provided as a standard option for the heaters proposed.
6. Controls: Adjustable immersion thermostat with safety shutoff.
7. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - a. Bradford White Corporation.
  - b. Lochinvar Corporation.
  - c. PVI Industries, LLC.
  - d. Rheem Manufacturing Company.
  - e. Smith, A.O. Water Products Co.; a division of A.O. Smith Corporation.
8. Vent: Furnish and install "Metalbestos", Selkirk, or equal, Model PS, all-steel vent, UL listed. Furnish complete with roof support, flashing, Briedert, Metalbestos, or equal, Type L stainless stack cap, .035" stainless steel inner pipe, and all supports and accessories required for a complete installation. All joints shall be sealed with silicone sealant as recommended by the manufacturer for pressure-tight joints.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - 1) American Metal Products
    - 2) Selkirk
    - 3) Metalbestos

D. Direct Vented Sealed Combustion Condensing Gas-Fired Water Heater:

1. General: Provide commercial direct vented sealed combustion condensing gas-fired water heater of size, capacity, and electrical characteristics as noted on Drawings. Provide UL or CSA International listing. Design unit to conform to the following:
    - a. ASHRAE/IESNA 90.1.
    - b. California NOx emission requirements.
    - c. Units with gas input above 200 MBH shall be ASME constructed and listed, stamped for 150 PSIG.
    - d. Minimum efficiency of 95 percent.
  2. Storage Tank Construction: Seamless steel with 150 psig working-pressure rating, glass lining on internal surfaces exposed to water.
  3. Factory-Installed Storage Tank Appurtenances:
    - a. Anode Rods: Magnesium.
    - b. Jacket: Heavy-gauge steel with enameled finish.
    - c. Cleanout: Hand-hole cleanout through tank and jacket.
    - d. Burner: Low NOx, pre-mix powered type, down-fired configuration.
    - e. Insulation: Non-CFC foam.
    - f. Drain Valve: Brass construction.
    - g. Heat Exchanger Coil: Located within submerged combustion chamber.
    - h. Combination Temperature and Pressure Relief Valve.
    - i. Dielectric Fittings.
  4. Accessories: Provide thermometer, installed in the top 1/3 of the tank or at hot water discharge at the tank.
  5. Controls: Adjustable electronic immersion thermostat with safety shutoff.
  6. Condensate Drain Piping: CPVC piping as defined in Section 22 10 00.
  7. Vent and Exhaust Piping: CPVC piping as defined in Section 22 10 00
  8. See equipment Schedule and details on Drawings for additional accessories and requirements.
  9. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Bradford White Corporation.
    - b. Lochinvar Corporation.
    - c. PVI Industries, LLC.
    - d. Rheem Manufacturing Company.
    - e. Smith, A.O. Water Products Co.; a division of A.O. Smith Corporation.
- E. Instantaneous Gas-Fired Water Heater:
1. General: Provide instantaneous gas-fired water heater of size, capacity, and electrical characteristics as noted on Drawings. Unit shall be suitable for interior or exterior installation and multiple-unit battery configuration as shown on Drawings, and shall be design certified and listed by CSA International. Design unit to conform to the following:
    - a. ASHRAE/IESNA 90.1.
    - b. California NOx emission requirements.
    - c. Minimum efficiency of 82 percent.
    - d. 150 PSI maximum water pressure.
  2. Factory-Installed Appurtenances:
    - a. Jacket: Heavy-gauge steel with enameled finish.

- b. Burner: Low NOx, horizontal stainless steel, direct electronic ignition.
  - c. Gas Valve: Automatic modulating type.
  - d. Gas Pressure Regulator.
  - e. Heat Exchanger Coil: Copper, integral fin and tube type.
3. Accessories: Provide with the following:
    - a. Thermometer, as described in Section 22 00 50.
    - b. Wall mounting bracket.
    - c. ASME pressure relief valve.
  4. Controls and Safeties: Shall provide the following features:
    - a. Flame proof sensor.
    - b. High temperature shut-off.
    - c. Over-current protection.
    - d. Freeze protection.
  5. Vent and Exhaust Piping: Provide field-fabricated or factory furnished piping as required by unit manufacturer for exterior or interior installations. Piping material shall be per unit manufacturers' requirements. Provide factory furnished vent termination cap for exterior installations.
  6. See equipment Schedule and details on Drawings for additional accessories and requirements.
  7. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Bradford White Corporation.
    - b. Rinnai Corporation.
    - c. Takagi Industrial Corporation.

## 2.05 EXPANSION TANKS

- A. Provide thermal expansion tanks of size and number as indicated on Drawings, conforming to lead-free requirements of California Health and Safety Code Section 11 68 75. Construct tank of welded steel for working pressure of 125 psi. Provide specially compounded flexible diaphragm securely sealed into tank to permanently separate air charge from system water, to maintain design expansion capacity.
  1. Tanks shall be IAPMO approved and listed for use with domestic water systems.
- B. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  1. Amtrol, Inc.
  2. A.O. Smith Water Products Company.
  3. Watts Water Technologies, Inc.

## 2.06 IN-LINE DOMESTIC HOT WATER RECIRCULATION PUMPS

- A. Provide lead-free in-line domestic water recirculation pumps where indicated on Drawings and of capacities as scheduled on Drawings. Pumps shall be third-party certified by an approved laboratory as complying with California Health and Safety Code Section 11 68 75.

- B. Pumps shall be of the centrifugal type with non-overloading characteristics and shall not overload the motor above its nameplate horsepower rating under any operating condition. No allowance for service factor shall be used in pump selection. Motor horsepower shown is minimum; furnish larger motors if necessary to meet the non-overloading requirements.
- C. Type: Horizontal, designed for 125 thru 150 psi maximum working pressure and 225 degrees F continuous water temperature.
- D. Construction: Bronze casing, non-metallic impeller.
- E. Shaft: Ceramic, supported by carbon bearings. Bearings shall be lubricated by the pumped water.
- F. Motors shall have permanently lubricated ball bearings. Motors shall meet NEMA specifications. Motors shall have built-in thermal overload or impedance protection.
- G. Provide control wiring between field-installed controls, indicating devices, and pump control panels as work of this section, complying with requirements of Division 26 sections:
  - 1. Control wiring specified as work of Division 23 for Automatic Temperature Controls is work of that section.
- H. Wire pumps to mechanical control circuits to shut down pump when building is not occupied. Where no control system is installed, furnish pump manufacturers standard timer to automatically turn off circulating pump when hot water is not required.
- I. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
  - 1. Grundfos Pumps Corporation.
  - 2. Bell & Gossett, ITT Corporation.
  - 3. Taco Incorporated.
  - 4. Armstrong Pumps, Inc.

## 2.07 NEUTRALIZING TANKS

- A. Plastic-Tank Neutralization Systems
  - 1. Description: System for neutralizing chemical waste.
  - 2. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Orion Fittings; a Watts Water Technologies company.
    - b. Town & Country Plastics, Inc.
  - 3. Controls: Factory wired and tested, 120 V ac, to operate probes, and to monitor pH of effluent; with wiring and electrical-power cord and plug.
  - 4. Panel: NEMA 250, Type 4X enclosure unless otherwise indicated; with manufacturer's standard features, control devices, and indicators, but not less than the following:
    - a. Power light and on/off switch.
    - b. pH analyzer with programmable meter and high- and low-pH indicators, factory calibrated.
    - c. Analyser and sensor fault detection.

- d. NEMA 5-15R audible and visual alarm with reset switch, with 4-20 mA output for remote indication.
  - e. Provide with contacts for connection to building energy management system.
5. Piping between Tanks: Polypropylene. Refer to Section 22 10 00, Plumbing Piping Systems.
  6. Neutralization Tank: Polyethylene; with removable, gastight cover, heat-fused threaded sidewall inlet, outlet, and vent piping connections
    - a. Limestone: Chips or lumps, with more than 90 percent calcium carbonate content and 1- to 3-inch diameter.
  7. Sampling Tank: Polyethylene; with removable, gastight cover, heat-fused threaded sidewall inlet, outlet, and vent piping connections, and opening in top for probe.
    - a. pH probe: Type and length suitable for sampling-tank size.

## 2.08 CATCH BASIN

- A. Shall be as detailed on the drawings. Santa Rosa Precast, Model BK, Brooks, or equal, with cast iron grate and locking device, depth as required, Provide 6 inch thick concrete base, 6" minimum width each side, grout drain line into box a minimum of 6 inches above bottom.
- B. Fill bottom with cobbles for a minimum of 6 inches deep. Joints between sections shall be sealed with Ram-Nek, or equal, flexible plastic gaskets.

## 2.09 INSULATION MATERIALS

### A. General:

1. Insulation products, including insulation, insulation facings, jackets, adhesives, sealants and coatings shall not contain polybrominated diphenyl ethers (PBDEs) in penta, octa, or deca formulations in amounts greater than 0.1 percent (by mass).
2. Products shall not contain asbestos, lead, mercury, or mercury compounds.
3. 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.
4. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
5. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
6. Adhesives and sealants shall comply with testing and product requirements of South Coast Air Quality Management District, Rule 1168.

### B. Insulation Materials:

1. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB.
  - a. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - 1) CertainTeed Corporation.
    - 2) Johns Manville.
    - 3) Knauf Insulation.
    - 4) Owens Corning.

- C. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Design Polymerics.
    - b. Foster Brand; H. B. Fuller Construction Products.
    - c. Knauf Insulation.
  - 2. Water-Vapor Permeance: Comply with ASTM E96/E96M or ASTM F1249.
  - 3. Service Temperature Range: 0 to plus 180 deg F.
  - 4. Color: White.
- D. Breather Mastic: Water based; suitable for indoor and outdoor use on above-ambient services.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. Design Polymerics.
    - b. Childers Brand; H. B. Fuller Construction Products.
    - c. Foster Brand; H. B. Fuller Construction Products.
    - d. Knauf Insulation.
  - 2. Water-Vapor Permeance: ASTM F 1249, 1.8 perms at 0.0625-inch dry film thickness.
  - 3. Service Temperature Range: 0 to plus 180 deg F.
  - 4. Color: White.

### **PART 3 - EXECUTION**

#### **3.01 EXAMINATION**

- A. The Contractor shall be responsible for the examination and acceptance of all conditions affecting the proper construction and/or installation of the Work of this Section and shall not proceed until all unsatisfactory conditions have been corrected. Commencing work shall be construed as acceptance of all conditions by the Contractor as satisfactory for the construction and/or installation of the Work.

#### **3.02 ELECTRIC WATER HEATER INSTALLATION**

- A. Install electric water heaters as indicated, in accordance with manufacturer's installation instructions and in compliance with applicable codes.
- B. Furnish wiring diagram to Electrical Installer. Refer to Division 26 for wiring of units, not work of this section.
- C. Connect to hot and cold water lines with shutoff valve, check valve, and dielectric union in the cold water line, and ASME standard pressure and temperature relief valve and dielectric union in the hot water line. Connect drain and relief piping as noted on Drawings.
- D. Start-up, test, and adjust electric water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.
- E. After installation has been completed, seal bottom of heaters without feet to floor with silicone sealer.

### 3.03 GAS-FIRED WATER HEATER INSTALLATION

- A. Install gas-fired water heaters as indicated, in accordance with manufacturer's installation instructions and in compliance with applicable codes.
- B. Furnish wiring diagram to Electrical Installer. Refer to Division 26 for wiring of units, not work of this section.
- C. Connect to hot and cold water lines with shutoff valves and dielectric unions. Install ASME standard pressure and temperature relief valve. Connect drain and relief piping as noted on Drawings.
- D. Start-up, test, and adjust water heaters in accordance with manufacturer's start-up instructions. Check and calibrate controls.
- E. Install thermometer, in the top 1/3 of the tank or at hot water discharge at the tank.
- F. Confirm that water heater proposed is suitably equipped to be brought into the building through building openings provided, and that heater may be installed and removed through building openings provided.
- G. Additional requirements for direct vented sealed combustion condensing water heaters:
  - 1. Install vent and exhaust piping for direct vented sealed combustion condensing gas-fired water heaters strictly in accordance with unit manufacturers' recommendations.
  - 2. Trap condensate drain line per manufacturers' recommendations and run to nearest code-compliant point of disposal.
- H. Additional requirements for gas fired instantaneous water heaters:
  - 1. Install pressure relief valve at the hot water discharge of the unit.
  - 2. Install vent and exhaust piping for instantaneous gas-fired water heaters strictly in accordance with unit manufacturers' recommendations.

### 3.04 PUMP INSTALLATION

- A. Install pumps where indicated, in accordance with manufacturer's published instructions, complying with recognized industry practices to ensure that pumps comply with requirements and serve intended purposes.
- B. Provide floor-mounted pumps with a 6 inch high concrete base and anchor bolts as recommended by the pump manufacturer. Pumps shall be carefully shimmed level.
- C. Provide access space around pumps for service as indicated, but in no case less than that recommended by manufacturer.
- D. Install in-line pumps with support from overhead structure on each side of pump, or as indicated on Drawings.

- E. Support piping from the building structure so as to prevent any strain on the pump casings. Provide a final check for perfect alignment of the piping connections after pump has been secured to its base. Provide valves, accessories, gauges, flexible connections, and supports as indicated.
- F. Install electrical devices furnished by manufacturer but not specified to be factory mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer.
- G. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 26 sections. Do not proceed with equipment start-up until wiring installation is complete and correct.
- H. Check alignment, and where necessary, realign shafts of motors and pumps within recommended tolerances by manufacturer.
- I. Lubricate pumps before start-up. Start-up in accordance with manufacturer's instructions.
- J. Increase piping immediately at pump suction and discharge; flexible couplings and all valves shall be full line size.
- K. Trim pump impeller to obtain the desired water flow after installation, without cost to Owner.
- L. Pumps shall not be connected to piping before piping is thoroughly flushed and cleaned of all dirt and grit. After piping connections have been made, systems shall be filled before starting pumps. Pumps shall not be run dry under any circumstances.

### 3.05 NEUTRALIZATION SYSTEM INSTALLATION

- A. Install neutralization systems as detailed on Drawings. Include full initial charge of limestone.

### 3.06 INSULATION INSTALLATION

#### 1. Insulation Installation on Pumps:

- a. Fabricate metal boxes lined with insulation. Fit boxes around pumps and coincide box joints with splits in pump casings. Fabricate joints with outward bolted flanges. Bolt flanges on 6-inch centers, starting at corners. Install 3/8-inch- diameter fasteners with wing nuts. Alternatively, secure the box sections together using a latching mechanism. Do not enclose or insulate pump motor.
- b. Fabricate boxes from G90 galvanized steel, at least 0.050 inch thick.
- c. For below ambient services, install a vapor barrier at seams, joints, and penetrations. Seal between flanges with replaceable gasket material to form a vapor barrier.

### 3.07 DEMONSTRATION AND TRAINING

- A. Provide a minimum of 8 hours of training and orientation of Owners staff in proper care and operation of Plumbing Equipment.

### 3.08 CARE AND CLEANING

- A. Repair or replace broken, damaged, or otherwise defective parts, materials, and work. Leave entire work in condition satisfactory to Architect. At completion, carefully clean and adjust equipment,

fixtures, and trim that are installed as part of this work. Leave systems and equipment in satisfactory operating condition.

### 3.09 OPERATIONAL TESTS

- A. Test each piece of equipment to show that it will operate in accordance with indicated requirements.

### 3.10 CLEANING UP

- A. Upon completion of Work remove materials, equipment, apparatus, tools, and the like, and leave premises clean, neat, and orderly.

### 3.11 EQUIPMENT INSULATION SCHEDULE

- A. Domestic hot water recirculation pump insulation shall be the following:
  - 1. Mineral-Fiber Board: Thickness equal to insulation thickness for connected pipes and 3-lb/cu. ft. nominal density.

END OF SECTION



## SECTION 23 00 50

## BASIC HVAC MATERIALS AND METHODS

**PART 1 - GENERAL**

## 1.01 SUMMARY

- A. Section Includes:
  - 1. Electric motors.
  - 2. Motor starters.
  - 3. Strainers.
  - 4. Gauges.
  - 5. Thermometers.
  - 6. Access Doors.
  - 7. Flexible joints.

## 1.02 RELATED REQUIREMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. This Section is a part of each Division 23 Section.
- C. Refer to Section 23 08 00.13, T-24 Commissioning of HVAC for Title 24 commissioning requirements.

## 1.03 ADDITIONAL REQUIREMENTS

- A. Furnish and install incidental work not shown or specified necessary to provide a complete and workable system.
- B. Make all temporary connections required to maintain services, including adequate heat and cooling, during the course of the Contract without additional cost to Owner. Notify Owner seven days in advance before disrupting services.
- C. Provide for adjustments or modifications to fan and motor sheaves, belts, damper linkages, and other components as required to achieve specified air balance at no additional cost to Owner.

## 1.04 REFERENCES AND STANDARDS

- A. Where material or equipment is specified to conform to referenced standards, it shall be assumed that the most recent edition of the standard in effect at the time of bid shall be used.
  - 1. AABC - Associated Air Balance Council
  - 2. AFBMA - Anti Friction Bearing Manufacturer's Association
  - 3. AMCA - Air Moving and Control Association Inc.
    - a. Standard 210 - Laboratory Methods of Testing Fans
  - 4. ANSI - American National Standards Institute

5. ARI - Air-Conditioning and Refrigeration Institute
  6. ASHRAE - American Society of Heating, Refrigerating and Air Conditioning Engineers
  7. ASME - American Society of Mechanical Engineers
  8. ASTM - American Society for Testing and Materials
  9. CCR - California Code of Regulations
    - a. Title 8 - Division of Industrial Safety, Subchapter 7; General Industry Safety Orders, Articles 31 through 36
  
  10. CSA – Canadian Standards Association International
  11. CSFM - California State Fire Marshal
  12. NCPWB - National Certified Pipe Welding Bureau
  13. NIST - National Institute of Standards and Technology
  14. NEMA - National Electrical Manufacturers' Association
  15. NFPA - National Fire Protection Association
  16. OSHA - Occupational Safety and Health Act
  17. SMACNA - Duct Manuals
  18. UL - Underwriters' Laboratories, Inc.
- B. Requirements of Regulatory Agencies:
1. The publications listed below form part of this specification; comply with provisions of these publications except as otherwise shown or specified.
    - a. California Building Code, 2022.
    - b. California Electrical Code, 2022.
    - c. California Energy Code, 2022.
    - d. California Fire Code, 2022.
    - e. California Green Building Standards Code, 2022.
    - f. California Mechanical Code, 2022.
    - g. California Plumbing Code, 2022.
    - h. California Code of Regulations, Title 24.
    - i. California Health and Safety Code.
    - j. CAL-OSHA.
    - k. California State Fire Marshal, Title 19 CCR.
    - l. National Fire Protection Association.
    - m. Occupational Safety and Health Administration.
    - n. Other applicable state laws.
  
  2. Nothing in Drawings or specifications shall be construed to permit work not conforming to these codes, or to requirements of authorities having jurisdiction. It is not the intent of Drawings or specifications to repeat requirements of codes except where necessary for clarity.

#### 1.05 DRAWINGS

- A. Examine Drawings prior to bidding of work and report discrepancies in writing to Architect.
  
- B. Drawings showing location of equipment and materials are diagrammatic and job conditions will not always permit installation in location shown. The HVAC Drawings show general arrangement of equipment and materials, etc., and shall be followed as closely as existing conditions, actual building construction, and work of other trades permit.

1. Architectural and Structural Drawings shall be considered part of the Work. These Drawings furnish Contractor with information relating to design and construction of the Project. Architectural Drawings take precedence over HVAC Drawings.
  2. Because of the small scale of HVAC Drawings, not all offsets, fittings, and accessories required are shown. Investigate structural and finish conditions affecting the Work and arrange Work accordingly. Provide offsets, fittings, and accessories required to meet conditions. Inform Architect immediately when job conditions do not permit installation of equipment and materials in the locations shown. Obtain the Architects approval prior to relocation of equipment and materials.
  3. Relocate equipment and materials installed without prior approval of the Architect. Remove and relocate equipment and materials at Contractors' expense upon Architects' direction.
  4. Minor changes in locations of equipment, piping, ducts, etc., from locations shown shall be made when directed by the Architect at no additional cost to the Owner providing such change is ordered before such items of work, or work directly connected to same are installed and providing no additional material is required.
- C. Execute work mentioned in the Specifications and not shown on the Drawings, or vice versa, the same as if specifically mentioned or shown in both.

#### 1.06 FEES AND PERMITS

- A. Obtain and pay for permits and service required in installation of the Work. Arrange for required inspections and secure approvals from authorities having jurisdiction. Comply with requirements of Division 01.
- B. Arrange for utility connections and pay charges incurred, including excess service charges.
- C. Coordination:
  1. General:
    - a. Coordinate HVAC Work with trades covered in other Specifications Sections to provide a complete, operable and sanitary installation of the highest quality workmanship.
  2. Have fire damper and fire smoke damper installation instructions available at Project site during construction for use by Project Inspector.
  3. Electrical Coordination:
    - a. Refer to the Electrical Drawings and Specifications, Division 26, for service voltage and power feed wiring for equipment specified under this section. Contractor has full responsibility for the following items of work:
      - 1) Review the Electrical Drawings and Division 26 Specifications to verify that electrical services provided are adequate and compatible with equipment requirements.
      - 2) If additional electrical services are required above that indicated on Electrical Drawings and in Division 26, such as more control interlock conductors, larger feeder, or separate 120 volt control power source, include cost to furnish and install additional electrical services as part of the bid.
      - 3) Prior to proceeding with installation of additional electrical work, submit detailed drawings indicating exact scope of additional electrical work.
  4. Mechanical Coordination:

- a. Arrange for pipe spaces, chases, slots and openings in building structure during progress of construction, to accommodate mechanical system installation.
- b. Coordinate installation of supporting devices. Set sleeves in poured-in-place concrete and other structural components during construction.
- c. Coordinate requirements for access panels and doors for mechanical items requiring access where concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."
- d. Coordinate with other trades equipment locations, pipe, duct and conduit runs, electrical outlets and fixtures, air inlets and outlets, and structural and architectural features. Provide information on location of piping and seismic bracing to other trades as required for a completely coordinated project.

#### 1.07 SUBMITTALS - GENERAL

- A. Refer to Division 01 Submittals Section(s) for additional requirements.
- B. Submittal packages may be submitted via email as PDF electronic files, or as printed packages. PDFs shall be legible at actual size (100 percent). Provide seven copies of printed submittal packages.
- C. Provide submittal of materials proposed for use as part of this Project. Product names in Specifications and on Drawings are used as standards of quality. Furnish standard items on specified equipment at no extra cost to the Contract regardless of disposition of submittal data. Other materials or methods shall not be used unless approved in writing by Architect. Architect's review will be required even though "or equal" or synonymous terms are used.
  1. Partial or incomplete submittals will not be considered.
  2. Quantities are Contractor's responsibility and will not be reviewed.
  3. Provide materials of the same brand or manufacturer for each class of equipment or material.
  4. Identify each item by manufacturer, brand, trade name, number, size, rating, or other data necessary to properly identify and review materials and equipment. Words "as specified" are not sufficient identification.
  5. Identify each submittal item by reference to items' Specification Section number and paragraph, by Drawing and detail number, and by unit tag number.
  6. Organize submittals in same sequence as in Specification Sections.
  7. Show physical arrangement, construction details, finishes, materials used in fabrications, provisions for piping entrance, access requirements for installation and maintenance, physical size, mechanical characteristics, foundation and support details, and weight.
    - a. Submit Shop Drawings, performance curves, and other pertinent data, showing size and capacity of proposed materials.
    - b. Specifically indicate, by drawn detail or note, that equipment complies with each specifically stated requirement of Contract Documents.
    - c. Drawings shall be drawn to scale and dimensioned (except schematic diagrams). Drawings may be prepared by vendor but must be submitted as instruments of Contractor, thoroughly checked and signed by Contractor before submission to Architect for review.
    - d. Catalog cuts and published material may be included with supplemental scaled drawings.
- D. Review of submittals will be only for general conformance with design concept and general compliance with information given in Contract Documents. Review will not include quantities, dimensions, weights or gauges, fabrication processes, construction methods, coordination with work

of other trades, or construction safety precautions, which are sole responsibility of Contractor. Review of a component of an assembly does not indicate acceptance of an assembly. Deviations from Contract Documents not clearly identified by Contractor are Contractor's responsibility and will not be reviewed by Architect.

- E. Within reasonable time after award of contract and in ample time to avoid delay of construction, submit to Architect shop drawings or submittals on all items of equipment and materials provided. Provide submittal as a complete package.
  - 1. Shop drawings and submittals shall include Specification Section, Paragraph number, and Drawing unit symbol or detail number for reference. Organize submittals into booklets for each Specification section and submit in loose-leaf binders with index. Deviations from the Contract Documents shall be prominently displayed in the front of the submittal package and referenced to the applicable Contract requirement.
- F. Furnish to the Project Inspector complete installation instructions on material and equipment before starting installation.

#### 1.08 ACTION SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for plumbing systems materials and products.
- B. Shop Drawings.
- C. Sustainable Design Submittals:
  - 1. Product Data: For adhesives and sealants, documentation of compliance including printed statement of VOC content and chemical components.
  - 2. Laboratory Test Reports: For adhesives and sealants, indicating compliance with requirements for low-emitting materials.
- D. Delegated-Design Submittals: For seismic supports, anchorages, restraints, and vibration isolators indicated to comply with performance requirements and design criteria.
  - 1. Calculations performed for use in selection of seismic supports, anchorages, restraints, and vibration isolators shall utilize criteria indicated in Structural Contract Documents.
  - 2. Include design calculations and details for selecting vibration isolators and vibration isolation bases complying with performance requirements, design criteria, and analysis data signed and sealed by the California registered structural engineer responsible for their preparation.
  - 3. Supports, anchorage and restraints for piping, ductwork, and equipment shall be an HCAI pre-approved system such as TOLCO, ISAT, Mason, or equal. Pipes, ducts and equipment shall be seismically restrained in accordance with requirements of current edition of California Building Code. System shall have current OPM number and shall meet additional requirements of authority having jurisdiction. Provide supporting documentation required by the reviewing authority and the Architect and Engineer. Provide layout drawings showing piping, ductwork and restraint locations.
    - a. Bracing of Piping, Ductwork, and Equipment: Specifically state how bracing attachment to structure is accomplished. Provide shop drawings indicating seismic restraints, including

details of anchorage to building. In-line equipment must be braced independently of piping and ductwork, and in conformance with applicable building codes. Provide calculations to show that pre-approval numbers have been correctly applied in accordance with general information notes of pre-approval documentation.

- b. In lieu of the above or for non-standard installations not covered in the above pre-approved systems, Contractor shall provide layout drawings showing piping, ductwork, and restraint locations, and detail supports, attachments and restraints, and furnish supporting calculations and legible details sealed by a California registered structural engineer, in accordance with 2022 California Building Code

4. Additional Requirements: In addition to the above, conform to all state and local requirements.

#### 1.09 INFORMATIONAL SUBMITTALS

- A. Provide coordinated layouts for HVAC Ductwork systems, in accordance with Specification Section 23 80 00.
- B. Provide evidence of equipment certification to California Energy Code Section 110.1 or 110.2, if not providing Electrically Commutated motors for HVAC fans sized below 1 hp and above 1/12 hp. Refer to specific equipment articles requiring electrically commutated motors.
- C. Check, Test, and Start forms, from equipment manufacturers.
- D. Check, Test and Start reports.

#### 1.10 CLOSEOUT SUBMITTALS

##### A. Operation and Maintenance Data:

1. Furnish three complete sets of Operation and Maintenance Manual bound in hardboard binder, and one compact disc containing complete Operation and Maintenance Manual in searchable PDF format. Provide Table of Contents. Provide index tabs for each piece of equipment in binder and disc. Begin compiling data upon approval of submittals.
  - a. Sets shall incorporate the following:
    - 1) Product Data.
    - 2) Shop Drawings.
    - 3) Record Drawings.
    - 4) Service telephone number, address and contact person for each category of equipment or system.
    - 5) Complete operating instructions for each item of heating, ventilating and air conditioning equipment.
    - 6) Copies of guarantees/warranties for each item of equipment or systems.
    - 7) Test data and system balancing reports.
    - 8) Typewritten maintenance instructions for each item of equipment listing lubricants to be used, frequency of lubrication, inspections required, adjustment, etc.
    - 9) Manufacturers' bulletins with parts numbers, instructions, etc., for each item of equipment.
    - 10) Temperature control diagrams and literature.

- 11) Check test and start reports for each piece of mechanical equipment provided as part of the Work.
  - 12) Commissioning and Preliminary Operation Tests required as part of the Work.
2. Post service telephone numbers and addresses in an appropriate place designated by Architect.
- B. Record Drawings:
1. Refer to Division 01 for additional requirements.
  2. Upon completion of the Work, deliver to Architect the following:
    - a. Originals of drawings showing the Work exactly as installed.
    - b. One complete set of reproducible drawings showing the Work exactly as installed.
    - c. One compact disc with complete set of drawings in PDF format showing the Work exactly as installed.
    - d. Provide Contractor's signature, verifying accuracy of record drawings.
    - e. Obtain the signature of the Inspector of Record for Record Drawings.

#### 1.11 SUBSTITUTIONS

- A. Refer to Division 01 for complete instructions. Requirements given below are in addition to or are intended to amplify Division 01 requirements. In case of conflict between requirements given herein and those of Division 01, Division 01 requirements shall apply.
- B. It is the responsibility of Contractor to assume costs incurred because of additional work and or changes required to incorporate proposed substitute into the Project. Refer to Division 01 for complete instructions.
- C. Substitutions will be interpreted to be manufacturers other than those specifically listed in the Contract Documents by brand name, model, or catalog number.
- D. Only one request for substitution will be considered for each item of equipment or material.
- E. Substitution requests shall include the following:
  1. Reason for substitution request.
  2. Complete submittal information as described herein; see "Submittals."
  3. Coordinated scale layout drawings depicting position of substituted equipment in relation to other work, with required clearances for operation, maintenance and replacement.
  4. List optional features required for substituted equipment to meet functional requirements of the system as indicated in Contract Documents.
  5. Explanation of impact on connected utilities.
  6. Explanation of impact on structural supports.
- F. Installation of reviewed substitution is Contractors' responsibility. Any mechanical, electrical, structural, or other changes required for installation of substituted equipment or material must be made by Contractor without additional cost to Owner. Review by Architect of substituted equipment or material, will not waive these requirements.

- G. Contractor may be required to compensate Architect for costs related to substituted equipment or material.

#### 1.12 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of HVAC systems products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Contractor's Qualifications: Firm with at least 5 years of successful installation experience on projects with HVAC systems work similar to that required for this Project.
- C. Comply with applicable portions of California Mechanical Code pertaining to selection and installation of HVAC materials and products.
- D. All materials and products shall be new.

#### 1.13 DELIVERY, STORAGE, AND HANDLING

- A. Protect equipment and materials delivered to Project site from weather, humidity and temperature variations, dirt, dust and other contaminants.

#### 1.14 FIELD CONDITIONS

- A. Contractor shall visit Project site and examine existing conditions in order to become familiar with Project scope. Verify dimensions shown on Drawings at Project site. Bring discrepancies to the attention of Architect. Failure to examine Project site shall not constitute basis for claims for additional work because of lack of knowledge or location of hidden conditions that affect Project scope.
- B. Information on Drawings relative to existing conditions is approximate. Deviations from Drawings necessary during progress of construction to conform to actual conditions shall be approved by the Architect and shall be made without additional cost to the Owner. The Contractor shall be held responsible for damage caused to existing services. Promptly notify the Architect if services are found which are not shown on Drawings.

#### 1.15 WARRANTY

- A. Refer to Division 01 for warranty requirements, and duration and effective date of Contractor's Standard Guarantee.
- B. Repair or replace defective work, material, or part that appears within the warranty period, including damage caused by leaks.
- C. On failure to comply with warranty requirements within a reasonable length of time after notification is given, Architect/Owner shall have repairs made at Contractor's expense.

**PART 2 - PRODUCTS****2.01 GENERAL**

- A. Materials or equipment of the same type shall be of the same brand wherever possible. All materials shall be new and in first class condition.
- B. All sizes, capacities, and efficiency ratings shown are minimum, except that gas capacity is maximum available.
- C. Refer to Division 22 10 00 and 23 80 00 for specific system piping materials.

**2.02 MATERIALS**

- A. No material installed as part of this Work shall contain asbestos.
- B. California Green Building Code Compliance:
  - 1. HVAC and refrigeration equipment shall not contain CFCs.
  - 2. HVAC and refrigeration equipment shall not contain Halons.

**2.03 ELECTRIC MOTORS**

- A. General Motor Requirements: Comply with NEMA MG 1 unless otherwise indicated. Comply with IEEE 841 for severe-duty motors.
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following, or equal:
    - a. U.S. Motors.
    - b. Century Electric.
    - c. General Electric.
    - d. Lincoln.
    - e. Gould.
- B. Motor Characteristics: Designed for continuous duty at ambient temperature of 40 deg. C and at altitude of 3300 feet above sea level. Capacity and torque shall be sufficient to start, accelerate, and operate connected loads at designated speeds, at installed altitude and environment, with indicated operating sequence, and without exceeding nameplate ratings or considering service factor.
  - 1. Motors exceeding the nameplate amperage shall be promptly replaced at no cost to the Owner. Horsepower shown is minimum and shall be increased as necessary to comply with above requirements. Furnish motors with splash-proof or weatherproof housings, where required or recommended by the manufacturer. Match the nameplate voltage rating with the electrical service supplied. Check Electrical Drawings. Provide a transformer for each motor not wound specifically for system voltage.
- C. Polyphase Motors: NEMA MG 1, Design B, medium induction motor, premium efficiency as defined in NEMA MG 1. Select motors with service factor of 1.15. Provide motor with random-wound, squirrel cage rotor, and permanently lubricated or regreasable, shielded, antifriction ball bearings suitable for radial and thrust loading. Temperature rise shall match insulation rating. Provide Class F insulation.

1. Multispeed motors shall have separate windings for each speed.

D. Polyphase Motors with Additional Requirements:

1. Motors Used with Reduced-Voltage and Multispeed Controllers: Match wiring connection requirements for controller with required motor leads. Provide terminals in motor terminal box, suited to control method.
2. Motors Used with Variable Frequency Controllers:
  - a. Separately Connected Motors: Ratings, characteristics, and features coordinated with and approved by controller manufacturer.
  - b. Windings: Copper magnet wire with moisture-resistant insulation varnish, designed and tested to resist transient spikes, high frequencies, and short time rise pulses produced by pulse-width modulated inverters.
  - c. Premium-Efficient Motors: Class B temperature rise; Class F insulation.
  - d. Inverter-Duty Motors: Class F temperature rise; Class H insulation.
  - e. Thermal Protection: Comply with NEMA MG 1 requirements for thermally protected motors.
  - f. Each motor shall be provided with a shaft grounding device for stray current protection.
3. Severe-Duty Motors: Comply with IEEE 841, with 1.15 minimum service factor.

E. Single-Phase Motors:

1. Select motors with service factor of 1.15.
2. Motors larger than 1/20 hp shall be one of the following, to suit starting torque and requirements of specific motor application:
  - a. Permanent-split capacitor.
  - b. Split phase.
  - c. Capacitor start, inductor run.
  - d. Capacitor start, capacitor run.
3. Motors for HVAC exhaust, transfer, and supply fans larger than 1/12 hp and smaller than 1 hp shall be the following:
  - a. Electronically Commutated motor (EC type): Motor shall be electronically commutated type specifically designed for applications, with heavy duty ball bearings. The motor shall be speed controllable down to 20% of full speed and 85% efficient at all speeds.
    - 1) Exceptions:
      - a) Motors in fan-coils and terminal units that operate only when providing heating to the space served.
      - b) Motors installed in space conditioning equipment certified under California Energy Code Section 110.1 or 110.2.
4. Contractor's Option: Motors scheduled on Drawings as single-phase, and larger than 1/12 hp and smaller than 1 hp, for applications other than HVAC fans, may be EC type.
5. Multispeed Motors: Variable-torque, permanent-split-capacitor type.
6. Bearings: Prelubricated, antifriction ball bearings or sleeve bearings suitable for radial and thrust loading.
7. Motors 1/20 HP and Smaller: Shaded-pole type.
8. Thermal Protection: Internal protection to automatically open power supply circuit to motor when winding temperature exceeds a safe value calibrated to temperature rating of motor

insulation. Thermal-protection device shall automatically reset when motor temperature returns to normal range.

#### 2.04 MOTOR STARTERS

- A. Square D, Allen Bradley, or equal, in NEMA Type 1 enclosure, unless otherwise specified or required. Minimum starter size shall be Size 1. Provide NEMA 3R enclosure where exposed to outdoors.
- B. Provide magnetic motor starters for all equipment provided under the Mechanical Work. Starters shall be non-combination type. Provide part winding or reduced voltage start motors where shown or as hereinafter specified. Minimum size starter shall be Size 1.
  - 1. All starters shall have the following:
    - a. Cover mounted hand-off-automatic switch. Starters installed exposed in occupied spaces shall have key operated HOA switch.
    - b. Ambient compensated thermal overload.
    - c. Fused control transformer (for 120 or 24 volt service).
    - d. Pilot lights, integral with the starters. Starters located outdoors shall be in NEMA IIIR enclosures.
  - 2. Where three phase motors are provided for two-speed operation, provide two speed motor starters.
  - 3. Starters for single-phase motors shall have thermal overloads. NEMA I enclosure for starters located indoors, NEMA IIIR enclosure for starters located outdoors.
  - 4. Provide OSHA label indicating the device starts automatically.

#### 2.05 STRAINERS

- A. Charles M. Bailey #100A, Armstrong, Muessco, or equal, Fig. 11 "Y" pattern, 125 psi WP minimum, with monel screens with 20 square mesh for 2 inches and smaller and 3/64 inch perforations for 2-1/2 inches and larger. Install all strainers with a blow-off hose valve with hose adapter. Strainer shall have gasketed cover with straight thread.

#### 2.06 GAUGES

- A. Marsh "Series J", U.S. Gage, Danton 800, or equal, with bronze bushed movement and front recalibration. Dials shall be white with black numerals, 3-1/2 inch dial face. Normal reading shall be at mid-scale. Provide a needle valve on each gauge connection. Supply a gauge piped with branch isolation valves across the inlet and outlet of each pump and where shown on the Drawings.
- B. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core {and gasketed cap}, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and where shown on Drawings.

#### 2.07 THERMOMETERS

- A. Marsh, Taylor, Palmer, or equal, 5 inch diameter bimetal dial, adjustable from face, with adjustable positioner, located to be easily read from normal personnel approach. Normal reading shall be at mid-scale.
  - 1. Provide extension for insulation.

2. Provide thermometers with steel bulb chambers and brass separable sockets.
  3. Thermometers for air temperature shall have 8 inch minimum stem.
- B. Provide Ventlock, Durodyne, or equal thermometer test holes at each air conditioning unit, furnace, and make-up air unit, in mixed air and supply air, and at all locations shown or scheduled on the Drawings. Provide two portable thermometers, with sensing connection arranged to suit test connections.
- C. Provide Pete's Plug II, Sisco P/T, or equal, test plug with Nordel core, on inlet and outlet of each coil, boiler, condenser, chiller and heat exchanger and provide two digital electronic test thermometers for each range of fluid temperature and where shown on Drawings.

## 2.08 ACCESS DOORS

- A. Where floors, walls, or ceilings must be penetrated for access to mechanical equipment, provide access doors, 14 inch by 14 inch minimum size in usable opening. Where entrance of a serviceman may be required, provide 20 inch by 30 inch minimum usable opening. Locate access doors/panels for non-obstructed and easy reach.
1. All access doors less than 7'-0" above floors and exposed to public access shall have keyed locks.
- B. Access doors shall match those supplied in Division 08 in all respects, except as noted herein.
- C. Provide stainless steel access doors for use in toilet rooms, shower rooms, kitchens and other damp areas. Provide steel access doors with prime coat of baked-on paint for all other areas.
- D. Where panels are located on ducts or plenums, provide neoprene gaskets to prevent air leakage, and use frames to set door out to flush with insulation.
- E. Provide insulated doors where located in internally insulated ducts or casings.
- F. Do not locate access doors in highly visible public areas such as lobbies, waiting areas, and primary entrance areas. Coordinate with the Architect when access is required in these areas.
- G. Where specific information or details relating to access panels different from the above is shown or given on the Drawings or other Divisions of work, then that information shall supersede this specification.
- H. Manufacturers: Subject to compliance with requirements, available manufacturers offering products which may be incorporated into the Work include Milcor, Karp, Nystrom, or Cesco, equal to the following:
1. Milcor
    - a. Style K (plaster).
    - b. Style DW (gypsum board).
    - c. Style M (Masonry).
    - d. Style "Fire Rated" where required.

## 2.09 FLEXIBLE JOINTS

- A. Where indicated on Drawings, provide Metraflex Metrasphere, Style R, Mason Industries, or equal, Spherical Expansion Joints. Provide control units at each expansion joint, arranged to limit both expansion and compression.
- B. Flexible joints at entry points to building shall be Barco Ductile iron, Advanced Thermal Systems, or equal, threaded style with stainless ball and mineral filled seal.

## 2.10 PIPE GUIDES

- A. Where flexible connections are indicated on Drawings, provide Metraflex style IV, B-Line, or equal, pipe guides in locations recommended by manufacturer. Maximum spacing from flexible connection to first pipe guide is 4 pipe diameters, and maximum spacing from second pipe guide is 14 pipe diameters.

## 2.11 EQUIPMENT IDENTIFICATION

- A. Identify each piece of equipment with a permanently attached engraved bakelite plate, 1/2 inch high white letters on black background.

## 2.12 PIPE IDENTIFICATION

- A. Identify each piping system and indicate the direction of flow by means of Seton, Inc., Marking Services Inc., Reef Industries, Inc., or equal, pre-tensioned, coiled semi-rigid plastic pipe labels formed to circumference of pipe, requiring no fasteners or adhesive for attachment to pipe.
- B. The legend and flow arrow shall conform to ASME A13.1.

## **PART 3 - EXECUTION**

### 3.01 EXISTING MATERIALS:

- A. Remove existing equipment, piping, wiring, construction, etc., which interferes with Work of this Contract. Promptly return to service upon completion of work in the area. Replace items damaged by Contractor with new material to match existing.
- B. Removed materials which will not be re-installed and which are not claimed by Owner shall become the property of Contractor and shall be removed from the Project site. Consult Owner before removing any material from the Project site. Carefully remove materials claimed by Owner to prevent damage and deliver to Owner-designated storage location.
- C. Existing piping and wiring not reused and are concealed in building construction may be abandoned in place and all ends shall be capped or plugged. Remove unused piping and wiring exposed in Equipment Rooms or occupied spaces. Material shall be removed from the premises. Disconnect power, water, gas, pump or any other active energy source from piping or electrical service prior to abandoning in place.

### 3.02 FRAMING, CUTTING, AND PATCHING

- A. Special framing, recesses, chases and backing for Work of this Section, unless otherwise specified, are covered under other Specification Sections.
- B. Contractor is responsible for placement of pipe sleeves, hangers, inserts, supports, and location of openings for the Work.
- C. Cutting, patching, and repairing of existing construction to permit installation of equipment, and materials is the responsibility of Contractor. Repair or replace damage to existing work with skilled mechanics for each trade.
- D. Cut existing concrete construction with a concrete saw. Do not utilize pneumatic devices.
- E. Core openings through existing construction for passage of new piping and conduits. Cut holes of minimum diameter to suit size of pipe and associated insulation installed. Coordinate with building structure, and obtain Structural Engineer's approval prior to coring through existing construction.

### 3.03 MECHANICAL DEMOLITION

- A. Refer to Division 01 Sections "Cutting and Patching" and "Selective Demolition" for general demolition requirements and procedures.
- B. Disconnect, dismantle and remove mechanical systems, equipment, and components indicated to be removed. Coordinate with all other trades.
  - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
  - 2. Piping to Be Abandoned in Place: Drain piping and cap or plug piping to remain with same or compatible piping material. Refrigerant system must be evacuated per EPA requirements.
  - 3. Ducts to Be Removed: Remove portion of ducts indicated to be removed and cap remaining ducts with same or compatible ductwork material.
  - 4. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.
  - 5. Equipment to Be Removed: Drain down and cap remaining services and remove equipment.
  - 6. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
  - 7. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

### 3.04 ELECTRICAL REQUIREMENTS

- A. Provide adequate working space around electrical equipment in compliance with the California Electrical Code. Coordinate the Mechanical Work with the Electrical Work to comply.
- B. Furnish necessary control diagrams and instructions for the controls. Before permitting operation of any equipment which is furnished, installed, or modified under this Section, review all associated electrical work, including overload protection devices, and assume complete responsibility for the

correctness of the electrical connections and protective devices. Motors and control equipment shall conform to the Standards of the National Electrical Manufacturers' Association. All equipment and connections exposed to the weather shall be NEMA IIIIR with factory-wired strip heaters in each starter enclosure and temperature control panel where required to inhibit condensation.

- C. All line voltage and low voltage wiring and conduit associated with the Temperature Control System are included in this Section. Wiring and conduit shall comply with Division 26.

### 3.05 PIPING SYSTEM REQUIREMENTS

- A. Drawing plans, schematic 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.

### 3.06 PRIMING AND PAINTING

- A. Perform priming and painting on the equipment and materials as specified herein.
- B. See Division 09 Painting Section(s) for detailed requirements.
- C. Priming and painting:
  - 1. Exposed ferrous metals, including piping, which are not galvanized or factory-finished shall be primed and painted.
    - a. Black Steel Piping:
      - 1) Primer: One coat gray Sherwin-Williams Pro Industrial Pro-Cryl Universal Primer, comparable products by Rust-Oleum, Kelly Moore, or equal.
      - 2) Topcoat: Two coats gray Sherwin-Williams Pro Industrial Waterbased Alkyd Urethane Enamel, comparable products by Rust-Oleum, Kelly Moore, or equal.
    - b. Interior Ductwork: Refer to Division 09 Painting Section(s). Architect shall select paint color.
  - 2. Metal surfaces of items to be jacketed or insulated except ductwork and piping shall be given two coats of primer unless furnished with equivalent factory finish. Items to be primed shall be properly cleaned by effective means free of rust, dirt, scale, grease and other deleterious matter and then primed with the best available grade of zinc rich primer. After erection or installation, all primed surfaces shall be properly cleaned of any foreign or deleterious matter that might impair proper bonding of subsequent paint coatings. Any abrasion or other damage to the shop or field prime coat shall be properly repaired and touched up with the same material used for the original priming.
  - 3. Where equipment is provided with nameplate data, the nameplate shall be masked off prior to painting. When painting is completed, remove masking material.

### 3.07 EXCAVATING

- A. Perform all excavating required for work of this Section. Provide the services of a pipe/cable locating service prior to excavating activities to determine location of existing utilities.

- B. Unless shown otherwise, provide a minimum of 2'-6" cover above top of pipe to finished grade for all service piping, unless otherwise noted. Trim trench bottom by hand or provide a 4 inch deep minimum bed of sand to provide a uniform grade and firm support throughout entire length of pipe. For all PVC pipe and for PE gas pipe, bed the pipe in 4 inch sand bed. Pipe bedding materials should be clean crushed rock, gravel or sand of which 100 percent will pass a 1 inch sieve. For pipes that are larger than 10 inches in diameter, at least 95 percent should pass a 3/4 inch sieve, and for pipes 10 inches in diameter or smaller, 100 percent should pass a 1/2 inch sieve. All other materials should have a minimum sand equivalent of 50. Only a small proportion of the native soils will meet these requirements without extensive processing; therefore, importation of pipe bedding materials should be anticipated. Pipe bedding materials shall be compacted in lifts not exceeding 6 inches in compacted thickness. Each lift shall be compacted to not less than 90 percent relative compaction at or above the optimum moisture content, in accordance with ASTM Specification D2940, except that bedding materials graded such 100 percent of the material will pass a No. 200 sieve shall be compacted in 6 inch lifts using a single pass of a flat-plate, vibratory compactor or vibratory drum. Pipe bedding materials should extend at least to the spring line.
- C. Maintain all warning signs, barricades, flares, and red lanterns as required.
- D. For all trenches 5 feet or more in depth, submit copy of permit detailed drawings showing shoring, bracing, sloping, or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trenches. Obtain a permit from the Division of Industrial Safety prior to beginning excavations. A copy of the permit shall be available at the site at all times.

### 3.08 BACKFILLING

- A. Backfill shall comply with applicable provisions of Division 31 of these Specifications.
- B. Except under existing or proposed paved areas, walks, roads, or similar surfaces, backfill for other types of pipe shall be made using suitable excavated material or other approved material. Place backfill in 8 inch layers, measured before compaction, and compact with impact hammer to at least 90 percent relative compaction per ASTM D2940.
  - 1. Backfill plastic pipe and insulated pipe with sand for a minimum distance of 12 inches above the top of the pipe. Compact using mechanical tamping equipment.
- C. Entire backfill for excavations under existing or proposed pavements, walks, roads, or similar surfaces, under new slabs on grade, shall be made with clean sand compacted with mechanical tamping equipment vibrator to at least 90 percent relative compaction per ASTM D2940. Remove excess earth. Increase the minimum compaction within the uppermost two feet of backfill to 95 percent.
- D. Replace or repair to its original condition all sod, concrete, asphalt paving, or other materials disturbed by the trenching operation. Repair within the guarantee period as required.

### 3.09 UNION AND FLANGE INSTALLATION

- A. Install Epco, Nibco, or equal, dielectric unions or flanges at points of connection between copper or brass piping or material and steel or cast iron pipe or material except in drain piping. Bushings or couplings shall not be used.

- B. Install unions in piping NPS 2" and smaller or flanges in piping NPS 2-1/2" and larger whether shown or not at each connection to all equipment and tanks, and at all connections to all automatic valves, such as temperature control valves.
- C. Locate the unions for easy removal of the equipment, tank, or valve.
- D. Do not install unions or flanges in refrigerant piping systems.

### 3.10 ACCESS DOOR INSTALLATION

- A. Furnish and install access doors wherever required whether shown or not for easy maintenance of mechanical systems; for example, at concealed valves, strainers, traps, cleanouts, dampers, motors, controls, operating equipment, etc. Access doors shall provide for complete removal and replacement of equipment.

### 3.11 CONCRETE WORK

- A. Concrete work required for work of this Section shall be included under another section of the Specification, unless otherwise noted, including poured-in-place concrete work for installing precast manholes, catch basins, etc., and shall include reinforced concrete bases for pumps, tanks, compressors, fan units, boilers, unless the work is specifically indicated on the Drawings to be furnished under this Section.
- B. Underground anchors, and pads for valve access boxes are included under this Section of the Specification. Concrete shall be 3000 psi test minimum. Refer to Division 03 for concrete types.

### 3.12 PIPE PROTECTION

- A. Wrap bare galvanized and black steel pipe buried in the ground and to 6" above grade, including piping in conduit, with one of the following, or equal:
  - 1. Polyethylene Coating: Pressure sensitive polyethylene coating, "X-Tru-Coat" as manufactured by Pipe Line Service Corporation or "Green Line" wrap as manufactured by Royston Products, or equal.
    - a. Field Joints and Fittings: Protecto Wrap #1170 tape as manufactured by Pipe Line Service Corporation, or Primer #200 tape by Royston Products, or equal. Installation shall be as per manufacturer's recommendation and instructions.
  - 2. Tape Wrap: Pressure-sensitive polyvinyl chloride tape, "Transtex #V-10 or V-20", "Scotchwrap 50", Slipknot 100, PASCO Specialty & Mfg., Inc., or equal, with continuous identification. Tape shall be a minimum of 20 mils thick for fittings and irregular surfaces, two wraps, 50 percent overlap, 40 mils total thickness. Tape shall be laminated with a suitable adhesive; widths as recommended by the manufacturer for the pipe size. Wrap straight lengths of piping with an approved wrapping machine.
- B. Field Joints: Valves and Fittings: double wrap polyvinyl chloride tape as above. Provide at least two thicknesses of tape over the joint and extend a minimum of 4 inches over adjacent pipe covering. Build up with primer to match adjacent covering thickness. Width of tape of fittings shall not exceed 3 inches. Tape shall adhere tightly to all surfaces of the fittings without air pockets.

- C. Testing: Test completed wrap of piping, including all epoxy painted piping with Tinker and Razor Co. holiday detector, or equal.
- D. Cleaning: Clean all piping thoroughly before wrapping.
  - 1. Inspection: Damaged or defective wraps shall be repaired as directed. No wrapped pipe shall be covered until approved by Architect.
- E. Covering: No rocks or sharp edges shall be backfilled against the wrap. When backfilling with other than sand, protect wrap with an outer wrapping of Kraft paper; leave in place during backfill.

### 3.13 PIPE IDENTIFICATION

- A. Provide temporary identification of each pipe installed, at the time of installation. Temporary identification shall be removed and replaced with permanent identification as part of the work.
- B. Apply the legend and flow arrow at all valve locations; at all points where the piping enters or leaves a wall, partition, cluster of piping or similar obstruction, at each change of direction, and at approximately 20'-0" intervals on pipe runs. Variations or changes in locations and spacing may be made with the approval of the Architect. There shall be at least one marking in each room. Markings shall be located for maximum visibility from expected personnel approach.
- C. Wherever two or more pipes run parallel, the markings shall be supplied in the same relative location on each.
- D. Each valve on non-potable water piping shall be labeled with a metal tag stamped "DANGER -- NON-POTABLE WATER" in 1/4 inch high letters.
- E. Apply the markings after painting and cleaning of piping and insulation is completed.

### 3.14 EXPANSION ANCHORS IN HARDENED CONCRETE

- A. Qualification Tests: The specific anchor shall have a current ICC-ES report and evaluated in cracked concrete in accordance with Acceptance Criteria AC193. If the specific anchor satisfies cyclic testing requirements per Acceptance Criteria AC01, Section 5.6, the full allowable shear and tension loads listed in the current ICC-ES report and manufacturer's recommendations for the specific anchor may be used. Otherwise, the design shear and tension loads shall not be more than 80% of the listed allowable shear and tension loads for the specific anchor.
- B. Installation: The anchors must be installed in accordance with the requirements given in ICC Research Committee Recommendations for the specific anchor.
- C. Testing: Fifty percent of the anchors shall be load-tested on each job to twice the allowable capacity in tension, except that if the design load is less than 75 pounds; only one anchor in ten need be tested. If any anchor fails, all anchors must be tested. The load test shall be performed in the presence of a special inspector.
- D. The load may be applied by any method that will effectively measure the tension in the anchor, such as direct pull with a hydraulic jack, a torque wrench calibrated using the specific anchor or calibrated

spring-loading devices. Anchors in which the torque is used to expand the anchor without applying tension to the bolt may not be verified with a torque wrench.

3.15 PIPING SYSTEM PRESSURE TESTING

A. General:

1. Perform operational tests under simulated or actual service conditions.
2. Repair leaks and defects with new materials, and retest piping or portion thereof until satisfactory results are obtained.

B. Piping Systems: Test the installations in accordance with the following requirements and applicable codes:

1. Notify the Architect at least seven days in advance of testing.
2. Authority having jurisdiction shall witness tests of piping systems.
3. Piping shall be tested at completion of roughing-in, or at other times as directed by the Architect.
4. Furnish necessary materials, test pumps, gases, instruments and labor required for testing.
5. Isolate from system equipment that may be damaged by test pressure.
6. Make connections to existing systems with flanged connection. During testing of new work, provide a slip-in plate to restrict test pressure to new systems. Remove plate and make final connection to existing system at completion of testing.
  - a. Authority having jurisdiction shall witness final connection to system.

C. Test Schedule: No loss in pressure or visible leaks shall show after four hours at the pressures indicated.

<u>System Tested</u>	<u>Test Pressure PSI</u>	<u>Test With</u>
All Hot, Chilled, Combination, Condenser Water Piping	Greater of 1-1/2 x WP or 100 psi	Water

D. Testing, Evacuating, Charging and Lubrication of Refrigeration Systems:

1. Pressurize with dry nitrogen and/or refrigerant to 300 psig and test all joints with an electronic detector or halide torch. Release the pressure and attach a high vacuum pump. Evacuate to 4 mm (4000 microns) and hold for 30 minutes. Break to 5 psig with dry nitrogen and allow to remain in the system for ten minutes. Evacuate to 2 mm (2000 microns) and hold for 30 minutes. Use a mercury manometer or electronic vacuum gauge. Do not start timing until recommended vacuum range is reached.
2. At the end of the evacuation, if the system has been proved leak-free, charge with refrigerant and fill the crankcase to the oil level specified by the manufacturer. All refrigerant oil shall be delivered to the location in sealed containers.
3. Replenish for a period of one year without cost to the Owner all refrigerant and oil required to maintain the proper levels.

### 3.16 TRACER WIRE INSTALLATION

- A. Provide tracer wire for non-metallic water pipe in ground outside of buildings. Use AWG #14 tracer wire with blue colored low density high molecular weight polyethylene insulation, and lay continuously on pipe so that it is not broken or stressed by backfilling operations. Secure wire to the piping with tape at 18 inch intervals. Solder all joints.
- B. Terminals: Precast concrete box and cast iron locking traffic cover, Brooks 3TL, or equal; cover marked with name of service; 6 inches of loose gravel below box. Plastic terminal board with brass bolts; identify line direction with plastic tags. Test for continuity between terminals, after backfilling, in presence of Inspector.
- C. Alternate: Use electronically detectable plastic tape with metallic core, Terra Tape D, manufactured by Reef Industries, Inc., Seton, Inc., Marking Services, Inc., or equal; tape 2 inches wide, continuously imprinted "CAUTION WATER (GAS, etc.) LINE BELOW". Install, with printed side up, directly over pipe, 18 inches below finish grade. Backfill material shall be as previously specified for the particular condition where pipe is installed, but avoid use of crushed rock or of earth with particles larger than 1/2 inch within the top 12 inches of backfill. Take precautions to insure that tape is not damaged or misplaced during backfill operations. Terminal boxes not required.

### 3.17 OPERATION OF SYSTEMS

- A. Do not operate any mechanical equipment for any purpose, temporary or permanent, until all of the following has been completed:
  - 1. Complete all requirements listed under "Check, Test and Start Requirements."
  - 2. Ductwork and piping has been properly cleaned. Piping systems shall be flushed and treated prior to operation.
  - 3. Filters, strainers etc. are in place.
  - 4. Bearings have been lubricated, and alignment of rotating equipment has been checked.
  - 5. Equipment has been run under observation, and is operating in a satisfactory manner.
- B. Provide test and balance agency with one set of Contract Drawings, Specifications, Addenda, Change orders issued, applicable shop drawings and submittals and temperature control drawings.
- C. Operate every fire damper, smoke damper, combination smoke and fire damper under normal operating conditions. Activate smoke detectors as required to operate the damper, stage fan, etc. Provide written confirmation that all systems operate in a satisfactory manner.

### 3.18 TEMPORARY HEAT

- A. The General Contractor will provide for all temporary heat at such times as may be required or directed by the Architect and pay all fuel and energy costs incurred.
- B. Temporary heating facilities proposed for use by the Contractor will be subject to review of the Architect. Prior to use of any equipment for temporary heat, install temporary filters on all return air inlets, to preclude dust and construction debris from entering the duct system. In addition, install filters in air handling units, and replace at the completion of temporary operation.

- C. Filters used for temporary operation of systems shall be as specified for permanent filters specified herein.
- D. Comply with Check, Test and Start Requirements for start-up of equipment prior to operation for temporary heat.
- E. Contractor shall complete the permanent heating system as soon as possible, thereby making it available for temporary heat. When available, the system may be used as required at the direction of the Architect after systems are properly prepared for use as specified elsewhere. Contractor shall then be responsible for operating the system during periods required and the General Contractor shall pay the fuel and energy costs incurred. Operation of the heating system prior to the filing of "notice of completion" shall not change the Guarantee provisions in any way.

### 3.19 CHECK, TEST AND START REQUIREMENTS

- A. An authorized representative of the equipment manufacturer shall perform check, test and start of each piece of mechanical equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the check test and start of the equipment.
  - 1. As part of the submittal process, provide a copy of each manufacturer's printed startup form to be used.
  - 2. Some items of specified equipment may require that check, test and start of equipment must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
  - 3. Provide all personnel, test instruments, and equipment to properly perform the check, test and start work.
  - 4. When work has been completed, provide copies of reports for review, prior to final observation of work.
- B. Provide copies of the completed check, test and start report of each item of equipment, bound with the Operation and Maintenance Manual.
- C. Upon completion of the work, provide a schedule of planned maintenance for each piece of equipment. Indicate frequency of service, recommended spare parts (including filters and lubricants), and methods for adjustment and alignment of all equipment components. Provide a copy of the schedule with each Operation and Maintenance Manual. Provide a copy of certification from the Owner's representative indicating that they have been properly instructed in maintenance requirements for the equipment installed.

### 3.20 PRELIMINARY OPERATIONAL REQUIREMENTS AND TESTS

- A. Prior to observation to determine final acceptance, put HVAC, plumbing, and fire protection systems into service and check that work required for that purpose has been done, including but not limited to the following condensed check list. Provide indexed report to tabulating the results of all work.
  - 1. All equipment has been started, checked, lubricated and adjusted in accordance with the manufacturer's recommendations, including modulating power exhausts if present.

2. Correct rotation of motors and ratings of overload heaters are verified.
  3. Specified filters are installed and spare filters have been turned over to Owner.
  4. All manufacturers' certificates of start-up specified have been delivered to the Owner.
  5. All equipment has been cleaned, and damaged painted finishes touched up.
  6. Damaged fins on heat exchangers have been combed out.
  7. Missing or damaged parts have been replaced.
  8. Flushing and chemical treatment of piping systems has been completed and water treatment equipment, where specified, is in operation.
  9. Equipment labels, pipe marker labels, ceiling markers and valve tags are installed.
  10. Valve tag schedules, corrected control diagrams, sequence of operation lists and start-stop instructions have been posted.
  11. Preliminary test and balance work is complete, and reports have been forwarded for review.
  12. Automatic control set points are as designated and performance of controls checks out to agree with the sequence of operation.
  13. Operation and Maintenance Manuals have been delivered and instructions to the operating personnel have been made.
- B. Prior to the observation to determine final acceptance, operate all mechanical systems as required to demonstrate that the installation and performance of these systems conform to the requirements of these specifications.
1. Operate and test all mechanical equipment and systems for a period of at least five consecutive 8 hour days to demonstrate the satisfactory overall operation of the project as a complete unit.
  2. Include operation of heating and air conditioning equipment and systems for a period of not less than two 8 hour days at not less than 90 percent of full specified heating and cooling capacities in tests.
  3. Commence tests after preliminary balancing and adjustments to equipment have been checked. Immediately before starting tests, install air filters and lubricate all running equipment. Notify the Architect at least seven calendar days in advance of starting the above tests.
  4. During the test period, make final adjustments and balancing of equipment, systems controls, and circuits so that all are placed in first class operating condition.
  5. Where Utility District rebates are applicable, demonstrate that the systems meet the rebate program requirements.
- C. Before handing over the system to Owner replace all filters with complete new set of filters.
- D. Review of Contractor's Tests:
1. All tests made by the Contractor or manufacturers' representatives are subject to observation and review by the Owner. Provide timely notice prior to start of each test, in order to allow for observation of testing. Upon the completion of all tests, provide a letter to confirm that all testing has been successful.
- E. Test Logs:
1. Maintain test logs listing the tests on all mechanical systems showing dates, items tested, inspectors' names, remarks on success or failure of the tests.
- F. Preliminary Operation:

1. The Owner reserves the right to operate portions of the mechanical system on a preliminary basis without voiding the guarantee.

G. Operational Tests:

1. Before operational tests are performed, demonstrate that all systems and components are complete and fully charged with operating fluid and lubricants.
2. Systems shall be operable and capable of maintaining continuous uninterrupted operation during the operating and demonstration period. After all systems have been completely installed, connections made, and tests completed, operate the systems continuously for a period of five working days during the hours of a normal working day.
3. This period of continuous systems operation may be coordinated with the removal of Volatile Organic Compounds (VOCs) from the building prior to occupancy should the Owner decide to implement such a program.
4. Control systems shall be completely operable with settings properly calibrated and adjusted.
5. Rotating equipment shall be in dynamic balance and alignment.
6. If the system fails to operate continuously during the test period, the deficiencies shall be corrected and the entire test repeated.

H. Pre-Occupancy Building Purge:

1. Prior to occupancy, ventilate the building on 100 percent outside air, 100 percent exhaust for a continuous period determined by a qualified industrial hygienist (engaged by the Contractor) to reduce V.O.C's prior to occupancy.
2. Submit report by the industrial hygienist verifying satisfactory completion of the pre-occupancy purge.

### 3.21 CERTIFICATES OF INSTALLATION

- A. Contractor shall complete applicable "Certificates of Installation" forms contained in the California Building Energy Efficiency Standards and submit to the authorities having jurisdiction for approval and issuance of final occupancy permit, as described in the California Energy Code.

### 3.22 DEMONSTRATION AND TRAINING

- A. An authorized representative of the equipment manufacturer shall train Owner-designated personnel in maintenance and adjustment of equipment. The representative may be an employee of the equipment manufacturer, or a manufacturer-certified contractor. Submit written certification from the manufacturer stating that the representative is qualified to perform the Owner training for the equipment installed.
1. As part of the submittal process, provide a training agenda outlining major topics and time allowed for each topic.
  2. Some items of specified equipment require that training must be performed by the manufacturer, using manufacturer's employees. See specific equipment Articles in these Specifications for this requirement.
  3. Contractor shall provide three copies of certification by Contractor that training has been completed, signed by Owner's representative, for inclusion in Operation and Maintenance Manual. Certificates shall include:

- a. Listing of Owner-designated personnel completing training, by name and title.
  - b. Name and title of training instructor.
  - c. Date(s) of training.
  - d. List of topics covered in training sessions.
4. Refer to specific equipment Articles for minimum training period duration for each piece of equipment.

END OF SECTION

SECTION 26 01 10

GENERAL REQUIREMENTS - ELECTRICAL

**PART 1 – GENERAL**

1.01 CONTRACT PROVISIONS

- A. The requirements of this Section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.02 SUMMARY

- A. This section describes the requirements for the electrical work includes, among others, the furnishing and installation of the following:
  - 1. Electrical service from the Main Switchboard to the building Distribution Panel including transformer, conduit and trenching, conductors.
  - 2. Power distribution system.
  - 3. Grounding system.
  - 4. Lighting and lighting control systems.
  - 5. Wiring systems including power wiring to plumbing and HVAC and other misc. appliances and equipment.
  - 6. Communications management system (voice/video/media/clock)
  - 7. Computer data systems, outlets, raceway, and cabling.
  - 8. Intrusion alarm and security systems.
  - 9. Emergency egress lighting.
  - 10. Fire alarm system.
  - 11. Photovoltaic System (Additive Alternate)

12. Testing and commissioning.

- B. Furnish and install all electrical equipment and systems as shown on the Drawings and as described in this Division of the Specifications to provide a complete and functional electrical installation. This work includes but is not limited to all material and labor required for installation of electrical and special systems complete as described herein this specification and drawings; and connections (and installation where not otherwise provided for) of electrical equipment furnished by others. Provide and install all items of equipment, devices, supports, etc., which are incidental to the major components shown on the Drawings or described in these Specifications.

1.03 RELATED WORK INCLUDED IN OTHER DIVISIONS

- A. Finish painting except factory applied finishes and repair of factory finishes shall be provided in accordance with appropriate sections of this Specification. Coordinate "painting" requirements of this Division with other trades as required to assure timely and satisfactory completion of required work. In finished areas, all exposed raceway, boxes, galvanized steel box covers (where allowed), and other electrical "structure" shall be finished to match adjacent structures. Verify that all raceway openings are closed, and box covers are in place prior to finishing work done by others.
- B. Examine the drawings and specification for mechanical equipment and provide electrical installation for heating, ventilation and air conditioning equipment, motors, pumps and associated motor starters and controls as described in Division 23.
- C. Examine the Architectural drawings and specification for electrical appliances and equipment which may not be shown on the plans to include and provide electrical installations as described in the architectural division of work.
- D. Examine the Architectural drawings and provide all construction necessary to maintain the integrity of the fire rated barriers.
- E. Examine the Architectural drawings and coordinate with the Architect to provide access doors, whether shown on drawings or not, where floors, walls, or ceiling must be penetrated for access to electrical equipment, outlet boxes, devices, etc., and as specified in this specification.
- F. Provide and install, as part of the work described in this Division, all power and control wiring fed from a source of 30 Volts or more (i.e. all wiring except temperature control wiring) for mechanical equipment described in Division 23.
- G. Examine the fire sprinkler system drawings and specifications for electrical work which may not be shown on the electrical and/or fire detection and alarm plans to be included in the electrical work as necessary as described in the Division 21 fire sprinkler system.

1.04 APPLICATION OF OTHER DIVISIONS

- A. Where carpentry, masonry, concrete work, painting, etc., is required in the installation of equipment specified under this Division, the work shall be done in accordance with the applicable Division of these Specifications. This work could include for example: work associated with panelboard installation, equipment pads or bases, support structures, etc.

1.05 DRAWINGS AND SPECIFICATIONS

- A. The information presented in these Specifications and on the Drawings is intended to describe the utilitarian and physical aspects of the systems shown as well as the quality of the entire installation. All information is as complete and thorough as possible, but every condition or situation cannot be anticipated. Exact locations, dimensions, elevations, etc. must be determined "on the job" with careful attention to the "intent" of the Drawings and Specifications.
- B. The above paragraph shall not be construed as to allow significant deviation from either the Drawings or Specifications without prior approval of the Architect, but minor changes in conduit routing or equipment locations may be required or desired due to specific conditions encountered. This work shall be accomplished in accordance with these Specifications and no "extra charges" are to be created for any unanticipated labor or material.
- C. Any error or omissions of detail in either the drawings or the specifications shall not relieve the Contractor from correctly installing all materials necessary for complete and operating electrical systems.
- D. Contractor shall inspect the site and verify all measurements and conditions. No extra compensation will be allowed because of differences between work shown on the drawings and measurements at the site.
  - 1. The Drawings are diagrammatic in nature, but the locations of devices, equipment, outlets, and lighting fixtures are shown approximately where installations are intended. Architectural, structural, mechanical, audio/video, theatrical lighting and other drawings shall be examined, noting all conditions that may affect this work. Report conflicting conditions to the Architect/Engineer for adjustment before proceeding with the work. Should the Contractor proceed with work without reporting the matter, he does so on his own responsibility and shall alter work if directed by the Architect/Engineer at his own expense.
- E. Examine the architectural, structural, mechanical, fire sprinkler and manufacturer's drawings for various equipment in order to determine exact routing and final terminations for all conduits and cables. Conduits shall be stubbed up as near as possible to equipment enclosure.
- F. All equipment shall be located and installed so that it will be readily accessible for operation and maintenance. The Owner reserves the right to require minor changes in location of outlets or equipment, prior to rough in without incurring any additional cost or changes.

- G. If significant departures from the Drawings or Specifications are considered necessary by the Contractor, details of the changes and the reasons therefore shall be submitted to the Architect as within thirty days after award of contract. Prior written acceptance of the Architect is required for these departures.
- H. Clarification of plans and specifications for the purpose of facilitating construction, but not involving additional labor and materials, may be prepared during construction by the Architect/Engineer. Said revised plans and specifications shall become a part of the contract. The Contractor shall conform to the revised plans and specifications at no additional cost to the District.

1.06 CODES, STANDARDS, RULES AND REGULATIONS

- A. All work and materials shall be in full accordance with the latest rules, codes, and/or regulations and not limited to the following:
  - B. California Electrical Code (CEC) - 2022 Edition
  - C. NFPA 101 - Life Safety Code
  - D. NFPA 72 - Fire Alarm Code
  - E. Title 24 - State of California Administrative Code
  - F. 2022 California Building Code (CBC)
  - G. City or County Electrical Code as applicable.
  - H. Utility rules and regulations.
  - I. Any applicable additional codes and regulatory documents effective at the project site.
  - J. Nothing on the Drawings or in the Specifications shall be construed to allow work not in conformance with these rules, codes, and regulations.
    - 1. The Drawings and/or Specifications shall take precedence where work and material described therein exceeds that required by rules, codes, or regulations.

1.07 MANUFACTURER'S INSTRUCTIONS

- A. Follow the manufacturer's instructions when specific installation or connection details are not indicated or specified on the contract documents.

- B. Notify the Architect/Engineer of conflicts between the manufacturer's instructions and installation or connection details prior to the installation of materials.

1.08 WORKMANSHIP

- A. High-quality workmanship shall be evidenced in the installation of all electrical equipment and materials. Use the National Electrical Contractors Association's "Standard of Installation" as a guide to the workmanship required. Be prepared to replace or repair any material or equipment damaged by or installed in a manner exhibiting evidence of poor workmanship.

1.09 COORDINATION WITH OTHER TRADES

- A. Examine the Electrical Drawings and refer to the Drawings and Specifications describing other work to be accomplished. Verify and coordinate prior to bid. Continue to coordinate work planning and all work in the field to avoid conflicts, errors, and/or delays. No compensation will be allowed for extra work necessitated by lack of coordination.

1.10 AUTHORITY OF THE ARCHITECT

- A. As used in this paragraph only, the word "Architect" shall mean the Architect of record or his designated representative.
- B. The authority of the Architect shall be absolute with respect to all performance under this Specification. In case of dispute, the decision of the Architect shall be final.
- C. Where optional materials, methods, or installation techniques are allowed under the provisions of this Specification, they may be used at the discretion of the Architect. The Architect may require specific materials, methods, or techniques to be used in specific situations where use of other materials, methods, or techniques might in his judgment result in loss of aesthetics, accidental damage, life safety hazard, or loss of utility over the system design lifetime.
- D. No additional charges will be allowed for work or material require to be supplied under the conditions of this paragraph unless the need for such material or work could not have been anticipated by thorough study of the site, Drawings, and Specifications and knowledge of all applicable codes, laws, and ordinances.

1.11 EXAMINATION OF THE SITE

- A. The contractor is required to visit the site of construction prior to bid to determine existing conditions and their effect upon the work he will be required to perform. No additional compensation will be allowed for any extra expenses incurred by failure to detect and evaluate all existing conditions that will affect his work to be included in the bid to accomplish this contract document's goal.

1.12 STRUCTURAL REQUIREMENTS:

- A. Secure all anchors for electrical equipment in a manner, which will not decrease the structural value of any structure to an unsafe level. Install all equipment, fixtures, and etc. to resist seismic movements. Inform the Architect in advance and provide drawings of any proposed modifications to the structure that involves cutting or patching of concrete, masonry, steel, or wood in this project.

#### 1.13 PERMITS, FEES, AND INSPECTIONS

- A. Obtain all permits and licenses as required and pay all fees incidental to construction.
- B. Inspections required by prevailing Local Authorities, and/or ordinances, shall be coordinated and arranged by the contractor. Provide the Architect with a schedule of inspections, where applicable, and submit all certificates of inspection to the Architect.
- C. The Contractor shall cooperate with the Architect and shall provide assistance at all times for the inspection of the electrical work. Remove covers, operate equipment, or perform any reasonable work, which, in the opinion of the Architect, will be necessary to determine the quality or adequacy of the work. Work shall not be closed in or covered before inspection and approval by the Architect. Cost of uncovering and making repairs where un-inspected work has been closed in shall be borne by the Contractor. If any material does not conform with these specifications the Contractor shall, within three days after being notified by the Architect, remove the materials from the premises.

#### 1.14 PRODUCT DELIVERY, STORAGE, AND HANDLING:

- A. Deliver materials and equipment to project site in manufacturer's original packaging with labeling showing product name, brand, model, project name, address, and Contractor's name. Store in a location as agreeable to District. Secure material from weather or accidental damage.

#### 1.15 OPERATING INSTRUCTIONS

- A. Instruct the District as to function, operation, maintenance, and adjustment of each system and piece of equipment provided.

#### 1.16 RECORD DRAWING

- A. See Section 00 7000, General Conditions and Division 00 and 01.

#### 1.17 GUARANTEE

- A. See Section 00 7000, General Conditions and Division 00 and 01.

### PART 2 – PRODUCTS

#### 2.01 MATERIALS

- A. Unless specifically indicated otherwise, all material shall be new and free from defects; it shall be listed by Underwriters' Laboratories where applicable. Like items shall be of the same manufacturer (except lighting fixtures - which shall be as specified).
- B. Except as noted otherwise, where material of a particular manufacturer is specified, the intent is to describe the quality and function of the item. The term "...or acceptable equal" is implied. A substitution of any of these items will require that the item be presented in a submittal whether specifically listed in the "Submittals" paragraph below or not.

## 2.02 SUBMITTALS

- A. See Section 00 7000, General Conditions and Division 00 and 01.
- B. As a minimum, submittals are required for the following items:
  - 1. RACEWAY COMPONENTS
  - 2. WIRE AND CABLE
  - 3. WIRING DEVICES
  - 4. MAIN SWITCHBOARD AND DISTRIBUTION PANELS
  - 5. PANELBOARDS
  - 6. PULL BOXES
  - 7. SAFETY SWITCHES, DISCONNECTS AND CIRCUIT BREAKERS
  - 8. TRANSFORMERS
  - 9. LIGHTING FIXTURES, CONTROL SYSTEMS, PEDESTALS AND POLES
  - 10. FIRE ALARM SYSTEM (COMPLETE)
  - 11. COMMUNICATIONS SYSTEM (COMPLETE)
  - 12. SECURITY SYSTEM (COMPLETE)
  - 13. DATA DISTRIBUTION SYSTEM (COMPLETE)
  - 14. TERMINAL CABINETS

2.03 SUBSTITUTIONS

- A. See Section 00 7000, General Conditions and Division 00 and 01.

2.04 ENCLOSURES

- A. Provide enclosures suitable for the specific type of location in which they are installed.
1. Provide NEMA 1 or NEMA 12 boxes and enclosures for dry locations. Dry locations are all indoor areas that do not fall within the definitions below for wet or damp locations.
  2. Provide NEMA 3R boxes and enclosures for wet locations. Wet locations are all locations exposed to weather, whether under a roof or not.
  3. Provide NEMA 4 boxes and enclosures for damp locations. Damp locations are all indoor spaces wholly or partially underground or any area subject to water spray.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. All equipment shall be set square and plumb, securely mounted, adequately supported, and permanent. Provide workspace around items of electrical equipment as required by California Electrical Code (CEC). In general, equipment is to be installed in accordance with manufacturer's instructions; but the requirements of these specifications shall take precedence where conflicts exist.
- B. WIRING METHODS: The cables and conductors of all systems specified in the Specification are required to be installed in raceway.

3.02 ELECTRICAL WORK FOR EQUIPMENT PROVIDED UNDER OTHER SECTIONS

- A. Install power conductors and terminate on equipment provided under other specification sections. Verify specific requirements.
- B. Install and terminate electrical controls as described on the Electrical Drawings (For mechanical equipment specified in Division 23).
- C. Line voltage control wiring of exhaust fans is to be accomplished under this Division. The controlling device may be specified elsewhere.
- D. Provide and install all disconnect/safety switches and motor starters except those devices specified to be furnished with equipment specified elsewhere.

- E. Unless provided for in another Division, install all items of electrical equipment provided by others.
- F. Assist others in equipment testing to verify that wiring and connections made under this Division are correct.

### 3.03 EQUIPMENT IDENTIFICATION

- A. Nameplates shall be installed on all items of electrical equipment as follows: switchboard(s) and switchboard circuit breakers, panelboards, terminal cabinets, time switches, contactors, motor control switches, wall switches (where noted on the Drawings), motor starters provided under this Division where the function is not immediately obvious, and safety switches.
- B. The nameplate shall identify the item by Drawing name where applicable and describe its use or function in this installation.
- C. Permanently mark all utility outlets to show source of power panel and circuit breaker number.

### 3.04 EXCAVATION AND BACKFILL

- A. Excavation and backfill shall be accomplished as required for installation of electrical equipment as shown on the Drawings. Restore all surfaces, roadways, walks, etc., and any existing underground structures which might be disturbed during this work to their original condition in a manner acceptable to the Architect.
- B. Trenches shall be straight except where otherwise indicated. Depth shall be as noted on the Drawings and at least as required to provide the minimum cover specified by applicable codes and regulations for the equipment installed. Bottom of trench shall be smooth and free of any rock points. Place a 4" sand bed in trench if these conditions cannot be met with native material.
- C. Backfill shall be clean and free of rocks and debris. Backfill is to be tamped in 6" layers to nominal 95% compaction using a mechanical tamper manufactured specifically for this purpose. In an area of engineered fill or other area of specified compaction, backfill shall be compacted to match that specified for that area.
- D. At a depth of 12" below finished grade and at least 6" above installed equipment, lay a 6" wide yellow warning tape on the compacted backfill for the full length of the trench. Do not stretch the tape. Use Brady "Identoline" stating: "CAUTION BURIED ELECTRICAL LINE". Installation under building slabs is not required unless noted otherwise.
- E. If at any time during a period of one year dating from the date of final acceptance of the project, there shall be any settlement of conduit trenches, the Architect may notify the Contractor to immediately provide additional fill and to make such repairs or replacements in paving, planting, or structures, as may be deemed necessary at the Contractor's expense.

- F. Cooperate and coordinate with others in planning for and execution of all trench work.
1. The Contractor is expected to exercise due care when excavating in an area of existing utilities to avoid damage to these facilities. Where it can be determined that underground facilities are likely to exist (either from the Drawings or inspection of the site), the Contractor is required to determine the exact locations of these existing installations. Damage to existing facilities, due to failure to properly accomplish the above, shall be repaired at the Contractors expense to the approval by the Architect and satisfaction of the District.
  2. CALL AN UNDERGROUND SERVICE FIRM BEFORE TRENCHING, CALL U.S.A. (800) 624-2444.

### 3.05 SEALING PENETRATIONS

- A. Flash and counter flash roof and wall penetrations with equipment manufactured for the purpose and as described in other Divisions of these Specifications or as Directed by the Architect. Apply mastic as required to seal absolutely watertight.
- B. Conduits penetrating floor slabs or block or concrete walls shall be grouted and sealed watertight.

### 3.06 CUTTING AND PATCHING

- A. Obtain the Architect's acceptance prior to cutting existing surfaces or surfaces under construction. All such surfaces must be repaired or patched to the satisfaction of the Architect.

### 3.07 EQUIPMENT ANCHORING

- A. Seismic Withstand Requirements: Freestanding or wall-hung equipment shall be anchored in place by methods, which will meet the requirements of the California Building code for seismic loads. The CONTRACTOR shall submit calculations in accordance with "Contractor Submittals", for the design of the anchoring systems for all equipment, including panels, transformers, etc. in excess of 250 pounds. Calculations shall be performed, signed and stamped by a Structural Engineer or a Civil Engineer experienced in structural design and licensed in the State of California. The calculation shall provide an analysis of lateral and overturning forces and shall include a factor of safety against overturning equal to 1.5. The calculation shall also provide an analysis of both the anchoring system and the foundation or wall system to receive the anchor loads and shall show that the foundation is capable of resisting all anchor loads. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria.
- B. Seismic bracing for light fixtures cable or pendant suspended from ceiling or roof structure shall be seismically braced to prevent fixture from swaying 45 degree in either direction of suspension point. Contractor shall use same cable used to suspend light fixture. Where pendants are use the contractor shall use aircraft light fixture suspension cable. Submittal shall include data on attachment hardware and methods that will satisfy withstand criteria referred to in above paragraph.

3.08 PROTECTION CLEANING AND REPAIRS

- A. All electrical equipment shall be protected from damage or degradation during construction. Electrical equipment stored or installed shall be protected from dust, water, or damage from other sources.
- B. After all other work has been accomplished, such as plastering, painting, etc., and prior to final review by the Architect; all electrical equipment, especially equipment enclosures, panelboards, switchboards, and lighting fixtures shall be thoroughly cleaned (inside and out) of all dirt, water, grease, plaster, paint, or other construction debris. All surfaces shall be clean and in "new" condition. All scratches, dents, marks, cracks, etc., shall be repaired to the satisfaction of the Architect or the equipment shall be replaced at no additional cost.

3.09 ELECTRICAL EQUIPMENT DELIVERABLES

- A. Retain and safeguard all detachable and spare devices, equipment, and literature (O&M manuals, instruction books, wiring diagrams, test reports, keys, fixtures, etc.) until completion of work. At this time, all items will be delivered to the District as directed by the Architect.

3.10 POWER SYSTEM COORDINATION

- A. Provide a coordination study of the new power system to match the trip curves of a new circuit breaker for proper interruption of the system. Contractor to make final breaker settings based on results of study.

3.11 TESTS

- A. Prior to energization of equipment, check the insulation resistance of listed circuits, with a 500 volt "Megger".
- B. Take precaution during the testing period to ensure the safety of personnel and equipment.
- C. Test all wiring for continuity and grounds before any fixtures or equipment are connected. Where such tests indicate faulty installation or other defects, the fault(s) shall be located and repaired at the Contractor's expense. The repaired installation shall then be retested.
- D. Verify rotation of all three phase motors and reconnect if necessary.
- E. Verify the resistance of the grounding electrode system(s)
- F. Balance all loads on each panelboard and all other types of distribution equipment as applicable.

END OF SECTION



SECTION 20 02 10

ELECTRICAL DEMOLITION GENERAL REQUIREMENTS

**PART 1 – GENERAL**

1.01 CONTRACT PROVISIONS

- A. The requirements of this Section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.02 RELATED DOCUMENTS

- A. Section 260110- General Requirements, Electrical.
- B. Notes and requirements on drawings.

1.03 REQUIREMENTS INCLUDED

- A. The Contractor shall furnish materials, equipment, and labor necessary to perform and complete demolition work.
- B. The work includes demolition of the existing electrical and fire alarm work.
- C. The work shall include, but not limited to, removal of existing electrical and fire alarm equipment and devices, conduits, and wiring.
- D. Manufactured articles, materials, equipment, and accessories shall be demolished in accordance with the manufacturer's specifications and recommendations, and industry standards.
- E. Notify the District's (Owner) representative at least 72 hours prior to any electrical systems shutdown.

1.04 PROTECTION

- A. It is essential that there be minimal interruption of existing systems such as power, fire protection, and other systems, in addition to the normal operations of the District's (Owner) facilities.

- B. Take care to ensure that there will be no damage to structural elements or portions there-of-which are not to be removed. Erect and maintain temporary shoring, bracing, and other means to safeguard the structural integrity of the existing buildings and structures.
- C. Erect and maintain temporary bracing, shoring, lights, barricades, signs, and other means to protect the public, workers, and other persons; finishes and improvements to remain; and adjoining property from damage from demolition work; all in accordance with application regulatory requirements.
- D. Protect existing structures, facilities, and plant life from damage. Items damaged as a result of demolition operations shall be repaired or replaced, at no cost to the District (Owner).
- E. Perform demolition to provide the least interference and most protection to existing facilities and improvements to remain.
- F. Demolish concrete in small sections.
- G. Perform demolition as much as possible with small tools.
- H. Jack-hammering:
  - 1. Jack-hammering will be permitted only to a limited degree, and only with the prior written approval of the Owner.
  - 2. Do not jackhammer within 2-inches of reinforcing or structural steel to remain; remove final 2-inches of material with chipping gun.

#### 1.05 CUTTING AND PATCHING

- A. Make new openings neat, as close as possible to profiles indicated, and only to extent necessary for new work.
- B. Do not cut or alter structural members unless specifically indicated or approved, and do not damage reinforcing or structural steel to remain.
- C. At concrete, masonry, paving, and other materials where edges of cuts and holes will remain exposed in the completed work, make cuts using power-sawing and coring equipment. Do not

over cut at corners of cut openings – saw overruns will not be permitted. Core hole at corner of proposed openings to insert blade and chip square.

- D. Upon completion of cutting and coring, clean remaining surfaces of loose particles and dust.
- E. Repair and patch all holes and openings from the removed electrical equipment, outlet boxes, etc. Coordinate with the General Contractor and the Architect to include and provide finished to match the adjacent area.

#### 1.06 PIPES, DUCTS, AND CONDUITS

- A. Remove deactivated electrical conduit, including fastenings, connections, and other related appurtenances and accessories that would otherwise be exposed in the completed work or interfere with construction operations.
- B. Unless noted otherwise, remove existing exposed conduits and abandon existing concealed conduits in walls, ceiling, and underground whether shown on drawings or not.
- C. Cap deactivated piping systems at points of cutoff.

#### 1.07 DEMOLITION DEBRIS

- A. All equipment and associated materials must be disposed of in an approved manner and in accordance with all applicable federal, state, and local environmental laws.
- B. Regularly remove debris from the site so that it's presence will not delay the progress of the work.
- C. Nothing to be removed from the site shall be stored, sold, or burned on the site without the District/Owner's prior written acceptance.

#### 1.08 RECONDITIONING EXISTING SUBSTRATES

- A. Clean surfaces on which new materials will be applied, removing adhesives, bitumen, and other adhering materials, as necessary to furnish acceptable substrates for new materials.

- B. Perform sandblasting, chipping, grinding, acid washing, etching, and other work as required by conditions encountered and new materials involved.
- C. Use of acids or other cleaning agents shall include neutralizing, washing, rinsing, and drying, as applicable.
- D. Determine substrate requirements for reconditions surfaces in cooperation with the manufacturer's representative and installer of each new installer involved.
- E. Clean surfaces on which new materials will be applied, removing adhesives, bitumen, and other adhering materials, as necessary to furnish acceptable substrates for new materials.

1.09 DISPOSAL OF FLUORESCENT LAMPS AND BALLASTS

- A. All existing fluorescent lamps and ballasts shall be properly disposed or recycled according to the Environmental Protection Agency (EPA) and Resource Conservation and Recovery Act (RCTA) standards. Include all costs for disposal or recycling in the bid proposal.
  - 1. Lamps: Dispose or recycle through "Allied Technology Group", 47375 Fremont Boulevard, Fremont, California, 94538, (510) 490-3008 or equal.
  - 2. Ballasts: Dispose or recycle through "Fulcircle Ballast Recyclers", 550 Montori Court, Pleasanton, California, 94556, (510) 417-5967 or equal.

1.10 ASBESTOS

- A. In the event asbestos is found to be present in areas conflicting with electrical work, before continuation of work in those areas, notify the General Contractor and/or District (Owner) representative and if applicable, for the removal of such hazardous material by a certified asbestos contractor.

END OF SECTION

SECTION 26 05 19

LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES (600 V AND LESS)

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Wire and cable for 600 volts and less.
- B. Wiring connectors and connections.

1.2 RELATED REQUIREMENTS

- A. Section 312316 - Excavation.
- B. Section 312323 - Fill: Bedding and backfilling.
- C. Section 312316.13 - Trenching: Excavating, bedding, and backfilling.
- D. Section 260553 - Identification for Electrical Systems.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- B. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.
- C. 2022 California Electrical Code.

1.4 SUBMITTALS

- A. See Section 00 7000, General Conditions and Division 00 and 01.
- B. Product Data: Provide for each cable assembly type.
- C. Test Reports: Indicate procedures and values obtained.
- D. Design Data: Indicate voltage drop and ampacity calculations for aluminum conductors substituted for copper conductors.
- E. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency.

F. Project Record Documents: Record actual locations of components and circuits.

## 1.5 QUALITY ASSURANCE

A. Conform to requirements of CEC.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with a minimum of three years of documented experience and with service facilities within 100 miles of the Project.

C. Products: Furnish products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

## 1.6 LUGS

1.6.1 Furnish and install proper lugs in all panelboards, switchboards, gutters, etc., required to properly terminate every cable. Where paralleled conductors or conductors of large size are to terminate on a breaker a short length of copper cable (of capacity of the breaker) shall be connected to the breaker, and the proper bolt or compression type lug installed to connect this cable to the feeder cable. The cutting of cable strands to fit the breaker will not be permitted. Lugs shall be Burndy, ILSCO or approved equal.

## 1.7 VERTICAL CABLE SUPPORTS

1.7.1 Vertical cable supports shall be provided in all light and power system runs at all pull boxes or at panelboards in vertical feeders and in all other light and power system runs other than feeders at spacing not exceeding code requirements. Cable supports shall be with split type impregnated hardwood plugs for synthetic insulated cables, O.Z./Gedney Company Types for voltages to 600 and Type "R" for voltages above 2,000.

## PART 2 PRODUCTS

### 2.1 WIRING REQUIREMENTS

A. Concealed Dry Interior Locations: Use only building wire in raceway.

B. Exposed Dry Interior Locations: Use only building wire in raceway.

C. Above Accessible Ceilings: Use only building wire in raceway.

- D. Wet or Damp Interior Locations: Use only building wire with Type insulation in raceway.
- E. Exterior Locations: Use only building wire with Type THWN insulation in raceway.
- F. Underground Installations: Use only building wire with Type THWN insulation in raceway.
- G. Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- H. Use stranded conductors for control circuits.
- I. Use conductor not smaller than 12 AWG for power and lighting circuits.
- J. Use conductor not smaller than 16 AWG for control circuits.
- K. Use 10 AWG conductors for 20 ampere, 120 volt branch circuits longer than 75 feet.
- L. Use 10 AWG conductors for 20 ampere, 277 volt branch circuits longer than 200 feet.
- M. All conductors shall be minimum of 98 percent conductivity, soft drawn copper.
- N. Feeders or branch circuits, aluminum conductors will not be allowed. Any appliance connected to a SCUSD electrical system, must make the transition to copper within the appliance. This transition shall be covered in the manufacturer's warranty.
- O. Control circuits for mechanical equipment in locations subject to abnormal temperatures on or under furnaces and heaters shall be C.E.C. listed 90 degrees C, 600 volt insulation conductors.

2.2 WIRE MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)

- A. Cerro Wire Inc: [www.cerrowire.com](http://www.cerrowire.com).
- B. Industrial Wire & Cable, Inc: [www.iewc.com](http://www.iewc.com).
- C. Southwire Company: [www.southwire.com](http://www.southwire.com).
- D. Or Equal.
- E. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.

2.3 BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor: Copper.
  - 1. For Sizes Smaller Than 4 AWG: Copper.

2. For Sizes 4 AWG and Larger: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: NFPA 70, Type THW.

#### 2.4 SERVICE ENTRANCE CABLE

A. Description: NFPA 70, Type SE.

B. Conductor: Copper.

1. For Sizes Smaller Than 4 AWG: Copper.

2. For Sizes 4 AWG and Larger: Copper.

C. Insulation Voltage Rating: 600 volts.

D. Insulation: Type RH.

#### 2.5 WIRING CONNECTORS

A. Solderless Pressure Connectors:

B. Compression Connectors:

### PART 3 EXECUTION

#### 3.1 EXAMINATION

A. Verify that interior of building has been protected from weather.

B. Verify that mechanical work likely to damage wire and cable has been completed.

C. Verify that raceway installation is complete and supported.

D. Verify that field measurements are as indicated.

#### 3.2 PREPARATION

A. Completely and thoroughly swab raceway before installing wire.

#### 3.3 INSTALLATION

A. Install wire and cable securely, in a neat and workmanlike manner, as specified in NECA.

B. Route wire and cable as required to meet project conditions.

1. Wire and cable routing indicated is approximate unless dimensioned.
  2. Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.
  3. Include wire and cable of lengths required to install connected devices within 10 ft of location shown.
- C. Use wiring methods indicated.
- D. Pull all conductors into raceway at same time.
- E. Use suitable wire pulling lubricant for building wire 4 AWG and larger.
- F. Protect exposed cable from damage.
- G. Support cables above accessible ceiling, using spring metal clips or metal cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
- H. Use suitable cable fittings and connectors.
- I. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- J. Clean conductor surfaces before installing lugs and connectors.
- K. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- L. Connectors and terminal lugs shall be used for terminating stranded conductors No. 8 and larger.
- M. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- N. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- O. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- P. Connector and terminal lugs shall be used for terminating stranded conductors No. 8 and larger shall be T&B, ILSCO, or equal, solderless connectors.
- Q. Identify and color code wire and cable under provisions of Section 260553. Identify each conductor with its circuit number or other designation indicated.
- R. Bolt type solderless connectors shall be tightened and then retightened after 24 to 48 hours before

taping. DSA Inspector shall be informed of this procedure during the waiting period and shall witness the act of retightening.

S. No oil, grease, or similar substances shall be used to facilitate the pulling in of conductors. Use minerallac, linseed soap or specifically approved wire-pulling compound.

3.4 FIELD QUALITY CONTROL

A. Perform field inspection and testing in accordance with Section 014000.

B. Inspect and test in accordance with NETA STD ATS, except Section 4.

C. Perform inspections and tests listed in NETA STD ATS, Section 7.3.2.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEM

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Grounding and bonding components.
- B. Provide all components necessary to complete the grounding system(s) consisting of:
  - 1. Existing metal underground water pipe.
  - 2. Metal underground water pipe.
  - 3. Metal frame of the building.
  - 4. Steel water storage tank and supports.
  - 5. Concrete-encased electrode.
  - 6. Ground ring specified in Section 337900.
  - 7. Existing metal underground gas piping system.
  - 8. Metal underground gas piping system.

1.2 RELATED REQUIREMENTS

- A. Section 337900 - Site Grounding.
- B. Section 032000 - Concrete Reinforcing.
- C. Section 033000 - Cast-in-Place Concrete.

1.3 REFERENCE STANDARDS

- A. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.
- B. 2022 California Electrical Code.

1.4 PERFORMANCE REQUIREMENTS

- A. Grounding System Resistance: 5 ohms.

## 1.5 SUBMITTALS

- A. See Section 00 7000, General Conditions and Division 00 and 01.
- B. Product Data: Provide for grounding electrodes and connections.
- C. Test Reports: Indicate overall resistance to ground and resistance of each electrode.
- D. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency specified under Quality Assurance. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E. Project Record Documents: Record actual locations of components and grounding electrodes.
- F. Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

## 1.6 QUALITY ASSURANCE

- A. Conform to requirements of CEC.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience with service facilities within 100 miles of Project.
- C. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

## PART 2 PRODUCTS

### 2.1 MANUFACTURERS

- A. Cooper Power Systems: [www.cooperpower.com](http://www.cooperpower.com).
- B. Framatome Connectors International: [www.fciconnect.com](http://www.fciconnect.com).
- C. Or Equal.
- D. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.

### 2.2 ELECTRODES

- A. Manufacturers:
  - 1. Cooper Power Systems: [www.cooperpower.com](http://www.cooperpower.com).
  - 2. Framatome Connectors International: [www.fciconnect.com](http://www.fciconnect.com).

3. Or Equal..

4. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.

B. Rod Electrodes: Copper.

1. Diameter: 3/4 inch.

2. Length: 10 feet.

C. Foundation Electrodes: 2/0 AWG. unless noted on plan.

### 2.3 CONNECTORS AND ACCESSORIES

A. Mechanical Connectors: Bronze.

B. Exothermic Connections:

C. Wire: Stranded copper.

D. Grounding Electrode Conductor: Size to meet CEC requirements.

E. Grounding Well:

1. Well Pipe: 8 inch by 24 inch long clay tile pipe with belled end.

2. Well Cover: Cast iron with legend "GROUND" embossed on cover.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

A. Verify existing conditions prior to beginning work.

B. Verify that final backfill and compaction has been completed before driving rod electrodes.

#### 3.2 INSTALLATION

A. Install ground electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.

B. Provide grounding well pipe with cover at each rod location. Install well pipe top flush with finished grade.

C. Install 4 AWG bare copper wire in foundation footing where indicated.

D. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where

indicated. Bond steel together.

- E. Provide bonding to meet requirements described in Quality Assurance.
- F. Provide isolated grounding conductor for circuits supplying personal computers and applicable electronic equipment.
- G. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- H. Install the grounding electrode system shown on the Drawings and as required by applicable Electrical Codes. Test the system and verify that the resistance of the grounding electrode conductor to ground – as measured from the point where the conductor will be connected to the service equipment – is less than 25 ohms. Where this is not achieved, augment the system with additional electrodes until it is.
- I. Ground rods, where used, shall not be less than 5/8 inch in diameter and 10 feet long. They shall be driven to within 4 inch of full length into the earth. Bonding to the rod(s) shall be with Burndy, Cad-Weld, or Ampact connectors.
- J. Interface with site grounding system installed under Section 337900.

### 3.3 FIELD QUALITY CONTROL

- A. Provide field inspection in accordance with Section 014000.
- B. Inspect and test in accordance with NETA STD ATS except Section 4.
- C. Perform inspections and tests listed in NETA STD ATS, Section 7.13.

END OF SECTION

SECTION 26 05 29

HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Conduit and equipment support.
- B. Anchors and fasteners.

1.2 REFERENCE STANDARDS

- A. ICC-ES AC01 - Acceptance Criteria for Expansion Anchors in Masonry Elements; 2009.
- B. ICC-ES AC106 - Acceptance Criteria for Predrilled Fasteners (Screw Anchors) in Masonry Elements; 2006
- C. ICC-ES AC193 - Acceptance Criteria for Mechanical Anchors in Concrete Elements; 2010
- D. ICC-ES AC308 - Acceptance Criteria for Post-Installed Adhesive Anchors in Concrete Elements; 2009.
- E. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- F. 2022 California Electrical Code.

1.3 SUBMITTALS

- A. See Section 00 7000, General Conditions and Division 00 and 01.
- B. Product Data: Provide manufacturer's catalog data for fastening systems.
- C. Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.4 QUALITY ASSURANCE

- A. Conform to requirements of CEC.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

## 2.1 MANUFACTURERS (LISTED IN ALPHABETICALLY ORDER ONLY AND NOT NECESSARY BY PREFERENCE)

- A. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
- B. Threaded Rod Company: [www.threadedrod.com](http://www.threadedrod.com).
- C. Or Equal.
- D. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.

## 2.2 SUPPORTS

- A. Pipe hangers for individual conduits shall be factory made, consisting of a pipe ring and threaded suspension rod. The pipe ring shall be malleable iron, split and hinged, or shall be springable wrought steel. Rings shall be bolted to or interlocked with the suspension rod socket.
- B. Pipe racks for groups of parallel conduits shall be constructed of galvanized structural steel preformed channels of length as required, suspended on threaded rods, and secured thereto with nuts above and below the cross bar.
- C. Factory made pipe straps shall be one-hole malleable iron or two-hole galvanized clamps.
- D. Supporting rods shall be at least 3/8" diameter and channel shall be at least 3/4" deep. Supporting hardware shall be galvanized steel.

## 2.3 MATERIALS

- A. Hangers, Supports, Anchors, and Fasteners - General: Corrosion-resistant materials of size and type adequate to carry the loads of equipment and conduit, including weight of wire in conduit.
- B. Supports: Fabricated of structural steel or formed steel members; galvanized.
- C. Anchors and Fasteners:
- D. Concrete Structural Elements: Use precast inserts, expansion anchors, powder-actuated anchors, or preset inserts.
- E. Steel Structural Elements: Use beam clamps, steel spring clips, steel ramset fasteners, or welded fasteners.
- F. Concrete Surfaces: Use self-drilling anchors or expansion anchors.
- G. Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
- H. Solid Masonry Walls: Use expansion anchors or preset inserts.

- I. Sheet Metal: Use sheet metal screws.
- J. Wood Elements: Use wood screws.
- K. Fastener Types:
  - 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.
  - 2. Masonry Wedge Expansion Anchors: Complying with ICC-ES AC01.
  - 3. Concrete Screw Type Anchors: Complying with ICC-ES AC193.
  - 4. Masonry Screw Type Anchors: Complying with ICC-ES AC106.
  - 5. Other Types: As required.
  - 6. Manufacturers:
    - a. Powers Fasteners, Inc: [www.powers.com](http://www.powers.com).
    - b. Or Equal.
- L. Formed Steel Channel:
- M. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.
- N. Powder-Actuated Anchors:
- O. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.
- P. Steel Spring Clips:
- Q. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.

### PART 3 EXECUTION

#### 3.1 INSTALLATION

- A. Install hangers and supports as required to support electrical system components adequately and securely, in a neat and workmanlike manner, as specified in NECA 1.
  - 1. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
  - 2. Obtain permission from the Architect and the Structural Engineer before drilling or cutting structural members.
- B. Rigidly weld support members or use hexagon-head bolts to present neat appearance with adequate

strength and rigidity. Use spring lock washers under all nuts.

- C. Install surface-mounted cabinets and panelboards with minimum of four anchors.
- D. In wet and damp locations use steel channel supports to stand cabinets and panelboards 1 inch off wall.
- E. Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

SECTION 26 05 34

RACEWAY

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Conduit, fittings and conduit bodies.

1.2 RELATED REQUIREMENTS

- A. Section 337119 - Electrical Underground Ducts and Manholes.
- B. Section 078400 - Firestopping.
- C. Section 260526 - Grounding and Bonding for Electrical Systems.
- D. Section 260529 - Hangers and Supports for Electrical Systems.
- E. Section 260553 - Identification for Electrical Systems.
- F. Section 260537 - Boxes.
- G. The requirements of the kitchen equipment consultant plans and specifications.

1.3 REFERENCE STANDARDS

- A. ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC); 2005.
- B. ANSI C80.3 - American National Standard for Steel Electrical Metallic Tubing (EMT); 2005.
- C. ANSI C80.5 - American National Standard for Electrical Rigid Aluminum Conduit (ERAC); 2005.
- D. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- E. NECA 101 - Standard for Installing Steel Conduit (Rigid, IMC, EMT); National Electrical Contractors Association; 2006.
- F. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.
- G. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit; National Electrical Manufacturers Association; 2005.
- H. NEMA TC 2 - Electrical Polyvinyl Chloride (PVC) Tubing and Conduit; National Electrical Manufacturers

Association; 2003.

- I. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing; National Electrical Manufacturers Association; 2004.
- J. 2022 California Electrical Code.

#### 1.4 SUBMITTALS

- A. See Section 00 7000, General Conditions and Division 00 and 01.
- B. Product Data: Provide for metallic conduit, flexible metal conduit, liquidtight flexible metal conduit, metallic tubing, nonmetallic conduit, fittings, and conduit bodies.
- C. Project Record Documents: Accurately record actual routing of conduits larger than 1 1/4 inches.

#### 1.5 QUALITY ASSURANCE

- A. Conform to requirements of CEC 2022.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept conduit on site. Inspect for damage.
- B. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- C. Protect PVC conduit from sunlight.

### PART 2 PRODUCTS

#### 2.1 CONDUIT REQUIREMENTS

- A. Conduit Size: Comply with CEC.
  - 1. Minimum Size: 3/4 inch unless otherwise specified.
- B. Underground Installations:
  - 1. More than 5 Feet from Foundation Wall: Use plastic coated conduit or thickwall non-metallic conduit.
  - 2. Within 5 Feet from Foundation Wall: Use rigid steel conduit.
  - 3. In or Under Slab on Grade: Use plastic coated conduit or thickwall non-metallic conduit.

4. Minimum Size: 1 inch.
- C. Outdoor Locations Above Grade: Use rigid steel conduit or intermediate metal conduit.
- D. In Slab Above Grade:
  1. Use intermediate metal conduit or thickwall nonmetallic conduit.
  2. Maximum Size Conduit in Slab: 3/4 inch; 1/2 inch for conduits crossing each other.
- E. Wet and Damp Locations: Use rigid steel conduit or intermediate metal conduit.
- F. Dry Locations:
  1. Concealed: Use electrical metallic tubing.
  2. Exposed: Use rigid steel conduit or intermediate metal conduit for installation up to 8 feet.

## 2.2 METAL CONDUIT

- A. Manufacturers:
  1. Allied Tube & Conduit: [www.alliedtube.com](http://www.alliedtube.com).
  2. Beck Manufacturing, Inc: [www.beckmfg.com](http://www.beckmfg.com).
  3. Wheatland Tube Company: [www.wheatland.com](http://www.wheatland.com).
  4. Or Equal..
  5. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.
- B. Rigid Steel Conduit: ANSI C80.1.
- C. Intermediate Metal Conduit (IMC): Rigid steel.
- D. Fittings and Conduit Bodies: NEMA FB 1; material to match conduit.

## 2.3 PVC COATED METAL CONDUIT

- A. Manufacturers:
  1. Allied Tube & Conduit: [www.alliedtube.com](http://www.alliedtube.com).
  2. Thomas & Betts Corporation: [www.tnb.com](http://www.tnb.com).
  3. Robroy Industries: [www.robroy.com](http://www.robroy.com).

4. Or Equal.

5. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.

B. Description: NEMA RN 1; rigid steel conduit with external PVC coating.

C. Fittings and Conduit Bodies: NEMA FB 1; steel fittings with external PVC coating to match conduit.

#### 2.4 FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. AFC Cable Systems, Inc: [www.afcweb.com](http://www.afcweb.com).

2. Electri-Flex Company: [www.electriflex.com](http://www.electriflex.com).

3. International Metal Hose: [www.metalhose.com](http://www.metalhose.com).

4. Or Equal..

5. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.

B. Description: Interlocked steel construction.

C. Fittings: NEMA FB 1.

#### 2.5 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

A. Manufacturers:

1. AFC Cable Systems, Inc: [www.afcweb.com](http://www.afcweb.com).

2. Electri-Flex Company: [www.electriflex.com](http://www.electriflex.com).

3. International Metal Hose: [www.metalhose.com](http://www.metalhose.com).

4. Or Equal..

5. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.

B. Description: Interlocked steel construction with PVC jacket.

C. Fittings: NEMA FB 1.

#### 2.6 ELECTRICAL METALLIC TUBING (EMT)

A. Manufacturers:

1. Allied Tube & Conduit: [www.alliedtube.com](http://www.alliedtube.com).
2. Beck Manufacturing, Inc: [www.beckmfg.com](http://www.beckmfg.com).
3. Wheatland Tube Company: [www.wheatland.com](http://www.wheatland.com).
4. Or Equal.

B. Description: ANSI C80.3; galvanized tubing.

C. Fittings and Conduit Bodies: NEMA FB 1; steel or malleable iron compression type.

## 2.7 RACEWAY, NON-METALLIC, THREE TRACK, SURFACE MOUNTED

A. Description: Non-Metallic, Surface mounted Raceway

1. 5500 Series Wiremold or T-70 Panduit, three compartments.
2. 800 Series Wiremold, single compartment.

## 2.8 Rigid Non-Metallic Conduit (PVC)

A. Rigid heavy weight type, Schedule 40 or 80 PVC - approved for direct burial and sunlight resistant (U.V. stabilized) where exposed. Minimum size 1".

## PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that field measurements are as shown on drawings.
- B. Verify routing and termination locations of conduit prior to rough-in.
- C. Conduit routing is shown on drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

### 3.2 INSTALLATION

- A. Install conduit securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install steel conduit as specified in NECA 101.
- C. All conduits shall be run concealed in walls and/or ceiling. Where conduits can not be run concealed in wall and/or ceiling space, the Contractor shall coordinate with the architectural and structural plans and the Architect for installing and routing of exposed conduits.
- D. Arrange supports to prevent misalignment during wiring installation.

- E. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- F. Group related conduits; support using conduit rack. Construct rack using steel channel; provide space on each for 25 percent additional conduits.
- G. Fasten conduit supports to building structure and surfaces under provisions of Section 260529.
- H. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- I. Do not attach conduit to ceiling support wires.
- J. Arrange conduit to maintain headroom and present neat appearance.
- K. Route exposed conduit parallel and perpendicular to walls.
- L. Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- M. Route conduit in and under slab from point-to-point.
- N. Do not cross conduits in slab.
- O. Maintain adequate clearance between conduit and piping.
- P. Cut conduit square using saw or pipecutter; de-burr cut ends.
- Q. Bring conduit to shoulder of fittings; fasten securely.
- R. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
- S. Use conduit hubs to fasten conduit to sheet metal boxes in damp and wet locations.
- T. Install no more than equivalent of three 90 degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one shot bender to fabricate bends in metal conduit larger than 2 inch size.
- U. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- V. Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic.
- W. Provide suitable pull string in each empty conduit except sleeves and nipples.
- X. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- Y. Ground and bond conduit under provisions of Section 260526.

Z. Identify conduit under provisions of Section 260553.

3.3 INTERFACE WITH OTHER PRODUCTS

A. Install conduit to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.

END OF SECTION



SECTION 26 05 37

BOXES

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Wall and ceiling outlet boxes
- B. Floor boxes.
- C. Pull and junction boxes.

1.2 RELATED REQUIREMENTS

- A. Section 078400 - Firestopping.
- B. Section 262716 - Electrical Cabinets and Enclosures.
- C. Section 262726 - Wiring Devices: Wall plates in finished areas.
- D. The requirements of the kitchen equipment consultant plans and specifications.

1.3 REFERENCE STANDARDS

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- B. NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; National Electrical Manufacturers Association; 2007.
- C. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; National Electrical Manufacturers Association; 2008.
- D. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.
- E. 2022 California Electrical Code.

1.4 SUBMITTALS

- A. See Section 00 7000, General Conditions and Division 00 and 01.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of CEC 2022.
- B. Products: Provide products listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Appleton Electric: [www.appletonelec.com](http://www.appletonelec.com).
- B. Arc-Co./Division of Arcade Technology; [www.arc-co.com](http://www.arc-co.com).
- C. Unity Manufacturing: [www.unitymfg.com](http://www.unitymfg.com).
- D. Or Equal.
- E. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.

2.2 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: NEMA OS 1, galvanized steel.
  - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 1/2 inch male fixture studs where required.
  - 2. Concrete Ceiling Boxes: Concrete type.
- B. Cast Boxes: Pressed Steel or Cast Metal.
- C. Wall Plates for Finished Areas: As specified in Section 262726.

2.3 FLOOR BOXES

- A. Floor Boxes: NEMA OS 1, fully adjustable, 1-1/2 inches deep.
- B. Material: Cast metal.
- C. Shape: Round.
- D. Service Fittings: As specified in Section 262726.

2.4 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

- B. Hinged Enclosures: As specified in Section 262716.
- C. Surface Mounted Cast Metal Box: NEMA 250, Type 4; flat-flanged, surface mounted junction box:
  - 1. Material: Galvanized cast iron.
  - 2. Cover: Furnish with ground flange, neoprene gasket, and stainless steel cover screws.
- D. Underground pull boxes: District Standard Concrete Box with concrete lid and hold-down bolts in non-vehicular traffic area. Steel lids and hold-down bolt for larger boxes and vehicular traffic area.
  - 1. Small underground boxes shall be provided with slab bottom with drain hole, conduit knockouts, and extensions as required. Place a minimum of 18" pea gravel in excavation below slab base. Covers shall be reinforced pre-cast concrete in walkways, planters, or lawn areas and traffic rated covers in paved areas or locations subject to vehicular traffic. All covers shall be secured in place with standard nonferrous hold-down bolts and hardware. Covers are to be permanently marked to indicate contents, e.g.: ELECTRICAL, TELEPHONE, SIGNAL, ETC.
  - 2. Large underground (structures larger than 48 inches cubed) shall include full bottom and sides and central drain sump. Covers for pull boxes shall be traffic rated heavy-duty steel. All covers shall be labeled, i.e. ELECTRICAL, SIGNAL, TELEPHONE, etc...
    - a. Cable pulling-in irons shall be furnished as required. Cable racks or supports shall be furnished for units equal to or larger than 48-inch cubed. All cable racks, arms and supports in pull boxes shall be yellow glass reinforced nylon.

### PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Verify locations of floor boxes and outlets prior to rough-in.
- B. Verify locations of all boxes required for kitchen equipment with kitchen consultant plans and specifications.

#### 3.2 INSTALLATION

- A. Install boxes securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install in locations as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections, and as required by CEC.
- C. Coordinate installation of outlet boxes for equipment connected under Section 262717.
- D. Set wall mounted boxes at elevations to accommodate mounting heights indicated.
- E. Electrical boxes are shown on Drawings in approximate locations unless dimensioned.

1. Adjust box locations up to 10 feet if required to accommodate intended purpose.
- F. Orient boxes to accommodate wiring devices oriented as specified in Section 262726.
- G. Maintain headroom and present neat mechanical appearance.
- H. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- I. Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- J. Install boxes to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- K. Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- L. Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- M. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- N. Use flush mounting outlet box in finished areas.
- O. Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- P. Do not install flush mounting box back-to-back in walls; provide minimum 6 inches separation. Provide minimum 24 inches separation in fire-rated and acoustic rated walls.
- Q. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- R. Use stamped steel bridges to fasten flush mounting outlet box between studs.
- S. Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- T. Use adjustable steel channel fasteners for hung ceiling outlet box.
- U. Do not fasten boxes to ceiling support wires.
- V. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches of box.
- W. Use gang box where more than one device is mounted together. Do not use sectional box.
- X. Use gang box with plaster ring for single device outlets.

- Y. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- Z. Use cast floor boxes for installations in slab on grade; formed steel boxes are acceptable for other installations.
- AA. Set floor boxes level.
- AB. Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

### 3.3 ADJUSTING

- A. Adjust floor boxes flush with finish flooring material.
- B. Adjust flush-mounting outlets to make front flush with finished wall material.
- C. Install knockout closures in unused box openings.

### 3.4 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION



SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Nameplates and labels.
- B. Wire and cable markers.
- C. Conduit markers.
- D. Field-painted identification of conduit.

1.2 RELATED REQUIREMENTS

- A. Section 099000 - Painting and Coating.

1.3 REFERENCE STANDARDS

- A. 2019 California Electrical Code.

1.4 SUBMITTALS

- A. See Section 00 7000, General Conditions and Division 00 and 01.

1.5 QUALITY ASSURANCE

- A. Conform to requirements of CEC 2019.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for purpose specified and shown.

**PART 2 PRODUCTS**

2.1 IDENTIFICATION APPLICATIONS

- A. Buried Electrical Lines: Underground warning tapes.
- B. Communication Cabinets: Nameplates.

- C. Conduit: Conduit markers.
- D. Control Device Station: Labels.
- E. Electrical Distribution and Control Equipment Enclosures: Nameplates.

## 2.2 MANUFACTURERS

- A. Brady Corporation: [www.bradycorp.com](http://www.bradycorp.com).
- B. Seton Identification Products: [www.seton.com/aec](http://www.seton.com/aec).
- C. HellermannTyton: [www.hellermanntyton.com](http://www.hellermanntyton.com).
- D. Or equal.
- E. Substitutions: See Section 00 7000, General Conditions and Division 00 and 01.

## 2.3 NAMEPLATES AND LABELS

- A. Manufacturers:
  - 1. Kolbi Pipe Marker Co.; [www.kolbipipemarkers.com](http://www.kolbipipemarkers.com).
  - 2. Seton Identification Products; [www.seton.com](http://www.seton.com).
  - 3. Or Equal.
- B. Nameplates: Engraved three-layer laminated plastic, black letters on white background.
- C. Locations:
  - 1. Each electrical distribution and control equipment enclosure.
  - 2. Communication cabinets.
- D. Letter Size:
  - 1. Use 1/8 inch letters for identifying individual equipment and loads.
  - 2. Use 1/4 inch letters for identifying grouped equipment and loads.
- E. Labels: Embossed adhesive tape, with 3/16 inch white letters on black background. Use only for identification of individual wall switches and receptacles, control device stations.

## 2.4 WIRE MARKERS

A. Manufacturers:

1. Brady Corporation; [www.bradycorp.com](http://www.bradycorp.com).
2. Seton Identification Products; [www.seton.com](http://www.seton.com).
3. HellermannTyton; [www.hellermanntyton.com](http://www.hellermanntyton.com).
4. Or Equal.

B. Description: Vinyl cloth type self-adhesive wire markers.

C. Description: Cloth type wire markers.

D. Locations: Each conductor at panelboard gutters, pull boxes, outlet boxes, and junction boxes each load connection.

E. Legend:

1. Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
2. Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings.

2.5 CONDUIT MARKERS

A. Manufacturers:

1. Brady Corporation; [www.bradycorp.com](http://www.bradycorp.com).
2. Seton Identification Products; [www.seton.com](http://www.seton.com).
3. HellermannTyton; [www.hellermanntyton.com](http://www.hellermanntyton.com).
4. Or Equal.

B. Location: Furnish markers for each conduit longer than 6 feet.

C. Spacing: 20 feet on center.

D. Color:

1. Fire Alarm System: Red.

2.6 UNDERGROUND WARNING TAPE

- A. Manufacturers:
  - 1. Brady Corporation; [www.bradycorp.com](http://www.bradycorp.com).
  - 2. Seton Identification Products; [www.seton.com](http://www.seton.com).
  - 3. Hellermann Tyton; [www.hellermanntyton.com](http://www.hellermanntyton.com).
  - 4. Or Equal.
- B. Description: 3-inch wide polyethylene tape, detectable type colored red with suitable warning legend describing buried electrical lines.
- C. Description: 4-inch-wide plastic tape, detectable type colored red with suitable warning legend describing buried electrical lines.

### PART 3 EXECUTION

#### 3.1 PREPARATION

- A. Degrease and clean surfaces to receive nameplates and labels.

#### 3.2 INSTALLATION

- A. Install nameplates and labels parallel to equipment lines.
- B. Secure nameplates to equipment front using screws.
- C. Secure nameplates to inside surface of door on panelboard that is recessed in finished locations.
- D. Identify underground conduits using underground warning tape. Install one tape per trench at 3 inches below finished grade.

END OF SECTION

SECTION 26 24 16

PANELBOARDS

**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. Power distribution panelboards.
- B. Lighting and appliance panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260553 - Identification for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- B. NEMA ICS 2 - Industrial Control and Systems: Controllers, Contactors, and Overload Relays, Rated Not More Than 2000 Volts AC or 750 Volts DC; National Electrical Manufacturers Association; 2000 (R2005).
- C. NEMA KS 1 - Enclosed and Miscellaneous Distribution Equipment Switches (600 Volts Maximum); National Electrical Manufacturers Association; 2001 (R2006).
- D. NEMA PB 1 - Panelboards; National Electrical Manufacturers Association; 2006.
- E. NEMA PB 1.1 - General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 600 Volts or Less; National Electrical Manufacturers Association; 2007.
- F. NETA STD ATS - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems; International Electrical Testing Association; 2009.
- G. California Building Code and California Fire Code, 2022 with 2022 California Electrical Code.

1.04 SUBMITTALS

- A. See Division 00 - Administrative Requirements, for submittal procedures.

- B. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, integrated short circuit ampere rating, circuit breaker and fusible switch arrangement and sizes.
- C. Maintenance Data: Include spare parts listing; source and current prices of replacement parts and supplies; and recommended maintenance procedures and intervals.
- D. Maintenance Materials: Furnish the following for Vacaville USD use in maintenance of project.
  - 1. See Division 00 - Product Requirements, for additional provisions.
  - 2. Panelboard Keys: Two of each different key.

#### 1.05 QUALITY ASSURANCE

- A. Conform to requirements of 2022 CEC.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Eaton Corporation; Cutler-Hammer Products: [www.eaton.com](http://www.eaton.com).
- B. Schneider Electric; Square D Products:
- C. Siemens.
- D. Or equivalent subject to substitution process.

#### 2.02 POWER DISTRIBUTION PANELBOARDS

- A. Description: NEMA PB 1, circuit breaker type.
- B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard.
- C. Minimum integrated short circuit rating: As indicated.
  - 1. 240 Volt Panelboards: amperes rms symmetrical per plan.
  - 2. 480 Volt Panelboards: amperes rms symmetrical per plan.
- D. Molded Case Circuit Breakers: With integral thermal and instantaneous magnetic trip in each pole; UL listed. For air conditioning equipment branch circuits provide circuit breakers UL listed as Type HACR.

- E. Controllers: NEMA ICS 2, AC general-purpose Class A magnetic controller for induction motors rated in horsepower, with bimetal overload relay.
  - 1. Coil operating voltage: 120 volts, 60 Hz.
  - 2. Size as shown on Drawings.
- F. Circuit Breaker Accessories: Trip units and auxiliary switches as indicated.
- G. Enclosure: NEMA PB 1, Type 1, cabinet box.
- H. Cabinet Front: Surface type, fastened with concealed trim clamps, hinged door with flush lock, metal directory frame, finished in manufacturer's standard gray enamel.

### 2.03 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: NEMA PB1, circuit breaker type, lighting and appliance branch circuit panelboard.
- B. Panelboard Bus: Copper, ratings as indicated. Provide copper ground bus in each panelboard; provide insulated ground bus where scheduled.
- C. Minimum Integrated Short Circuit Rating: As indicated.
  - 1. 240 Volt Panelboards: 10,000 amperes rms symmetrical.
  - 2. 480 Volt Panelboards: 14,000 amperes rms symmetrical.
- D. Molded Case Circuit Breakers: Thermal magnetic trip circuit breakers, bolt-on type, with common trip handle for all poles; UL listed.
  - 1. Type SWD for lighting circuits.
  - 2. Type HACR for air conditioning equipment circuits.
  - 3. Class A ground fault interrupter circuit breakers where scheduled.
  - 4. Do not use tandem circuit breakers.
- E. Enclosure: NEMA PB 1, Type 1.
- F. Cabinet Box: 6 inches deep, 20 inches wide for 240 volt and less panelboards, 20 inches wide for 480-volt panelboards.
- G. Cabinet Front: Flush cabinet front with concealed trim clamps, concealed hinge, metal directory frame, and flush lock all keyed alike. Finish in manufacturer's standard gray enamel.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Install panelboards in accordance with NEMA PB 1.1 and NECA 1.
- B. Install panelboards plumb. Install recessed panelboards flush with wall finishes.
- C. Height: 6 feet to top of panelboard; install panelboards taller than 6 feet with bottom no more than 4 inches above floor.
- D. Provide typed or neatly handwritten circuit directory for each branch circuit panelboard. Revise directory to reflect circuiting changes required to balance phase loads.
- E. Provide engraved plastic nameplates under the provisions of Section 260553.
- F. Provide spare conduits out of each recessed panelboard to an accessible location above ceiling. Identify each as SPARE.
  - 1. Minimum spare conduits: 5 empty 1 inch.
- G. Ground and bond panelboard enclosure according to Section 260526.

3.02 COLOR CODING

- A. Wiring for branch circuits shall be color-coded and shall be so noted on the directory in panels. The same color-coding system shall be used throughout the entire job. Color coding shall be as follows:

120/208 Volt	
Phase A hot leg	Black
Phase B hot leg	Red
Phase C hot leg	Blue
Neutral	White
277/480 Volt	
Phase A hot leg	Brown
Phase B hot leg	Orange
Phase C hot leg	Yellow

Neutral

White

### 3.03 FIELD QUALITY CONTROL

- A. Perform field inspection and testing in accordance with Section 014000.
- B. Inspect and test in accordance with NETA STD ATS, except Section 4.
- C. Perform inspections and tests listed in NETA STD ATS, Section 7.5 for switches, Section 7.6 for circuit breakers.

### 3.04 ADJUSTING

- A. Measure steady state load currents at each panelboard feeder; rearrange circuits in the panelboard to balance the phase loads to within 20 percent of each other. Maintain proper phasing for multi-wire branch circuits.

END OF SECTION



SECTION 26 27 16

ELECTRIC CABINETS & ENCLOSURES

**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. Hinged cover enclosures.
- B. Cabinets.
- C. Terminal blocks.
- D. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 260529 - Hangers and Supports for Electrical Systems.

1.03 REFERENCE STANDARDS

- A. NECA 1 - Standard Practices for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- B. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum); National Electrical Manufacturers Association; 2008.
- C. NEMA ICS 4 - Industrial Control and Systems: Terminal Blocks; National Electrical Manufacturers Association; 2005.
- D. California Building Code and California Fire Code, 2022 with 2022 California Electrical Code.

1.04 SUBMITTALS

- A. See Division 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide the manufacturer's standard data for enclosures and cabinets.
- C. Cabinet Keys: Deliver to Vacaville USD in accordance with Division 00 for maintenance materials.

1.05 QUALITY ASSURANCE

- A. Conform to requirements of 2022 CEC.

- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

## PART 2 - PRODUCTS

### 2.01 ENCLOSURE MANUFACTURERS

- A. Cooper B-Line: [www.bline.com](http://www.bline.com).
- B. Qube Corporation: [www.qubeinc.com](http://www.qubeinc.com).
- C. Robroy Industries: [www.robroy.com](http://www.robroy.com).
- D. Or equal.
- E. Substitutions: See Division 00 - Product Requirements.

### 2.02 HINGED COVER ENCLOSURES

- A. Construction: NEMA 250, Type 1 steel enclosure.
- B. Covers: Continuous hinge, held closed by flush latch operable by a screwdriver.
- C. Provide interior plywood panel for mounting terminal blocks and electrical components, finish with white enamel.
- D. Enclosure Finish: Manufacturer's standard enamel.

### 2.03 CABINETS

- A. Boxes: Galvanized steel.
- B. Backboard: Provide 3/4-inch-thick plywood backboard for mounting terminal blocks. Paint matte white.
- C. Fronts: Steel, flush type with concealed trim clamps, door with concealed hinge, and flush lock keyed to match branch circuit panelboard. Finish with gray baked enamel.
- D. Provide metal barriers to form separate compartments wiring of different systems and voltages.
- E. Keys: Provide two of each different key.

### 2.04 TERMINAL BLOCKS

- A. Manufacturers:
  - 1. Allen-Bradley/Rockwell Automation: [www.ab.com](http://www.ab.com).

2. Cooper Bussmann: [www.bussmann.com](http://www.bussmann.com).
  3. WECO Electrical Connectors Inc: [www.weco.ca](http://www.weco.ca).
  4. Substitutions: See Division 00 - Product Requirements.
- B. Terminal Blocks: NEMA ICS 4.
  - C. Power Terminals: Unit construction type with closed back and tubular pressure screw connectors, rated 600 volts.
  - D. Signal and Control Terminals: Modular construction type, suitable for channel mounting, with tubular pressure screw connectors, rated 300 volts.
  - E. Provide ground bus terminal block, with each connector bonded to enclosure.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
- B. Install enclosures and boxes plumb. Anchor securely to wall and structural supports at each corner under the provisions of Section 260529.
- C. Install cabinet fronts plumb.

#### 3.02 CLEANING

- A. Clean electrical parts to remove conductive and harmful materials.
- B. Remove dirt and debris from enclosure.
- C. Clean finishes and touch up damage.

END OF SECTION



SECTION 26 27 17  
EQUIPMENT WIRING

**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 260534 - Conduit.
- B. Section 260519 - Low-Voltage Electrical Power Conductors and Cables (600 V and Less).
- C. Section 260537 - Boxes.
- D. Section 262726 - Wiring Devices.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).
- B. NEMA WD 6 - Wiring Devices - Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).
- C. California Building Code and California Fire Code, 2022 with 2022 California Electrical Code.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
  - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
  - 2. Determine connection locations and requirements.
- B. Sequencing:
  - 1. Install rough-in of electrical connections before installation of equipment is required.
  - 2. Make electrical connections before required start-up of equipment.

1.05 SUBMITTALS

- A. See Division 00 - Administrative Requirements, for submittal procedures.

1.06 QUALITY ASSURANCE

- A. Conform to requirements of 2022 California Electrical Code.
- B. Products: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Cords and Caps: NEMA WD 6; match receptacle configuration at outlet provided for equipment.
  - 1. Colors: Conform to NEMA WD 1.
  - 2. Cord Construction: CEC, Type SO, multiconductor flexible cord with identified equipment grounding conductor, suitable for use in damp locations.
  - 3. Size: Suitable for connected load of equipment, length of cord, and rating of branch circuit overcurrent protection.
- B. Disconnect Switches: As described and in individual equipment sections.
- C. Wiring Devices: As specified in Section 262726.
- D. Flexible Conduit: As specified in Section 260534.
- E. Wire and Cable: As specified in Section 260519.
- F. Boxes: As specified in Section 260537.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.

- B. Make conduit connections to equipment using flexible conduit. Use liquid tight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.
- J. Coolers and Freezers: Cut and seal conduit openings in freezer and cooler walls, floor, and ceilings.

END OF SECTION 26 27 17



SECTION 26 27 26

WIRING DEVICES

**PART 1 - GENERAL**

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Fan speed controllers.
- C. Receptacles.
- D. Wall plates.

1.02 RELATED REQUIREMENTS

- A. Section 260526 - Grounding and Bonding for Electrical Systems.
- B. Section 260537 - Boxes.
- C. Section 260553 - Identification for Electrical Systems: Labels for wiring devices.
- D. Section 262717 - Equipment Wiring: Cords and plugs for equipment.
- E. Division 27 - Structured Telecommunications Cabling and Enclosures: Voice and data jacks.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 - Connector, Electrical, Power, General Specification for; Federal Specification; Revision G, 2001.
- B. FS W-S-896 - Switches, Toggle (Toggle and Lock), Flush-mounted (General Specification); Federal Specification; Revision F, 1999.
- C. NECA 1 - Standard for Good Workmanship in Electrical Contracting; National Electrical Contractors Association; 2006.
- D. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2005).
- E. NEMA WD 6 - Wiring Device -- Dimensional Requirements; National Electrical Manufacturers Association; 2002 (R2008).

- F. California Building Code and California Fire Code, 2022 with 2022 California Electrical Code.
- G. UL 20 - General-Use Snap Switches; Current Edition, Including All Revisions.
- H. UL 498 - Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- I. UL 514D - Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- J. UL 943 - Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- K. UL 1472 - Solid-State Dimming Controls; Current Edition, Including All Revisions.
- L. UL 1917 - Solid-State Fan Speed Controls; Current Edition, Including All Revisions.

#### 1.04 ADMINISTRATIVE REQUIREMENTS

##### A. Coordination:

1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
3. Coordinate the placement of outlet boxes for wall switches with actual installed door swings.
4. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
5. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.
6. Notify the Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.

##### B. Sequencing:

1. Do not install wiring devices until final surface finishes and painting are complete.

#### 1.05 SUBMITTALS

- A. See Division 00 - Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.

1. Wall Dimmers: Include derating information for ganged multiple devices.

#### 1.06 QUALITY ASSURANCE

- A. Conform to requirements of 2022 California Electrical Code.
- B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

#### 1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

### PART 2 - PRODUCTS

#### 2.01 MANUFACTURERS

- A. Cooper Wiring Devices: [www.cooperwiringdevices.com](http://www.cooperwiringdevices.com).
- B. GE Industrial: [www.geindustrial.com](http://www.geindustrial.com).
- C. Leviton Manufacturing, Inc: [www.leviton.com](http://www.leviton.com).
- D. Or equal.

#### 2.02 APPLICATIONS

- A. Provide wiring devices suitable for intended use and with ratings adequate for load served.
- B. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- C. Provide weather resistant GFI receptacles with specified weatherproof covers for all receptacles installed outdoors or in damp or wet locations.
- D. Provide GFI receptacles for all receptacles installed within 6 feet of sinks.
- E. Provide GFI receptacles for all receptacles installed in kitchens.
- F. Provide GFI receptacles for all receptacles serving electric drinking fountains.
- G. Provide isolated ground receptacles for all receptacles serving computers and electronic cash registers.
- H. Unless noted otherwise, do not use combination switch/receptacle devices.

- I. For flush floor service fittings, use tile rings for installations in tile floors.
- J. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

## 2.03 ALL WIRING DEVICES

- A. Provide products listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- B. Finishes:
  - 1. All Wiring Devices: White with white nylon wall plate unless otherwise indicated.
  - 2. Wiring Devices Installed in Finished Spaces: White with white nylon wall plate unless otherwise indicated.
  - 3. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate unless otherwise indicated.
  - 4. Wiring Devices Installed in Wet or Damp Locations: White with specified weatherproof cover unless otherwise indicated.
  - 5. Isolated Ground Convenience Receptacles: Orange with isolated ground triangle mark on device face.
  - 6. Surge Protection Receptacles: Blue.
  - 7. Clock Hanger Receptacles: White with nylon wall plate.
  - 8. Above-Floor Service Fittings: wiring devices with housing.
  - 9. Flush Floor Box Service Fittings: wiring devices with cover and ring/flange.
  - 10. Flush Poke-Through Service Fittings: wiring devices with cover and aluminum flange.

## 2.04 WALL SWITCHES

- A. All Wall Switches: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
  - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

- C. Pilot Light Wall Switches: Industrial specification grade, 20 A, 120/277 V with red illuminated standard toggle type switch actuator and maintained contacts; illuminated with load on; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- D. Locking Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed switch actuator and maintained contacts; all switches keyed alike; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.
- E. Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with toggle type three position switch actuator and momentary contacts; single pole double throw, off with switch actuator in center position.
- F. Locking Momentary Contact Wall Switches: Industrial specification grade, 20 A, 120/277 V with lever type keyed three position switch actuator and momentary contacts; all switches keyed alike; single pole double throw, off with switch actuator in center position.
- G. Wall Switches: Heavy Duty, AC only general-use snap switch, complying with NEMA WD 6 and WD 1.
  - 1. Body and Handle: white plastic with toggle handle.
  - 2. Indicator Light: Lighted handle type switch; red handle.
  - 3. Locator Light: Lighted handle type switch; red color handle.
  - 4. Ratings:
    - a. Voltage: 120 and 277 volts, AC.
    - b. Current: 20 amperes.
- H. Switch Types: Single pole, double pole, and 3-way.

## 2.05 WALL DIMMERS

- I. All Wall Dimmers: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.
- B. Electronic Low-Voltage Wall Dimmers: 120 V AC, slide control type with separate on/off switch; single pole or three-way as indicated on the drawings.

1. Power Rating: 400 VA unless otherwise indicated or required to control the load indicated on the drawings.
- C. Fluorescent Wall Dimmers: 120 V AC, slide control type with separate on/off switch, compatible with dimming ballast controlled; single pole or three-way as indicated on the drawings.
1. Power Rating: 600 VA unless otherwise indicated or required to control the load indicated on the drawings.
- D. Wall Dimmers: Semiconductor dimmer for incandescent lamps, Type as indicated on drawings, complying with NEMA WD 6 and WD 1.
1. Body and Handle: white plastic with rotary knob.
  2. Voltage: 120 and 277 volts.
  3. Power Rating: 600 watts.
- E. Provide accessory wall switches to match dimmer appearance when installed adjacent to each other.

## 2.06 FAN SPEED CONTROLLERS

- A. Description: 120 V AC, solid-state, full-range variable speed, slide control type with separate on/off switch, with integral radio frequency interference filtering, fan hum elimination circuitry, field-adjustable trim, power failure preset memory, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1917.
1. Current Rating: 1.5 A unless otherwise indicated or required to control the load indicated on the drawings.

## 2.07 RECEPTACLES

- A. All Receptacles: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
  2. NEMA configurations specified are according to NEMA WD 6.
- B. Convenience Receptacles:
1. Standard Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.

2. Isolated Ground Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, with ground contacts isolated from mounting strap; single or duplex as indicated on the drawings.
  3. Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
  4. Tamper Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R, listed and labeled as tamper resistant type; single or duplex as indicated on the drawings.
  5. Tamper Resistant and Weather Resistant Convenience Receptacles: Commercial specification grade, 20A, 125V, NEMA 5-20R,, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations; single or duplex as indicated on the drawings.
  6. Color coded Orange for computer receptacles and Green for Controlled Receptacles
- C. GFI Receptacles:
1. All GFI Receptacles: Provide with feed-through protection, light to indicate ground fault tripped condition and loss of protection, and list as complying with UL 943, class A.
  2. Standard GFI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
  3. Weather Resistant GFI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
  4. Tamper Resistant GFI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type.
  5. Tamper Resistant and Weather Resistant GFI Receptacles: Commercial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as tamper resistant type and as weather resistant type complying with UL 498 Supplement SE suitable for installation in damp or wet locations.
  6. Heavy duty vandal resistant metal weatherproof cover for exterior locations, locker rooms, and student toilet rooms.
- D. Receptacles: Heavy duty, complying with NEMA WD 6 and WD 1.
1. Device Body: white plastic.

2. Configuration: NEMA WD 6, type as specified and indicated.

E. Convenience Receptacles: Type 5 to 15.

F. Single Convenience Receptacles.

G. Duplex Convenience Receptacles.

H. GFCI Receptacles: Convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.

## 2.08 TELEPHONE AND DATA JACKS

## 2.09 WALL PLATES

A. All Wall Plates: Comply with UL 514D.

1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.

2. Screws: Metal with slotted heads finished to match wall plate finish.

B. Nylon Wall Plates: Smooth finish, high-impact thermoplastic.

C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.

D. Galvanized Steel Wall Plates: Rounded corners and edges, with corrosion resistant screws.

E. Weatherproof Covers for Damp Locations: Gasketed, cast aluminum, with self-closing hinged cover and corrosion-resistant screws; listed as suitable for use in wet locations with cover closed.

F. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected.

G. Decorative Cover Plates: white, nylon.

H. Jumbo Cover Plates: Ivory, nylon.

I. Weatherproof Cover Plates: Gasketed cast metal with hinged.

## 2.10 FLOOR BOX SERVICE FITTINGS

A. Description: Service fittings compatible with floor boxes provided under Section 260537 with all components, adapters, and trims required for complete installation.

B. Above-Floor Service Fittings:

C. Flush Floor Service Fittings:

1. Single Service Flush Convenience Receptacles:

- a. Cover: Rectangular.
- b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).

2. Single Service Flush Communications Outlets:

- a. Cover: Rectangular.

3. Single Service Flush Furniture Feed:

- a. Cover: Rectangular.
- b. Configuration: One 2-1/8 inch by 3/4-inch combination threaded opening(s).

4. Dual Service Flush Combination Outlets:

- a. Cover: Rectangular.
- b. Configuration:
  - 1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).

5. Dual Service Flush Furniture Feed:

- a. Cover: Rectangular.
- b. Configuration:
  - 1) Power: One 2-1/8 inch by 3/4-inch combination threaded opening(s).
  - 2) Communications: One 2-1/8 inch by 1 inch combination threaded opening(s).

6. Accessories:

- a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
- b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

D. Flush Cover Convenience Receptacles:

- 1. Material: Brass.

E. Flush Cover Communication Outlets:

F. Flush Cover Combination Fittings:

1. Material: Brass.

G. Protective Ring: Brass finish.

H. Split Nozzles: Brass finish.

I. Carpet Rings: Brass.

## 2.11 POKE-THROUGH ASSEMBLIES

A. Description: Assembly comprising floor service fitting, poke-through component, fire stops and smoke barriers, and junction box for conduit termination; fire rating listed to match fire rating of floor and suitable for floor thickness where installed.

B. Above-Floor Service Fittings:

C. Flush Floor Service Fittings:

1. Single Service Flush Convenience Receptacles:

a. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).

2. Single Service Flush Communications Outlets:

a. Voice and Data Jacks: As specified in Section 271005.

3. Single Service Flush Furniture Feed:

a. Configuration: One 2 inch by 1-1/4 inch combination threaded opening(s).

4. Dual Service Flush Combination Outlets:

a. Cover: Hinged door(s).

b. Configuration:

1) Power: One standard convenience duplex receptacle(s).

2) Voice and Data Jacks: As specified in Section 271005.

5. Dual Service Flush Furniture Feed:

- a. Configuration:
  - 1) Power: One 3/4-inch threaded opening(s).
  - 2) Communications: Two 1/2-inch threaded opening(s).
- 6. Accessories:
  - a. Closure Plugs: Size and fire rating as required to seal unused core hole and maintain the fire rating of floor.

### PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with CEC.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that core drilled holes for poke-through assemblies are in proper locations.
- H. Verify that conditions are satisfactory for installation prior to starting work.

#### 3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

#### 3.03 INSTALLATION

- A. Perform work in a neat and workmanlike manner in accordance with NECA 1, including mounting heights specified in that standard unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260537 as required for installation of wiring devices provided under this section.

1. Mounting Heights: Unless otherwise indicated, as follows:
    - a. Wall Switches: 48 inches above finished floor.
    - b. Wall Dimmers: 48 inches above finished floor.
    - c. Fan Speed Controllers: 48 inches above finished floor.
    - d. Receptacles: 18 inches above finished floor or 6 inches above counter.
  2. Orient outlet boxes for vertical installation of wiring devices unless otherwise indicated.
  3. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
  4. Locate wall switches on strike side of door with edge of wall plate 3 inches from edge of door frame. Where locations are indicated otherwise, notify LP Consulting Engineers to obtain direction prior to proceeding with work.
  5. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
  - D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
  - E. Where required, connect wiring devices using pigtails not less than 6 inches long. Do not connect more than one conductor to wiring device terminals.
  - F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
  - G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  - H. For isolated ground receptacles, connect wiring device grounding terminal only to identified branch circuit isolated equipment grounding conductor. Do not connect grounding terminal to outlet box or normal branch circuit equipment grounding conductor.
  - I. Install securely, in a neat and workmanlike manner, as specified in NECA 1.
  - J. Install wiring devices plumb and level with mounting yoke held rigidly in place.

- K. Install wall switches with OFF position down.
- L. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- M. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- N. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- O. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- P. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- Q. Install identification label for wall switches and wall dimmers in accordance with Section 260526 indicating load served when controlling loads that are not visible from the control location or multiple wall switches or wall dimmers are installed at one location.
- R. Install identification label for all receptacles in accordance with Section 260526 indicating serving branch circuit.
- S. Install poke-through closure plugs in all unused core holes to maintain fire rating of floor.
- T. Install receptacles with grounding pole on top.
- U. Connect wiring device grounding terminal to outlet box with bonding jumper.
- V. Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- W. Connect wiring devices by wrapping conductor around screw terminal.
- X. Use jumbo size plates for outlets installed in masonry walls.
- Y. Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- Z. Install protective rings on active flush cover service fittings.

### 3.04 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate locations of outlet boxes provided under Section 260537 to obtain mounting heights specified.
- B. Install wall switch 48 inches above finished floor.
- C. Install convenience receptacle 18 inches above finished floor.
- D. Install convenience receptacle 6 inches above counter.
- E. Install dimmer 48 inches above finished floor.
- F. Install telephone jack 18 inches above finished floor.
- G. Install telephone jack for forward-reach wall telephone to position top of telephone at 48 inches above finished floor.

### 3.05 FIELD QUALITY CONTROL

- A. Perform field inspection, testing, and adjusting in accordance with Section 014000.
- B. Inspect each wiring device for damage and defects.
- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Operate each wall switch with circuit energized and verify proper operation.
- E. Verify that each receptacle device is energized.
- F. Test each receptacle to verify operation and proper polarity.
- G. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- H. Correct wiring deficiencies and replace damaged or defective wiring devices.
- I. Verify that each telephone jack is properly connected, and circuit is operational.

### 3.06 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.

### 3.07 CLEANING

- A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

END OF SECTION 26 27 26



SECTION 26 28 16

OVERCURRENT PROTECTION DEVICES

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. The requirements of this section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.02 SUMMARY

- A. Scope: Furnish all labor, materials, equipment, and incidentals required, and install overcurrent protective devices as shown on the Drawings and as required to protect all circuits in strict accordance with applicable Electrical Code(s). Overcurrent protective devices may be required as a component of disconnect switches, transformers, motor starters, switchboards, panelboards or mechanical equipment.
- B. QUALITY ASSURANCE
- C. All overcurrent protective devices shall comply with applicable standards of the Underwriter's Laboratories. Circuit breakers and other devices shall be UL labeled.

**PART 2 - PRODUCTS**

2.01 CIRCUIT BREAKERS

- A. Circuit breakers shall be of the proper type and rating for each application. They shall be molded case, thermal-magnetic, with inverse time characteristic response - temperature compensated. The fault current interrupting rating shall not be less than that shown on the Drawings (10,000 ASYM minimum). Only as indicated on the drawings, series rated circuit breaker combinations may be accepted to meet required fault current interrupting ratings. Panelboard circuit breakers shall be "bolt on" type unless noted otherwise. Multiple pole circuit breaker must be manufactured as a single unit - single pole units with handles "bailed" together will not be acceptable. Use of "tandem" circuit breakers or "two in the space normally occupied by one" will not be acceptable.
- B. Circuit breaker dedicated for the Fire Alarm system shall be painted color "RED" handle.
- C. Enclosed circuit breakers shall be as indicated on the Drawings and as required by applicable Electrical Code. The enclosures shall have been manufactured specifically for the type of circuit breaker provided and shall be UL listed. Use NEMA 1 enclosures dry indoors areas and NEMA 3R/12 (rain and dust tight) in outdoor areas.

2.02 FUSES

- A. Fuses shall be provided for all fuse holders as shown on the Drawings and specified herein. They shall be current-limiting, non-renewable as indicated on the Drawings - Fusetron or Limitron type manufactured by Bussman or equal. Provide 3 spare fuses for each size and class of fuse used.

### PART 3 - EXECUTION

#### 3.01 INSTALLATION

- A. Circuit breakers and fuses are to be installed in accordance with manufacturers' instructions. Fuses must seat solidly with all contact surfaces bearing evenly. Replace warped, weak, or broken fuse clamp terminals. Do not attempt to repair or bend back into position.
- B. HACR rated circuit breakers shall be provided to protect all feeders and branch circuits to non-fused HVAC and refrigeration equipment and where required by equipment listing conditions.
- C. Switch duty rated circuit breakers are to be provided where circuit breakers will be used to control the connected loads.
- D. Enclosed circuit breakers are to be installed plumb and rigidly secured to structure or equipment with wood screws, bolts and expansion anchors, or machine bolts and locknuts as applicable. Nameplates shall be installed as indicated in Section 16010, General Requirements, Electrical.
- E. Test circuit breakers and ground fault devices when required by the local utility company or building code.

END OF SECTION

SECTION 26 28 19

DISCONNECT SWITCHES

**PART 1 - GENERAL**

1.01 RELATED DOCUMENTS

- A. The requirements of this section are in addition to the requirements of Division 1, General Conditions and Supplementary Conditions.

1.02 SUMMARY

- A. Scope: Furnish all labor, materials, equipment and incidentals required, and install all disconnect switches for all HVAC equipment and individually installed motors in accordance with applicable California Electrical Codes, as shown on the Drawings, and described in the Specification
- B. QUALITY ASSURANCE
- C. All disconnects shall comply with applicable standards of the Underwriter's Laboratories.
- D. Ratings of disconnect switches (both Ampere and Horsepower) shall be in accordance with the applicable California Electrical Code for the equipment actually installed.

**PART 2 - PRODUCTS**

2.01 GENERAL

- A. Heavy duty rated switches fused or non-fusible as indicated on the Drawings, shall be provided as required. General duty switches will not be allowed. Switches shall have "Quick-break" actuating mechanisms and shall be enclosed as required by the conditions of installation. The cover shall be interlocked with the switch such that the enclosure cannot be opened with the switch in the "on" position. The "on" and "off" positions shall be clearly marked by the manufacturer. The switch shall be capable of being locked in the open position.
  - 1. Provide enclosures suitable for the specific type of location in which they are installed. Use NEMA 1 enclosures dry locations (indoors) and NEMA 3R in wet locations (outdoors).
- B. All circuit breakers shall be U.L labeled as suitable for use with 60 degree/75 degree C or 75 degree C rated conductors.

2.02 MANUFACTURERS:

- A. Cutler-Hammer
- B. Square D
- C. Siemens

D. Or accepted equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Safety switches are to be installed plumb and rigidly secured to structure or equipment with wood screws, machine bolts and concrete anchors, or machine bolts and lock nuts as applicable.
  - 1. Nameplates shall be installed as indicated in Section 26010, General Electrical Requirements.
  - 2. Install fuses where indicated on the Drawings or as otherwise required. Fuses must be sized per California Electrical Code (CEC) for each specific connected load.

END OF SECTION

SECTION 31 00 00

EARTHWORK

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Engineered fill materials.
  - 2. Imported engineered fill material.
  - 3. Landscape backfill material'
  - 4. Decomposed granite.
  - 5. Aggregate base.

1.2 RELATED REQUIREMENTS

- A. Section 01 50 00, Temporary Facilities and Controls.
- B. Section 01 57 13, Erosion Control.
- C. Section 01 81 13, Sustainable Design Requirements, for CAL-Green [and Collaborative for High Performance Schools (CHPS)] general requirements and procedures.
- D. Section 31 23 33, Trenching and Backfilling.
- E. Section 32 12 00, Asphalt Concrete Paving.
- F. Section 32 16 00, Site Concrete.
- G. Section 33 00 00, Utilities
- H. Section 33 40 00, Storm Drainage Utilities.

1.3 REFERENCES AND STANDARDS

- A. California Building Code (CBC), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Green Building Standards Code (CAL Green), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).
- C. Local Jurisdiction: Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.
- D. ASTM International (ASTM):

1. D698-00 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.
  2. D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.
  3. D1557-02e2 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
  4. D3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
  5. D422-63(2007) e1 Test Method for Particle Size Analysis of Soil.
  6. D4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.
- E. CALTRANS Standard Specifications Section 17.
- F. CAL-OSHA, Title 8, Section 1590 (e).
- G. Site survey: Included in the drawings, was prepared by Warren Consulting Engineers, inc. dated November 18<sup>th</sup> 2022, and is the basis for data regarding current conditions. While the survey is deemed generally accurate, there exists discrepancies and variations due to elapsed time, weather, etc. Existing dirt grades may vary 0.2 ft. from that shown.
- H. Geotechnical Engineering Report: Prepared by Wallace Kuhl & Associates. Report is entitled John F. Kennedy High School Parking Lot Replacement, and is on file with Architect. Soils information is taken from this Report. Contractor is responsible for any conclusions drawn from this data; should he prefer not to assume such risk he is under obligation to employ his own experts to analyze available information and/or to make additional explorations, at no cost to Owner, upon which to base his conclusions. Neither Owner, Soils Engineer nor Architect guarantees information will be continuous over entire site of work.
- 1.4 ADMINISTRATION REQUIREMENTS
- A. Submittal Procedures:
1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 33 00, Submittal Procedures.
  2. Closeout Submittals shall be submitted in accordance with Section 01 77 00, Closeout Procedures.
  3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 81 13, Sustainable Design Requirements.
- B. Site Visitation: All bidders interfacing with existing conditions shall visit the site prior to bid to verify general conditions of improvements. Discrepancies must be reported prior to the bid for clarification.
- 1.5 ACTION SUBMITTALS
- A. Provide supplier's descriptive literature for all products to demonstrate compliance with specified attributes.
- 1.6 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For Contractor / Installer.

### 1.7 CLOSEOUT SUBMITTALS

- A. Guarantee: Submit subcontractor's guarantee.

### 1.8 QUALITY ASSURANCE

- A. Contractor / Installer shall have been in business for five (5) years providing/finishing similar size projects and complexity.
- B. Contractor shall be solely responsible for all subgrades built. Failures resulting from inadequate compaction or moisture content are the responsibility of the contractor. Contractor shall be solely responsible for any and all repairs.
- C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting of inadequate compaction or moisture content is the sole responsibility of the contractor.
- D. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- E. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.
- F. Tests (See Part 3, Article "Testing and Observation" for Compaction Testing).

### 1.9 DELIVERY, STORAGE AND HANDLING

- A. Transport, store and handle in strict accord with the local jurisdiction.

### 1.10 FIELD CONDITIONS

### 1.11 EXISTING SITE CONDITIONS

- A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.
- B. Existing civil, mechanical and electrical improvements are shown on respective site plans to the extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.

### 1.12 ON SITE UTILITY VERIFICATION AND REPAIR PROCEDURES

- A. Ground-breaking requirements:
  - 1. All underground work performed by a Contractor must be authorized by the District's Construction Manager or the Low Voltage Consultant prior to start of construction.

2. The Contractor is to obtain and keep the original School's construction utility site plans on site during all excavation operations. Contractor can contact the District's Construction Manager, Facilities Manager, or the Low Voltage Consultant to procure the drawings.

B. Underground Utility Locating:

1. The contractor shall hire an Underground Utility Locating Service to locate existing underground utility pathways in areas effected by the scope of work for excavation.
2. Contractor must use an underground utility locator service with a minimum of 3 years experience. The equipment operator must have demonstrated experience. Contact Norcal Underground Locating (800/986-6722) or Precision Locating (800/577-7324)
3. The Underground Utility Locator Service must have the use of equipment with the ability to locate by means of inductive clamping, induction, inductive metal detection, conductive coupling, or TransOnde (Radiodetection) to generate signals, passive locating (free scoping) for "hot" electric, and metal detector.
4. The Underground Utility Locator Service must be able to locate existing utilities at a depth of at least 72".
5. The Underground Utility Locator Service must be able to locate but are not limited to locating the following types of utility pathways:
  - a. All conduit pathways containing 110 volt or greater 50-60Hz electrical wire.
  - b. All conduit pathways containing an active cable TV system.
  - c. All conduit pathways containing wire or conductor in which a signal can be attached and generated without damaging or triggering the existing systems.
  - d. All empty conduit pathways or pipe in which a signal probe or sonde (miniature transmitter) can be inserted.
  - e. All conduit pathways containing non-conductive cables or wires in which a signal probe or sonde (miniature transmitter) can be inserted.
  - f. All plastic and other nonconductive water lines in which a TransOnde Radiodetection) or other "transmitter" can be applied to create a low frequency pressure wave (signal) without damaging or triggering the existing systems.
  - g. All copper or steel waterlines and plastic or steel gas lines.
6. All markings made by the Underground Utility Locator Service or other shall be clear and visible.
7. The contractor shall maintain all markings made by Underground Utility Locator Service or other throughout the entire length of the project.
8. The Underground Utility Locator Service shall provide the contractor with two sets of maps showing the location of utilities and average depth. They will be referenced to permanent buildings. Contractor will deliver one copy to the district at no additional charge.
9. Contractor is responsible to contact Underground Service Alert (U.S.A. 800/227-2600) and receive clearance prior to any excavation operations.
10. Contractor shall inform the (District's Construction Manger)(Architect)(Owner) no later than five (5) days prior to the date scheduled for the utility locator service to be on site.

### 1.13 PROTECTION

- A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.
- B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.
- C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gulying of sides of excavation.
- E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.
- F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.
- H. Trees: Carefully protect existing trees that are to remain. Provide temporary irrigation as necessary to maintain health of trees.

### 1.14 SEASONAL LIMITS

- A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.
- B. Excessively wet fill material shall be bladed and aerated per Article "Subgrade Preparation".

### 1.15 TESTING

- A. General: Refer to Section 01 45 23 - TESTING AND INSPECTION SERVICES, AND STRUCTURAL TESTS AND INSPECTIONS LIST, DSA-103.

- B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and backcharged to Contractor.
1. If Contractor elects to process or mine onsite materials for use as Suitable Fill, Aggregate Sub Base, Aggregate Base, Rock, Crushed Rock or sand the cost of all testing of this material shall be paid for by the Contractor.
  2. Testing of import fill for compliance with Department of Toxic Substance Control (DTSC) shall be paid for by the Contractor.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Engineered Fill Materials: All fill shall be of approved local materials supplemented by imported fill if necessary. "Approved" local materials are defined as local soils tested and approved by Geotechnical Engineer free from debris, and concentrations of clay and organics; and contain rocks no larger than 3-inches in greatest dimension. The soil and rock should be thoroughly blended so that all rock is surrounded by soil. This may require mixing of the soil and rock with a dozer prior to placement and compaction. Clods, rocks, hard lumps or cobbles exceeding 3-inches in final size shall not be allowed in the upper 6 inches of any fill. Native clay or clayey soils will not be permitted within the upper 6 inches of building pad areas or paved areas.
- B. Imported Engineered Fill Material: Imported fill may be required to complete work. Proposed import fill material shall meet the above requirements; shall be similar to the native soils. Import fill shall meet the above requirements; shall have plasticity index of 20 or less; an Expansion Index of 50 or less; be free of particles greater than 3-inch (3") in largest dimension; be free of contaminants and have corrosion characteristics within the acceptable limits. All import fill material shall be tested and approved by Soils Engineer prior to transportation to the site. Proposed fill material shall comply with DTSC guidelines to include Phase 1 environmental site assessment and related tests. Refer to the October 2001 DTSC Information Advisory for clean imported fill material.
1. DTSC TESTING: Site work contractor is to coordinate testing with an analytical lab, hired by the owner, licensed by the State of California for the DTSC testing. The costs associated with testing will be paid by the contractor.
  2. DTSC testing shall include documentation as to the previous land use, location, and history. Soils shall be analyzed for all compounds of concern to ensure the imported soil is uncontaminated and acceptable. Testing shall be performed per the recommendations included in DTSC Imported Fill Advisory ([http://www.dtsc.ca.gov/Schools/upload/SMP FS Cleanfill-Schools.pdf](http://www.dtsc.ca.gov/Schools/upload/SMP_FS_Cleanfill-Schools.pdf)). Soils shall be tested prior to import to the project site.
  3. Lab shall determine geographically which tests and analysis comparison will be appropriate for the testing. (CAM 17 / Title 22); (RWQCB) Regional Water Quality Control Board; or (OEHHA) Office of Environmental Health Hazard Assessment.
  4. Frequency of testing shall be conducted in accordance with DTSC's Imported Fill Advisory as follows;

Fill Material Sample Schedule	
Area Of Individual Borrow Area	Sampling Requirements
2 Acres or less	Minimum of 4 samples
2 to 4 Acres	Minimum of 1 sample every ½ acre
4 to 10 Acres	Minimum of 8 samples
Greater than 10 Acres	Minimum of 8 locations with 4 subsamples per location

Volume of Borrow Area Stockpile	
Up to 1,000 Cubic Yards	1 sample per 250 cubic yards
1,000 to 5,000 Cubic Yards	4 samples for the first 1000 cubic yards + 1 sample per each additional 500 cubic yards
Greater than 5,000 Cubic Yards	12 samples for the first 5,000 cubic yards + 1 sample per each additional 1,000 cubic yards

5. Reports/ Documentation

- a. Results of the testing analysis shall be sent to the Owner; Architect; Project Inspector, Project Civil Engineer, DTSC, and DSA. Letter shall reference DSA file and application numbers.

C. Landscape Backfill Material:

- 1. The top 10" of native topsoil stripped from the site may be used for landscape backfill material provided it meets the requirements as specified in Section [Landscape].
- 2. Imported Topsoil may be required to complete work. See Section [Landscape] for requirements. Proposed Topsoil material shall comply with DTSC guidelines to include Phase 1 environmental site assessment and related tests. Refer to the October 2001 DTSC Information Advisory for clean imported fill material.

D. Water: Furnish all required water for construction purposes, including compaction and dust control. Water shall be potable.

E. Aggregate Base: Provide Class 2 3/4" Aggregate Base conforming to standard gradation as specified in Cal Trans Standard Specifications, Section 26,-1.02A.

F. Decomposed Granite: None Proposed

- G. Decomposed Granite Solidifier: None proposed.

### PART 3 - EXECUTION

#### 3.1 INSPECTION LAYOUT AND PREPARATION

- A. Prior to installation of the work of this Section, carefully inspect and verify by field measurements that installed work of all other trades is complete to the point where this installation may properly commence
- B. Layout all work, establish grades, locate existing underground utilities, set markers and stakes, setup and maintain barricades and protection facilities; all prior to beginning actual earthwork operations. Layout and staking shall be done by a licensed Land Surveyor or Professional Civil Engineer.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. In event of discrepancy, immediately notify Owner and the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

#### 3.2 PERFORMANCE

##### A. GENERAL:

1. General: Do all grading, excavating and cutting necessary to conform finish grade and contours as shown. All cuts shall be made to true surface of subgrade.
2. Archaeological Artifacts: Should any artifacts of possible historic interest be encountered during earthwork operations, halt all work in area of discovery and immediately contact the Architect for notification of appropriate authorities.
3. Degree of Compaction: Percentage of maximum density, hereinafter specified as degree of compaction required, means density equivalent to that percentage of maximum dry density determined by ASTM D1557 Compaction Test method, and such expressed percentage thereof will be minimum acceptable compaction for specified work.
4. Moisture Content: Moisture content shall be as noted below and as called for on the plans. Moisture content shall be maintained until subgrade is covered by surfacing materials.

#### 3.3 DEMOLITION, DISPOSAL AND DISPOSITION OF UNDESIRABLE MAN-MADE FEATURES

- A. All other obstructions, such as abandoned utility lines, septic tanks, concrete foundations, and the like shall be removed from site. Excavations resulting from these removal activities shall be cleaned of all loose materials, dish shaped, and widened as necessary to permit access for compaction equipment. Areas exposed by any required over-excavation should be scarified to a depth of 6", moisture-conditioned to near optimum moisture content, and recompacted to at least 90% of the maximum dry density.

#### 3.4 TESTING AND OBSERVATION

- A. All grading and earthwork operations shall be observed by the Geotechnical Engineer or his representative, serving as the representative of the Owner.

- B. Field compaction tests shall be made by the Geotechnical Engineer or his representative. If moisture content and/or compaction are not satisfactory, Contractor will be required to change equipment or procedure or both, as required to obtain specified moisture or compaction. Notify Geotechnical Engineer at least 48 hours in advance of any filling operation.
- C. Earthwork shall not be performed without the notification or approval of the Geotechnical Engineer or his representative. The Contractor shall notify the Geotechnical Engineer at least two (2) working days prior to commencement of any aspect of the site earthwork.
- D. If the Contractor should fail to meet the compaction or design requirements embodied in this document and on the applicable plans, he shall make the necessary readjustments until all work is deemed satisfactory, as determined by the Geotechnical Engineer or Architect/Engineer.
- E. After each rain event Geotechnical Engineer shall test fill material for optimum moisture. Do not place any fill material until desired moisture is achieved.

### 3.5 CLEARING AND GRUBBING

- A. Prior to grading, remove all debris off-site. Remove trees and brush including the root systems. Holes resulting from tree and brush removal should be prepared and backfilled in accordance with paragraphs 3.7, 3.8, 3.9, and 3.10. This may require deepening and/or widening the holes to adequately remove disturbed soil and provide room for compaction equipment. Strip the surface of all organics. Strippings meeting the requirements of Section 32 90 00 (if provided) may be used in landscape areas only.

### 3.6 CUTTING

- A. Building pads that are located within a cut/fill transition area will have to be overexcavated to provide a semi-uniform fill beneath the building pad. The portions of building pads located in cut areas shall be overexcavated to provide no more than 1 foot difference in fill placed in the same building pad.
- B. Do all cutting necessary to bring finish grade to elevations shown on Drawings.
- C. When excavation through roots is necessary, cut roots by hand.
- D. Carefully excavate around existing utilities to avoid unnecessary damage. The contractor shall anticipate and perform hand work near existing utilities as shown on the survey, without additional claims or cost.

### 3.7 STRUCTURAL EXCAVATION

- A. General: Excavate to bear on firm material at contract depth shown on Structural Drawings.
- B. Footings: All footing excavations shall be of sufficient width for installation of formwork, unless earth will retain its position during concreting. All portions of footings above grade must be formed. In the event that footings are placed against earth, footing widths below grade shall be increased 2 inches from those shown on Drawings and positive protection shall be provided for top corners of trench.
- C. Unsuitable Ground: Any errors in structural excavation, soft ground, or clay soils found when excavating shall be reported to Architect. In no case shall work be built on any such soft or clayey unsuitable surface

without direction from the Architect. Restore excavations to proper elevation with engineered fill material compacted to 95% of dry density.

### 3.8 SUBGRADE PREPARATION

- A. Grade compact and finish all subgrades within a tolerance of 0.10' of grades as indicated on Drawings and so as not to pool water. Subgrade within building pads and concrete walks shall be within 0.05' of grades indicated.
- B. After clearing, grubbing and cutting, subsurface shall be plowed or scarified to a depth of at least 12", until surface is free from ruts, hummocks or other uneven features. Moisture condition to 2% above the optimum moisture content and recompact to at least 95% of the maximum dry density as determined by ASTM Test Method D1557. If the existing soils are at a water content higher than specified, the contractor shall provide multiple daily aerations by ripping, blading, and/or discing to dry the soils to a moisture content where the specified degree of compaction can be achieved. After seven consecutive working days of daily aerations, and the moisture content of the soil remains higher than specified, the contractor shall notify the architect. If the existing soils have a moisture content lower than specified, the contractor shall scarify, rip, water and blade existing soil to achieve specified moisture content. The contractor shall make proper allowance in schedule and methods to complete this work.
- C. After subgrade for fill within building pad area or within paved areas has been cleared, plowed and scarified, it shall be disked or bladed until uniform and free from large clods, brought to (optimum) (2% above optimum) moisture content and compacted to not less than 95% of maximum dry density, as determined by ASTM Test Method D1557, and such expressed percentage thereof will be minimum acceptable density for specified work.
- D. Subgrade in areas to receive landscaping shall be compacted to (90%).
- E. Where Contractor over-excavates building pads through error, resulting excavation shall be recompact as engineered fill at Contractor's expense.

### 3.9 PLACING, SPREADING AND COMPACTING FILL MATERIAL IN BUILDING PAD AND PAVEMENT AREAS

- A. Selected fill material shall be placed in layers which, when compacted, shall not exceed 6 inches in compacted thickness. Each layer shall be spread evenly and thoroughly mixed to insure uniformity in moisture content.
- B. Selected fill material shall be moisture-conditioned to specified moisture content. Selected fill material shall be unfrozen. When moisture content of fill material is below that specified, add water until proper moisture content is achieved. When moisture content is above that specified, aerate by blading or other methods mentioned in 3.08 B until moisture content is satisfactory.
- C. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to a minimum of 95% as determined by the ASTM D1557 Compaction Test. Compact each layer over its entire area until desired density has been obtained.
- D. Recompaction of Fill in Trenches and Compaction of Fill Adjacent to Walls: Where trenches must be excavated, backfill with material excavated. Place in lifts that when compacted do not exceed 6",

moisture conditioned to 2% above the optimum moisture content, and compact to a minimum of 95% relative compaction in building pad and paved areas, and to 90% relative compaction in landscape areas.

- E. Jetting of fill materials will not be allowed.

### 3.10 FINAL SUBGRADE COMPACTION

- A. Paved Areas: Upper 6" of all final subgrades supporting pavement sections and all other flatwork shall be brought to specified moisture content and shall be uniformly compacted to not less than 95% of maximum dry density, regardless of whether final subgrade elevation is attained by filling, excavation, or is left at existing grade. After acceptance of final compaction test, contractor shall maintain the required moisture content of subgrade until concrete flatwork is placed.
- B. Other Fill and Backfill: Upper 6" of all other final subgrades or finish grades shall be compacted to 90% of maximum dry density.
- C. Gravel Fill: Do not place compacted gravel fill until after underground work and foundations are in place. Compact gravel fill with vibratory plate or similar equipment to preclude settlement.

### 3.11 PLACING, SPREADING, AND COMPACTION OF LANDSCAPE BACKFILL MATERIALS

- A. All landscaped areas shall receive topsoil. After subgrade under landscape area has been scarified and brought to 95% maximum dry density, top soil shall be placed evenly to depth of 6" at 85% of maximum dry density.
- B. Project Inspector must verify that materials are uniformly spread to minimum depth specified.

### 3.12 SLOPE CONSTRUCTION

- A. Cut slopes shall be constructed to no steeper than 1:1 (horizontal:vertical). Fill slopes shall be constructed to no steeper than 1:1 (horizontal:vertical). Prior to placement of fill on an existing slope the existing slope shall be benched. The benches shall be in a ratio of 1 horizontal to 1 vertical. The face of the fill slopes shall be compacted as the fill is placed, or the slope may be overbuilt and then cut back to the design grade. Compaction by track walking will not be allowed.

### 3.13 FINISH GRADING

- A. At completion of project, site shall be finished graded, as indicated on Drawings. Finish grades shall be "flat graded" to grades shown on the drawing. Mounding of finish grades will not be allowed unless otherwise directed on the landscape drawings. Tolerances for finish grades in drainage swales shall be  $\pm 0.05'$ . Tie in new and existing finish grades. Leave all landscaped areas in finish condition for lawn seeding. Landscaped planters shall be graded uniformly from edge of planter to inlets. If sod is used for turf areas the finish grade on which it is placed shall be lowered to allow for sod thickness.
- B. All landscape areas shall be left free of rock or foreign material as specified in Section \_\_\_\_\_.
- C. All landscape areas shall be approved by Architect prior to any planting.

3.14 SURPLUS MATERIAL

- A. Excavated material not required for grading or backfill shall be removed from site at contractor's expense.

3.15 CLEANING

- A. Refer to Section 01 77 00.
- B. Remove from fill all vegetation, wood, form lumber, casual lumber, and shavings, in contact with ground; buried wood will not be permitted in any fill.

END OF SECTION

SECTION 31 23 33

TRENCHING AND BACKFILLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Trench backfill materials.

1.2 RELATED REQUIREMENTS

- A. Section 01 50 00, Temporary Facilities and Controls.
- B. Section 01 81 13, Sustainable Design Requirements, for CAL-Green [and Collaborative for High Performance Schools (CHPS)] general requirements and procedures.
- C. Section 31 00 00, Earthwork.
- D. Section 32 80 00, Irrigation.
- E. Section 33 00 00, Utilities
- F. Section 33 40 00, Storm Drainage Utilities.

1.3 REFERENCES AND STANDARDS

- A. California Building Code (CBC), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Green Building Standards Code (CAL Green), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).
- C. California Plumbing Code (CPC), edition as noted on the drawings.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Submittal Procedures:
  - 1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 33 00, Submittal Procedures.
  - 2. Closeout Submittals shall be submitted in accordance with Section 01 77 00, Closeout Procedures.
  - 3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 81 13, Sustainable Design Requirements.
- B. Coordination:

1. General Contractor shall coordinate work as herein specified, in accordance with drawings and as required to complete scope of work with all related trades.

#### 1.5 ACTION SUBMITTALS

- A. Provide supplier's descriptive literature for all products to demonstrate compliance with specified attributes:

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For contractor / Installer.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Guarantee: Submit subcontractor's guarantee.

#### 1.8 QUALITY ASSURANCE

- A. Contractor / Installer shall have been in business for five (5) years providing/finishing similar size projects and complexity.
- B. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
- C. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

#### 1.9 DELIVERY, STORAGE AND HANDLING

- A. Transport, store and handle in strict accord with the local jurisdiction.

#### 1.10 FIELD CONDITIONS

- A. Contractor shall acquaint himself with all existing site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.
- B. Trench dewatering may be necessary. Contractor shall provide any and all tools, equipment and labor necessary for trench dewatering no matter what the source. Dewatering shall be continuous until all site utilities are installed and backfilled.

#### 1.11 PROTECTION

- A. Adequate protection measures shall be provided to protect workers and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations. Repair all trenches in grass areas with new sod (seeding not permitted) and "stake-off" for protection.

- B. Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.
- C. Any construction review of the Contractor's performance conducted by the Architect or Owner is not intended to include review of the adequacy of the Contractor's safety measures, in, on or near the construction site.
- D. Provide shoring, sheeting, sheet piles and or bracing to prevent caving, erosion or gullyng of sides of excavation.
- E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. Keep all excavations free from water during entire progress of work, regardless of cause, source or nature of water.
- F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance.
- H. Trees: Carefully protect existing trees which are to remain.

#### 1.12 TRENCH SAFETY PROVISIONS

- A. General Contractor shall be solely responsible for safety design, construction and coordination with agencies having jurisdiction. If such plan varies from shoring system standards established by Construction Safety Orders, plan shall be prepared by registered civil or structural engineer.
- B. Nothing herein shall be deemed to allow use of shoring, sloping or protective system less effective than that required by Construction Safety Orders of California State Division of Industrial Safety.
- C. When trenching through paved surface, provide steel trench plates to cover open trenches daily until trenches are backfilled.

#### 1.13 SEASONAL LIMITS

- A. No backfill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by heavy rains, full operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.
- B. Material above optimum moisture shall be processed per Section 31 0000, Part 3, Article "Subgrade Preparation".

#### 1.14 TESTING

- A. General: Refer to Section 31 00 00, Part 1, Article "Testing" and Part 3, Article "Testing and Observation".

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Backfill materials: Pipeline and conduit trench backfill as shown on the plans and as specified below.
  - 1. ¾ inch crush rock.
  - 2. Native Materials: Soil native to Project Site, free of wood, organics, and other deleterious substances. Rocks shall not be greater than \_\_\_-inches.
  - 3. Sand: Fine granular material, free of organic matter, mica, loam or clay.
  - 4. Lean Mix Concrete: 3 sacks of cement per yard plus sand.
  - 5. Class 2 aggregate base, ¾" rock, per Caltrans Section 26-1.02B
  - 6. Controlled Density Fill: 3 sack slurry backfill.
- B. Water: Furnish all required water for construction purposes, including compaction and dust control. Water shall be potable.
- C. Provide other bedding and backfill materials as described and specified in Section 33 00 00, Section 33 40 00 and Divisions 22 and 26.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions:
  - 1. Examine areas and conditions under which work is to be performed.
  - 2. Identify conditions detrimental to proper or timely completion of work and coordinate with General Contractor to rectify.

3.2 INSTALLATION

- A. Perform work in accordance with pipe manufacturer's recommendations, as herein specified and in accordance with drawings.

3.3 TRENCHING

- A. Make all trenches open vertical construction with sufficient width to provide free working space at both sides of trench around installed item as required for caulking, joining, backfilling and compacting; not less than 12 inches wider than pipe or conduit diameter, unless otherwise noted.
- B. Carefully excavate around existing utilities to avoid unnecessary damage. The contractor shall anticipate and perform hand work near existing utilities as shown on the survey, without additional claims or cost.
- C. Trench straight and true to line and grade with bottom smooth and free of edges or rock points.
- D. Where depths are not shown on the plans, trench to sufficient depth to give minimum fill above top of installed item measured from finish grade above the utility as follows:

1. Sewer pipe: depth to vary
2. Storm drain pipe: depth to vary
3. Water pipe - Fire Supply: 36 inches
4. Water pipe – Domestic Supply: 30 inches

### 3.4 BACKFILL

#### A. Pipe Trench Backfill is divided into three zones:

1. Bedding: Layer of material directly under the pipe upon which the pipe is laid.
2. Pipe Zone: Backfill from the top of the bedding to 6 inches (compacted) over the top of the pipe.
3. Upper Zone: Backfill between top of Pipe Zone and to surface of subgrade.

#### B. Bedding: Type of material and degree of compaction for bedding backfill shall be as defined in the Details and Specifications.

#### C. Pipe Zone and Upper Zone Backfill:

1. Type of material and degree of compaction Pipe Zone and Upper Zone Backfill shall be as required by Drawings, Details, & Specifications.
2. Upper Zone Backfill shall not be placed until conformance of Bedding and Pipe Zone Backfill with specified compaction test requirements has been confirmed.
3. Backfill shall be brought up at substantially the same rate on both sides of the pipe and care shall be taken so that the pipe is not floated or displaced. Material shall not be dropped directly on pipe.

#### D. Backfill Compaction:

1. Backfill shall be placed in layers which, when compacted shall not exceed 6 inches in thickness. Each layer shall be spread evenly and thoroughly mixed to insure uniformity. Do not backfill over, wet, frozen or soft subgrade surfaces. Employ a placement method that does not disturb or damage foundation walls, perimeter drainage, foundation damp-proofing, waterproofing or protective cover.
2. When moisture content of fill material is below that required to achieve specified density, add water until proper moisture content is achieved. When moisture content is above that required, aerate by blading or other methods until specified moisture content is met; see Section 31 00 00, Part 3, Article "Subgrade Preparation".
3. After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to \_\_\_\_% of maximum dry density while at specified moisture content. Compact each layer over its entire area until desired density has been obtained.
4. Compaction: All backfill operations shall be observed by the Inspector of Record and/or Geotechnical Engineer. Field density tests shall be made to check compaction of fill material. If densities are not satisfactory, Contractor will be required to change equipment or procedure or both, as required to obtain specified densities. Notify Inspector and Architect at least 24 hours in advance of any operation.

E. Backfill in Areas Previously Lime or Cement Treated

1. Where trenching occurs in areas that have been lime or cement treated, class 2 aggregate bases or approved controlled density backfill material shall be used for the top 12-inches minimum of the trench or thickness shall match the depth of treated material.

3.5 TRENCH AND SITE RESTORATION

- A. Finished surface of trenches shall be restored to a condition equal to, or better than the condition as existed prior to excavation work.

3.6 PROTECTION

- A. Protect existing surfaces, structures, and utilities from damage. Protect work by others from damage. In the event of damage, immediately repair or replace to satisfaction of Owner.
- B. Repair existing landscaped areas to as new condition. Replant trees, shrubs or groundcover with existing materials if not damaged or with new materials if required. Replace damaged lawn areas with sod, no seeding will be permitted.
- C. Replace damaged pavement with new compatible matching materials. Concrete walks to be removed to nearest expansion joint and entire panel replaced. Asphalt to be cut neatly and replaced with new materials.
- D. Any existing materials removed or damaged due to trenching to be returned to new condition.

3.7 SURPLUS MATERIAL

- A. Remove excess excavated material, unused materials, damaged or unsuitable materials from site.

3.8 CLEANING

- A. Refer to Section 01 77 00.
- B. Contractor will keep the work areas in a clean and safe condition so his rubbish, waste, and debris do not interfere with the work of others throughout the project and at the completion of work.
- C. After completion of work in this section, remove all equipment, materials, and debris. Leave entire area in a neat, clean, acceptable condition.

END OF SECTION

SECTION 31 25 00

EROSION AND SEDIMENT CONTROLS

PART 1 - GENERAL

1.01 SCOPE OF WORK

- A. GENERAL: Provide all materials, equipment and labor necessary to furnish and install erosion control measures and implement best management practices, including but not limited too; straw wattles, silt fence barriers; stabilized entrances, etc. at locations shown on the drawings and in the Storm Water Pollution Prevention Plan (when required, see below).
  
- B. STORM WATER POLLUTION PREVENTION PLAN:
  - 1. Due to the project size and project timing (summer). A Storm Water Pollution Prevention Plan (SWPPP) is not anticipated to be required. Should size or timing change, Contractor will be responsible for development of a Storm Water Pollution Prevention Plan (SWPPP) by a Qualified SWPPP Developer (QSD) and also provide all necessary State Permitting with the States online "SMARTS" System. Although a SWPPP is not anticipated to be required, contractor will still be responsible to implement appropriate measures to prevent illicit discharges from the site, such as sediment or otherwise contaminated water and dust.
  
  - 2. If a SWPPP is required, Contractor shall provide a Qualified SWPPP Practitioner (QSP) to implement the SWPPP onsite and also provide and upload the necessary reports to the State SMARTS System. QSP shall be certified as such by the state of California. if Erosivity Waiver is granted as anticipated, contractor shall still assign site personnel the responsibility of implementing and maintaining erosion control devices to prevent erosion or illicit discharges by water or wind, regardless of the source.
  
  - 3. Contractor shall Comply with State Water Resources Control Board requirements and Local Jurisdiction where applicable.
  
  - 4. When SWPPP Required, the Contractor shall amend the SWPPP Map during the course of construction to the contractor's approach to the work in this contract. The Contractor shall as a minimum address and show:
    - a. Cut and fill operations
    - b. Temporary stockpile locations and protection measures
    - c. Vehicle and equipment storage, maintenance and fueling operations
    - d. Concrete and asphalt disposal areas and protective measures
    - e. Dust control measures
    - f. Tracking of dirt, mud and off-site streets and subsequent street cleaning when required.
    - g. Pipe flushing and disposal of sediment latent flush waters.

1.02 QUALITY ASSURANCE

- A. GENERAL: Comply with local governing codes and regulations.

### 1.03 SUBMITTALS

- A. SMARTS & NOTICE OF INTENT (NOI): If SWPPP required, contractor shall be responsible for submittal to the State of California Storm Water Multiple Application and Report Tracking System (SMARTS). A Copy of the complete SWPPP and NOI receipt letter is to be provided to the Architect and owner for record.

## PART 2 - PRODUCTS

### 2.01 MATERIALS

- A. STRAW WATTLES: Shall be new manufactured straw roles in compliance with state requirements for sediment control.
- B. SILT FENCES: Comply with state and local requirements.
- C. HYDRO SEED MIX: Contractor shall provide a blended seed mix containing both seeds blends and in the following mixture:

Blando Brome – 12 lbs/acre (0.3 lbs per sf)

Annual Ryegrass – 9 lbs/acre (0.2 lbs per sf)

Contractor, or Contractor's erosion control specialist or subcontractor may submit an alternative seed mix for review, however, sample projects need to be provided in the greater Sacramento Area that show this mix design is effective.

- D. STRAW HYDROSEED /TACKIFIER: Straw Hydroseed with Tackifier mulch shall be composed of fibers derived from straw products with no growth or germination inhibiting substances. Mulch shall be manufactured in such a manner that when thoroughly mixed with seed, fertilizer, and water, in the proportions specified, it will form a homogeneous slurry which is capable of being sprayed to form a porous mat. The fibrous mulch in its air-dry state shall contain not more than fifteen percent by weight of water. The fiber shall have a temporary green dye and shall be accompanied by a certificate of compliance stating that the fiber conforms to these specifications. Product shall be Hydrostraw™ or equal.
- E. CONCRETE WASHOUT(S): Shall be pre-constructed or built onsite with plastic sheeting and supporting material such as straw bales. Washouts shall be sized for expected concrete work, or multiple washouts provided.

## PART 3 - EXECUTION

### 3.01 INSTALLATION

- A. STRAW WATTLES: Shall be installed per the drawings and/or as required by the SWPPP and Local Authority.
- B. SILT FENCES: Shall be installed per the Drawings and/or as required by the SWPPP and Local Authority.
- C. HYDROSEEDED AREA:

- 1. Preparation: Do all slurry preparation at the job site:
  - a. Water, straw mulch w/tacifier, fertilizer, and other ingredients shall be added to the tank simultaneously so that the finished load is homogenous mix of the specified ingredients.
  - b. Seed shall be added last and shall be discharged within two hours (2hrs.). Loads held over four hours (4 hrs.) will be recharged with one-half (1/2) the seed rate before application.
  - c. Once fully loaded, the complete slurry shall be agitated for three to five minutes (3-5 min.) to allow for uniform mixing.
- 2. Application:
  - a. General: All hydroseed applications are to be applied in a sweeping motion to form a uniform mat at the specified rates.

Two-step Slope Application

Step One	
<u>Material</u>	<u>Lbs/Ac</u>
Hydrostraw	2,000
7.2.3 Slow Release Fertilizer	1,000
Seed as per section (2.02 Seed)	#
Am 120 Mycorrhizal Inoculant	60
Step Two	
<u>Material</u>	<u>Lbs/Ac</u>
Hydrostraw	2,000

- b. Protection: Contractor is to apply the hydrostraw in such a way as to complete the application in an orderly manner and stay off partially and completely treated areas.
- c. Unused Loads: If mixture remains in tank for more than 8 hours it shall be removed from the job site at Contractor's expense.

3.02 MAINTENANCE AND REMOVAL:

- A. GENERAL: Maintain and repair existing and new erosion and sediment controls facilities throughout the construction period. Remove silt build up as needed. Repair damage to earth slopes and banks. Ero

sion and sediment controls measures shall be left in place until final paving and landscaping are complete or as required by SWPPP.

- B. MONITORING: Provide monitoring of erosion and sediment controls measures before and after storm events. Provide a daily log of construction activities and impact on erosion and sediment controls measures. Update SWPPP continuously throughout construction period.
- C. CLEANING: Keep area clean of debris.
- D. Remove erosion and sediment controls measures prior to placing finish landscaping.

END OF SECTION

SECTION 32 16 00

SITE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
  - 1. Concrete curbs and gutters.
  - 2. Concrete pavement, sidewalks and ramps.
  - 3. Steel reinforcing for flatwork and curbs.
  - 4. Truncated domes.

1.2 RELATED REQUIREMENTS

- A. Section 01 4523, Testing & Inspection Services.
- B. Section 01 6116, Volatile Organic Compound (VOC) Restrictions; for VOC limits pertaining to adhesives, sealants, fillers, primers, and coatings.
- C. Section 01 8113, Sustainable Design Requirements, for CAL-Green [and Collaborative for High Performance Schools (CHPS)] general requirements and procedures.
- D. Section 03 1000, Concrete Forming & Accessories.
- E. Section 03 2000, Concrete Reinforcing.
- F. Section 03 3000, Cast-in-Place Concrete.
- G. Section 09 9623, Graffiti-Resistant Coatings.
- H. Division 31, Earthwork.
- I. Section 32 1200, Asphalt Concrete Paving.

1.3 REFERENCES AND STANDARDS

- A. California Building Code (CBC), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Green Building Standards Code (CALGreen), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).
- C. American Concrete Institute (ACI):
  - 1. 117: Specification for Tolerances for Concrete Construction and Materials and Commentary.

2. 211.1: Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
3. 301: Specifications for Structural Concrete.
4. 302.1R: Guide to Concrete Floor and Slab Construction.
5. 305R: Guide to Hot Weather Concreting.
6. 306R: Guide to Cold Weather Concreting.
7. 308R: Guide to External Curing of Concrete.
8. 318: Building Code Requirements for Structural Concrete and Commentary.
9. 347R: Guide to Formwork for Concrete.

D. ASTM International (ASTM):

1. A615/A615M: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
2. A706/A706M: Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement.
3. C33/C33M: Standard Specification for Concrete Aggregates.
4. C94/C94M: Standard Specification for Ready-Mixed Concrete.
5. C143/C143M: Standard Test Method for Slump of Hydraulic-Cement Concrete.
6. C150/C150M: Standard Specification for Portland Cement.
7. C260/C260M: Standard Specification for Air-Entraining Admixtures for Concrete.
8. C309: Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
9. C330/C330M: Standard Specification for Lightweight Aggregates for Structural Concrete.
10. C494/C494M: Standard Specification for Chemical Admixtures for Concrete.
11. C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.
12. C920: Standard Specification for Elastomeric Joint Sealants.
13. C1107/C1107M: Standard Specification for Packaged Dry, Hydraulic Cement Grout (Non-Shrink).
14. C1315: Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.
15. D1751: Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
16. D5893/D5893M: Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.

E. Concrete Reinforcing Steel Institute (CRSI):

1. Manual of Standard Practice.
2. Placing Reinforcing Bars.

F. State of California, Department of Transportation (Caltrans):

1. Division of Engineering Services:

- a. California Test 342: Method of Test for Surface Skid Resistance with the California Portable Skid Test.
2. Standard Specifications.
  - a. Section 51, Concrete Structures.
  - b. Section 52, Reinforcement.
  - c. Section 73, Concrete Curbs and Sidewalks.
  - d. Section 90, Concrete.

G. US Government General Services Administration (GSA/SAE):

1. GSA/SAE AMS-STD-595A: Colors Used In Government Procurement.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:

1. Action Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

1.5 ACTION SUBMITTALS

A. Shop Drawings: Joint pattern layout for walks and pavement.

B. Product Data:

1. A complete list of materials proposed to be used for the site concrete work including, but not limited to, sand, gravel, admixtures, surface treatments, coloring agents, sealers, cast-in-place accessories, forming and curing products, concrete mix designs, reinforcing materials, joint materials, curing materials, and detectable warning surface.
2. Manufacturer's descriptive literature for products proposed for use. Include installation instructions, and maintenance instructions.

C. Concrete Mix Design: The Contractor shall submit three copies of each proposed mix design for each class of concrete in accordance with ACI 301, Sections 3.9 "Proportioning on the Basis of Previous Field Experience or Trial Mixture," or 3.10 "Proportioning Based on Empirical Data." The Contractor shall submit a separate mix design for concrete to be placed by pumping, in addition to the mix design for concrete to be placed directly from the truck chute.

1. The following information shall be included in the concrete mix design:
  - a. Proportions of cement, fine and coarse aggregate, and water.
  - b. Water-cement ratio, 28-day compressive design strength, slump, and air content.
  - c. Type of cement and aggregate.
  - d. Special requirements for pumping.
  - e. Range of ambient temperature and humidity for which design is valid.

- f. Special characteristics of mix, which require precautions in mixing, placing, or finishing techniques to achieve specified finished product.
- 2. Do not begin concrete production until mixes have been reviewed and approved by Engineer.
  - a. Review of mix design by the Architect and Engineer shall in no way relieve the subcontractor of his responsibility for the performance of the concrete.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer
- B. Delivery tickets as specified for ready-mixed concrete.
- C. Record of pre-installation meeting.
- D. Sustainable Design:
  - 1. General:
    - a. Submit information necessary to establish and document compliance with the California Green Building Standards Code.
    - b. Sustainable design submittals are in addition to other submittals.
  - 2. The following information shall be provided:
    - a. Adhesives and Sealants: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.
    - b. Paints and Coatings: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.

#### 1.7 CLOSEOUT SUBMITTALS

- A. Guarantee: Submit subcontractor's guarantee.

#### 1.8 QUALITY ASSURANCE

- A. Qualifications:
  - 1. Manufacturer of ready-mixed concrete products shall meet ASTM C94/C94M requirements for production facilities and equipment.
- B. Design, erect, support, brace and maintain formwork and shoring to safely support all loads that might be applied until such loads can be carried by concrete.
- C. The Contractor shall perform work in accordance with ACI 301.
- D. Use only new materials and products.
- E. Single-Source Responsibility: Use materials and products of one manufacturer whenever possible.
- F. Materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

- G. Testing to determine compliance with the work of this Section will be the responsibility of the Contractor.
1. Cement and reinforcing shall be tested in accordance with CBC Section 1910A. Testing of reinforcing may be waived in accordance with Section 1910A.2 when approved by the Engineer and DSA.
  2. Testing will be performed by an independent testing and inspecting agency in accordance with Section 01 4523, Testing and Inspection Services, and paid for by the Owner.
  3. Refer to Article FIELD QUALITY CONTROL in Part 3 of this Section for additional requirements.
  4. Cost of retests and coring due to low strength or defective concrete will be paid by the Owner and back-charged to the Contractor.
- H. Sieve analysis from testing laboratories identifying rock/sand percentages within the concrete mix; or class 2 aggregate base shall have the current Project name and Project location identified on the report. Outdated analytical reports greater than 90 days old will not be accepted.
- I. Mockups: Provide on-site mockup panels for each type of exposed colored concrete flatwork showing texture and color before proceeding with finish to be used on this Project.
1. Construct sample panels after review and approval of samples.
  2. Size: Minimum 5 feet square and have at least one longitudinal and one transverse joint unless a more specific note indicates otherwise on Drawings.
  3. Construct sample panels at location approved by Architect.
  4. Construct sample panels in ample time to allow for finishing and curing before requesting Architect to review.
  5. Follow procedures used on accepted samples.
  6. Include saw-cut and tooled joints to match method and appearance proposed for use in completed work.
  7. Prepare successive sample panels as required until finish, color, and appearance is approved by Architect.
  8. Do not remove sample panels until authorized in writing by the Architect and all concrete work has been approved.

#### 1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.
- B. Store materials in protected, dry conditions off of ground and in areas so as to not interfere with the progress of the Work.
- C. Transport, store and handle in strict accordance with the manufacturer's written recommendations.
- D. Store cement in weather tight building, permitting easy inspection and identification. Protect from dampness. Lumpy or stale cement will be rejected.

- E. Aggregates: Prevent excessive segregation, or contamination with other materials or other sizes of aggregate. Use only one supply source for each aggregate stock pile.

#### 1.10 FIELD CONDITIONS

- A. Make and be responsible for all field dimensions necessary for proper fitting, slopes, and completion of work. Report discrepancies to Architect before proceeding.
- B. Do not place concrete during rain without adequate protection.
- C. The Contractor shall conform to ACI 306R when mixing and placing concrete during cold weather. Provide sufficient protection when daily temperatures drop below 40 degrees F.
- D. The Contractor shall conform to ACI 305R when mixing and placing concrete during hot weather. When air temperature exceeds 100 degrees F adjust concrete mix with retarding admixture in design mix, and adequately test and take additional measures as directed by concrete supplier.
- E. The Contractor shall maintain access for vehicular and pedestrian traffic as required for other construction activities. Use temporary striping, flagmen, barricades, warning signs, and warning lights as required.
- F. Placing in hot weather: Comply with ACI 305R. Concrete shall be delivered, placed and finished in a sufficiently short period of time to avoid surface dry checking.
  - 1. Concrete shall not exceed 85 degrees F at time of placement.
  - 2. Concrete shall be kept wet continuously after tempering until implementation of curing compound procedure in accordance with this specification.
  - 3. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 pounds per square foot per hour, before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- G. Placing in Cold Weather: Comply with ACI 306R. Protect from frost or freezing. No antifreeze admixtures are permitted.
  - 1. When placing concrete during freezing or near-freezing weather, mix shall have temperature of at least 50 degrees F but not more than 90 degrees F.
  - 2. Concrete shall be maintained at temperature of at least 50 degrees F for not less than 72 hours after placing or until it has thoroughly hardened.
  - 3. Provide necessary thermal coverings for any flat work exposed to freezing temperatures.

#### PART 2 - PRODUCTS

##### 2.1 DESIGN AND PERFORMANCE CRITERIA

- A. Contractor shall comply with requirements applicable to this Section for concrete materials, admixtures, bonding materials, curing materials, surface sealers and others as required.

- B. Concrete walking surfaces shall have a coefficient of friction not less than 0.30 and will be subject to testing to verify compliance as specified in Article FIELD QUALITY CONTROL.
  - 1. The coefficient of friction will be measured by California Test 342 before pavement is opened to public traffic, but not sooner than 7 days after concrete placement.
  - 2. Contractor shall notify the Architect and Project Inspector of pavement having a coefficient of friction less than 0.30.
- C. Sustainable Design:
  - 1. VOC emissions for field-applied adhesives, sealants, and sealant primers must comply with limits specified in Section 01 6116.
  - 2. VOC emissions for field-applied paints and coatings must comply with limits specified in Section 01 6116.

## 2.2 FORMING MATERIALS

- A. Form Material: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. The forms shall be of a depth equal to the depth of curbing or sidewalk, and so designed as to permit secure fastening together at the tops. Coat forms with non-staining type coating that will not discolor or deface surface of concrete.
  - 1. Concrete Exposed to View: 5/8-inch minimum APA B-B Plyform, steel or "Sonotube" forms by Sunoco, 888-875-8754, or equal.
  - 2. Concrete Concealed from View: 5/8-inch minimum APA B-B Plyform, steel or 1 x 8 DF, Number 2 Grade or better.
- B. Form Ties: Snap off metal of fixed length, leaving no metal within 1-1/2 inches of surface and no fractures, spalls or other surface defects larger than 1 inch diameter; manufactured by Burke, Dayton Superior, or equal.
- C. Spreaders: Metal. Wood is not permitted.
- D. Form Coating: Coat forms with non-staining material that will not discolor or deface surface of concrete or leave any residue on concrete that would interfere with surface coating as approved by the Architect.
- E. Chamfer Strips: Rigid polyvinyl chloride, 3/4-inch x 3/4-inch, in maximum possible lengths, manufactured by Burke, Greenstreak, Vulco, or equal.

## 2.3 REINFORCING MATERIALS

- A. Reinforcement Bars: New billet steel deformed bars conforming to requirements of ASTM A615/A615M or ASTM A706/A706M; Grade 60.
  - 1. Bars for dowels installed through expansion joints or construction joints to existing sidewalks or concrete features shall be smooth or if deformed shall be sleeved on one end for slippage.

- B. Reinforcing Supports: Galvanized metal chairs or spacers or metal hangers, accurately placed 3 feet on center each way, staggered, with each support securely fastened to steel reinforcement in place.
  - 1. Bottom bars in footings may be supported with 3-inch concrete blocks with embedded wire ties.
  - 2. Concrete supports without wire ties will not be allowed.

## 2.4 CONCRETE MATERIALS

- A. Cement: Portland cement in accordance with ASTM C150/C150M, Type II, low alkali.
- B. Concrete Aggregates: Graded from coarse to fine in accordance with ASTM C33/C33M.
  - 1. Normal Weight Aggregates: Clean and free from deleterious coatings, clay balls, roots, and other extraneous materials, and in conformance with ASTM C33/C33M, except as otherwise specified. Combined grading shall meet limits of ASTM C33/C33M.
    - a. Size: Not be larger than one-fifth of the narrowest dimension between forms, or larger than three-fourths of the minimum clear spacing between reinforcing bars.
  - 2. Lightweight Aggregates:
    - a. General: Durable particles suitably processed, washed and screened without adherent coatings, free of materials with deleterious reactivity to alkali in cement, and conforming to ASTM C330/C330M.
    - b. Fine aggregate shall be natural sand, or sand prepared from stone or gravel, with grains free of silt, loam and clay.
- C. Water: Potable, clean, and in accordance with ASTM C94/C94M, free from injurious amounts of oil, acids, alkalis, salts, scale, organic materials or other deleterious matter, and in compliance with ACI 318 Section 26.4.1.3.
- D. Fly Ash: Western Fly Ash, conforming to ASTM C618 for Class N or Class F materials and in accordance with CBC Section 1903A.6.
  - 1. Class C is not permitted.
  - 2. Proportions: Not more than 15 percent (by weight) may be substituted for portland cement.

## 2.5 ADMIXTURES

- A. Water Reducing Admixture: Admixture to improve placing, reduce water cement ratio and ultimate shrinkage; "WRDA 64" by GCP Applied Technologies, or equal conforming to ASTM C494/C494M and ACI 318 Section 3.6.
  - 1. Water reducing admixture may be used subject to prior approval by the Architect, Engineer, and the Testing Lab.
  - 2. Proposed product and quantity shall be included in original design mix.
- B. Air-Entraining Admixture: "Daravaire 1000" by GCP Applied Technologies or equal conforming to ASTM C260 and ACI 318, section 26.4.1.4.

1. Proportion air entraining concrete to attain specified minimum 28-day compressive strength.
2. Total air entrainment in concrete shall be not less than 4 percent or more than 6 percent of the volume of concrete.

C. Glare Reduction Colorant: Concentrated pigment dispersions designed to permanently color concrete; "Chromix L10 Base-Black" by Sika Corporation, or equal. *Was within 2.2 H.1*

D. Coloring Agent for Integrally Colored Concrete: Weather resistant, UV stable, lightfast, and alkali resistant free-flowing concentrated pigment granules designed to permanently color concrete; Scofield "Chromix G" (granular) / "Chromix L" (liquid) by Sika Corporation, or equal.

1. Colors: As selected by Architect from manufacturer's full range of standard colors.

## 2.6 CURING MATERIALS

A. Clear Curing Compound: Water-based membrane-forming concrete curing compound in accordance with ASTM C309 and C1315; "Aqua Resin Cure Clear" by Burke CO, "1100" by W.R. Meadows, or equal.

B. Colored Curing Compound: Scofield "Lithochrome Colorwax Concrete Curing Compound" by Sika Corporation or equal meeting ASTM C309 for liquid membrane curing compounds.

1. Color: To match selected coloring agent additive.

## 2.7 SURFACE TREATMENTS

A. Surface Retarder for Exposed Aggregate Finish: "Rugasol-S" by Sika Corporation, "Top-Cast" by GCP Applied Technologies, or equal.

B. Concrete Stain: High performance, low-odor, reactive polymer; Scofield "Lithochrome Tintura Stain" by Sika Corporation, or equal.

1. Colors: As selected by Architect.

C. Heavy Duty Color Hardener: Heavy duty abrasion resistant dry shake color hardener comprised of specialty aggregates; Scofield "Emerchrome SC Color Hardener" by Sika Corporation, or equal.

1. Colors as selected by Architect.

D. Sealer for Stained Concrete: High-solids, low-odor, self-crosslinking, abrasion resistant, urethane fortified acrylic; Scofield "SelectSeal Plus" by Sika Corporation, or equal.

1. Colors: To be selected by Architect from standard colors.

## 2.8 ADDITIONAL MATERIALS AND COMPONENTS

A. Concrete Bonding Agent: The following, or equal, conforming to ASTM C1059/C1059M.

1. "Weld-Crete" by Larson Products Corporation, 800-633-6668.
2. "Daraweld C" by GCP Applied Technologies, 877-423-6491.

- B. Patching Mortar: One-component, trowel applied, migrating-corrosion-inhibitor enhanced, polymer-modified, shrinkage-compensated, fiber reinforced, micro-silica enhanced, cementitious repair mortar for horizontal, vertical, and overhead applications; "Meadow-Crete GPS" by W.R. Meadows, or equal.
  - C. Non-Shrink Grout: Premixed, non-metallic, no chlorides, non-staining and non-shrinking conforming to ASTM C1107/C1107M; "MasterFlow 713" by Master Builders Solutions, a division of BASF, 800-433-9517, or equal.
  - D. Drainage Rock Base: 3/4-inch aggregate size conforming to Class 2 Aggregate Base as defined in Caltrans Standard Specifications Section 26, or equal clean free-draining gravel or crushed rock as recommended by the Geotechnical Engineer.
  - E. Expansion Joint Material: Preformed 3/8-inch fiber material, with bituminous binder manufactured for use as concrete expansion joint material and conforming to ASTM D1751 and approved by Architect.
    - 1. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint-filler sections together.
  - F. Joint Sealant for Expansion Joints in Concrete: Weather and UV resistant, single component, cold applied silicone sealant, Type S, conforming to ASTM D5893/D5893M; ASTM C920, Grade P, Class 25, Use T.
    - 1. Self-Leveling: "DOWSIL 890-SL Silicone Joint Sealant" by Dow Chemical Company, or equal.
    - 2. At Slopes Exceeding 5 Percent: Non-sagging; "DOWSIL 888 Silicone Joint Sealant" by Dow Chemical Company, or equal.
    - 3. Color: As standard with manufacturer.
  - G. Pre-Formed Plastic Expansion Joint Caps: Polystyrene, with removable tops; "Snap Cap" by W. R. Meadows, Tex-Trude expansion caps, or equal.
  - H. Truncated Domes: Vitrified Polymer Composite (VPC) cast-in-place detectable/tactile warning surface tiles complying with Americans with Disabilities Act (ADA) and the California Code of Regulations (CCR) Title 24, Part 2, Chapter 11B; "Armor-Tile", "Access Tile Tactile Systems," or equal.
    - 1. Color: Shall be yellow and approximate 33538 of GSA/SAE AMS-STD-595A in accordance with CBC Section 11B-705.1.1.3.1.
  - I. Traffic Paint for Accessibility Striping at Stairs: VOC compliant, water-based, vinyl acrylic copolymer fast drying emulsion and specifically formulated as a traffic marking paint; "Setfast" with "Duckback" abrasive additive by Sherwin-Williams, "SAFE-STRIDE" by Wooster Products, Inc., or equal.
    - 1. Colors: As selected by Architect.[Yellow]
- 2.9 CONCRETE DESIGN AND CLASS
- A. Designed Strength and Classes of Concrete: The following mixes are not applicable to concrete items exceeding 4 feet in height above the adjacent grade.

1. Class "B": Concrete shall have 1 inch maximum size aggregate, shall have 3000 pounds per square inch minimum at 28 day strength with a maximum water to cementitious ratio no greater than 0.50.
    - a. Location of Use: Exterior slabs, including walks, vehicular paved surfaces, manhole bases, poured-in-place drop inlets, curbs, valley gutters, curb and gutter, and other concrete of like nature.
  2. Class "D" concrete of 1 inch maximum size aggregate shall have 3500 pounds per square inch 28 day strength with a maximum water to cementitious materials ratio of 0.55.
    - a. Location of Use: Footings and retaining walls not attached to buildings, and planter walls, monument signs, and other site concrete not described for use in Class "B".
- B. Slump Limits: Provide concrete, at point of final discharge of proper consistency as tested in accordance with ASTM C143/C143M with slumps of 4 inches, plus or minus 1 inch.
- C. Mix Design: Concrete shall be designed for strength in accordance with provisions of CBC Section 1905A.
1. Should the Contractor desire to pump concrete, a modified mix design will need to be submitted for review.
  2. Fly ash may be used in concrete to improve workability in amounts up to 15 percent of the total cementitious weight.
- D. Air Entrainment: Provide at concrete paving / flatwork, including concrete ramps and stairs in accordance with local jurisdiction minimum requirements, but no less than 3 percent of the volume of concrete.
- E. Glare Reduction Additive:
1. General:
    - a. Provide at exterior concrete slabs, walks, ramps, stairs, including bleachers, and other exposed flatwork to eliminate glare.
    - b. Omit glare reduction colorant where color hardener, integral color, and stain treatment of concrete are scheduled.
  2. Quantity: As required to match approved sample but not exceed 2 pounds of colorant per cubic yard of concrete.
  3. Add colorant to mix in accordance with manufacturer's printed instructions.
- F. Coloring Agent:
1. Quantity: Add pigment as required to result in hardened concrete color consistent with approved sample but not exceeding maximum dosage per sack of cement as recommended by manufacturer based on total cementitious materials of mix design.
  2. Add pre-mixed colorant bags to mix in accordance with manufacturer's printed instructions.
- 2.10 MIXING OF CONCRETE
- A. Conform to requirements of CBC Chapter 19A.

- B. Concrete shall be mixed until there is uniform distribution of material and mass is uniform and homogenous; mixer must be discharged completely before the mixer is recharged.
- C. Concrete shall be Ready-Mixed Concrete: Mix and deliver in accordance with the requirements set forth in ASTM C94/C94M and ACI 301. Batch Plant inspection may be waived in accordance with CBC Section 1705A.3.3, when approved by the Project Engineer and DSA.
  - 1. Furnish batch certificates for each batch discharged and used in the work.
  - 2. Approved Testing Laboratory shall check the first batching at the start of the work and furnish mix proportions to the Licensed Weighmaster.
  - 3. Licensed Weighmaster shall identify materials as to quantity and to certify to each load by ticket.
  - 4. Delivery tickets are to accompany each truck and shall be kept in the job superintendent's file. Delivery tickets must indicate the following information or be subject to rejection:
    - a. Name of Project.
    - b. Supplier of concrete.
    - c. Truck identity and ticket serial number.
    - d. Date of delivery.
    - e. Brand of cement.
    - f. Cement content.
    - g. Strength classification.
    - h. Batching time.
    - i. Point of deposit.
    - j. Total amount of water.
    - k. Weight of aggregate.
    - l. Daily temperature.
    - m. Number of cubic yards in load.
    - n. Admixture content.
    - o. Name of Contractor.
    - p. Name of driver.
    - q. Time loaded and first mixing of concrete.
    - r. Reading of revolution counter.
    - s. Color additive.
  - 5. Ticket shall be transmitted to Project Inspector by truck driver with load identified thereon. Project Inspector will not accept load without load ticket identifying mix and will keep daily record of pours, identifying each truck, its load and time of receipt, and will transmit two copies of record to DSA.
  - 6. At end of project, Weighmaster shall furnish affidavit to DSA on form satisfactory to DSA, certifying that all concrete furnished is in conformance with proportions established by mix designs.

7. Placement of concrete shall occur as rapidly as possible after batching and in a manner which will assure that the required quality of the concrete is maintained. In no case may concrete be placed more than 90 minutes from batch time.
  - a. When air temperature is between 85 and 90 degrees F, reduce maximum batching to discharge time from 90 minutes to 75 minutes.
  - b. When air temperature is above 90 degrees F, reduce maximum batching to discharge time to 60 minutes.
8. Water may be added to the mix only if neither the maximum permissible water-cement ratio nor the maximum slump is exceeded.
  - a. The quantity of water used for each batch shall be accurately measured.
  - b. In no case shall more than 10 gallons of water be added to a full 9-yard load, or 1 gallon per yard on remaining concrete within the drum, providing load tag indicates at time of mixing at plant an allowance for additional water.

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Confirm general layout, grade, and joint pattern layout with the Architect prior to placing concrete.
- B. Verify that gradients and elevations of the base are correct, and that the base is dry.
- C. Contractor shall report in writing to the Architect prevailing conditions that will adversely affect satisfactory execution of the work of this Section.
  1. Do not proceed with work until unsatisfactory conditions have been corrected.
- D. Forms and reinforcements are subject to approval by the Project Inspector as specified in Article FIELD QUALITY CONTROL.

#### 3.2 PREPARATION

- A. Remove frost, water, and other foreign materials from form surfaces, reinforcement, and embedded items against which concrete will be placed.
- B. When the ambient temperature necessitates the use of cold or hot weather concreting, make provisions in advance of concrete placement.
- C. Before placing concrete, clean tools and equipment, and remove debris from areas to receive concrete.
- D. Clean reinforcing and other embedded items of coatings, oil, mud and soil that may impair bond with concrete.
- E. Slab-On-Grade: After subgrade has been approved by Geotechnical Engineer, install specified drainage rock base material to thickness shown. Rock base shall be implemented and compacted in accordance with the Geotechnical Report and recommendations of the Geotechnical Engineer.

### 3.3 INSTALLATION – FORMWORK

- A. Form material shall be straight, true, sound and able to withstand deformation due to loading and effects of moist curing. Materials which have warped or delaminated, or require more than minor patching of contact surfaces, shall not be reused.
- B. Build forms to shapes, lines, grades and dimensions indicated. Construct formwork to maintain tolerances required by ACI 301. Forms shall be substantial, tight to prevent leakage of concrete, and properly braced and tied together to maintain position and shape. Butt joints tightly and locate on solid backing. Chamfer corners where indicated. Form bevels, grooves and recesses to neat, straight lines. Construct forms for easy removal without hammering, wedging or prying against concrete.
- C. Space clamps, ties, hangers and other form accessories so that working capacities are not exceeded by loads imposed from concrete or concreting operations.
- D. Build openings into vertical forms at regular intervals if necessary to facilitate concrete placement, and at bottoms of forms to permit cleaning and inspection.
- E. Build in securely braced temporary bulkheads, keyed as required, at planned locations of construction joints.
- F. Before placement of reinforcing steel, coat faces of all forms to prevent absorption of moisture from concrete and to facilitate removal of forms. Apply specified material in conformance with manufacturer's written directions.
  - 1. Seal all cut edges.
  - 2. Before re-using form material, inspect, clean thoroughly, and recoat.
- G. Slope tie-wires downward to outside of wall.
- H. Brace, anchor and support all cast-in items to prevent displacement or distortion.
- I. During and immediately after concrete placing, tighten forms, posts and shores. Readjust to maintain grades, levels and camber.
- J. Concrete Paving, Curbs, Curb and Gutters, Ramps:
  - 1. Expansion Joints: Install at locations indicated, and so that maximum distance between joints is 20 feet for exterior concrete unless otherwise shown. Expansion joint material shall be full depth of concrete section. Recess for snap cap and sealant when required.
  - 2. Curbs, Valley Gutter, and Curb & Gutter: Install expansion joints at 60 feet on center, except when placing adjacent to concrete walks, the expansion joints shall align with the expansion joints shown for the concrete walks. Expansion joint material shall be full depth of concrete section. Recess for snap cap and sealant when required.
  - 3. Isolation Joints: 3/8-inch felt between walls and exterior slabs or walks so that paved areas are isolated from all vertical features, unless specifically noted otherwise on plans.
  - 4. Exterior Concrete Paving: Install expansion joints at 20 feet on center maximum, both directions, unless shown otherwise on plans.

5. Ramps: Whether shown or not, all ramps shall have control joints and expansion joints.
  - a. Control joints on ramps shall be aligned and placed in between the vertical posts for the handrails. The curbs, if required shall have control joints that align with the handrail posts.
  - b. Expansion joints shall be placed at the upper, intermediate, and bottom landings.

K. Inspection: Refer to Article FIELD QUALITY CONTROL.

### 3.4 INSTALLATION – REINFORCING

A. General: Reinforcing shall be accurately placed at locations indicated on the drawings within required tolerances and providing required clearances. Reinforcement shall be secured prior to placement of concrete such that tolerances and clearances are maintained. Coverage shall be in accordance with Section 1907A.7 of the CBC.

1. Reinforcement must be in place before concreting is begun.
2. Keep a person on the job to maintain position of reinforcing as concrete is placed.
3. All expansion and construction joints in concrete shall have dowels of size and spacing as shown on the Drawings, or as approved by Architect.
4. Give notice whenever pipes, conduits, sleeves, and other construction interferes with placement; obtain method of procedure to resolve interferences.

B. Additional reinforcing steel shall be placed around all utility boxes, valve boxes, manhole frames and covers that are located within the concrete placements.

1. The bars shall be placed so that there will be a minimum of 1-1/2-inch clearance and a maximum of 3-inch clearance. The reinforcing steel shall be placed mid-depth of concrete slab.

C. At right angles or intersections of concrete walks, additional 2 feet x 2 feet #5, 90 degree bars shall be added at all inside corners for additional crack control. The bars shall be placed 2 inches from concrete forms and supports, at mid-depth of slab.

D. Reinforcing steel shall be adequately supported by approved devices on centers close enough to prevent any sagging.

E. Placing Tolerances:

1. In accordance with ACI 301 or CRSI/WCRSI Recommended Practice for Placing Reinforcing Bars, unless otherwise shown.
2. Clear distance between parallel bars in a layer shall be no less than 1 inch, the maximum bar diameter shall not exceed 1-1/2 times the maximum size of coarse aggregate.

F. Splices:

1. General: Unless otherwise shown on drawings, splice top reinforcing at midspan between supports, splice bottom reinforcing at supports, and stagger splices. Bar laps shall be wired together. Reinforcing steel laps shall be as follows:
  - a. Length of Lap Splices in Concrete:

- 1) No. 4 bar: 24 inches minimum.
  - 2) No. 5 Bar: Not less than 62 bar diameters.
  - 3) No. 6 Bar: 56 inches minimum.
  - 4) No. 7 Bars and Larger: Not less than 93 bar diameters.
- b. All splices shall be staggered at 5 feet minimum from adjacent splices.

G. Inspection: Refer to Article FIELD QUALITY CONTROL.

### 3.5 PLACING OF CONCRETE – GENERAL

- A. Adjacent finish surfaces shall be protected at all times during the concrete pour and finishing. Verify that all formwork is tight and leak-proof before concrete is poured. Finish work defaced during the concrete pour and finishing shall be replaced at no extra cost to Owner.
- B. Remove wood chips, sawdust, dirt, loose concrete and other debris just before concrete is to be poured. Use compressed air for inaccessible areas. Remove all standing water from excavations.
- C. Transport concrete from mixer to place of final deposit as rapidly as practicable by methods which will prevent separation or loss of ingredients. Deposit as close as practicable in final position to avoid re-handling or flowing. Partially hardened concrete must not be deposited in work. Concrete shall not be wheeled directly on top of reinforcing steel.
- D. Keep excavations free of standing water, but moisture condition sub-grade before concrete placement.
- E. Placing: Once started, continue concrete pour continuously until section is complete between predetermined construction joints. Prevent splashing of concrete onto adjacent forms or reinforcement and remove such accumulation of hardened or partially hardened concrete from forms or reinforcement before work proceeds in that area. Free fall of concrete shall not to exceed 4'-0" in height. If necessary, provide lower openings in forms to inject concrete and to reduce fall height.
- F. Remove form spreaders as placing of concrete progresses.
- G. Place footings as monolithic and in one continuous pour.
- H. Compacting: Concrete shall be compacted by mechanical vibrators.
1. Concrete shall be thoroughly worked around reinforcement and embedded fixtures and into corners of forms.
  2. Vibrating shall not be applied to concrete which has already begun to initially set or be continued so long as to cause segregation of materials.

### 3.6 REMOVAL OF FORMS

- A. Remove without damage to concrete surfaces.
1. Sequence and timing of form removal shall insure complete safety of concrete structure.

2. Forms shall remain in place for not less than the following periods of time. These periods represent cumulative number of days during which temperature of air in contact with concrete is 60 degrees F and above.
  - a. Vertical Forms of Foundations, Walls and All Other Forms Not Covered Below: 5 days.
  - b. Concrete Paving Edge Screeds or Forms: 7 days.
3. Concrete shall not be subjected to superimposed loads (structure or construction equipment) until it has attained its full design strength and not for a period of at least 21 days after placing. Concrete systems shall not be subjected to construction loads in excess of design loads.

- B. Patching: Install specified patching mortar per manufacturer's recommendations. Repairs to defective concrete which affect the strength of any structural concrete member or component are subject to approval by the architect and DSA.

### 3.7 CONCRETE PAVING

- A. Concrete paving shall be formed and finished to required line and grades true and flat with a maximum tolerance of 1/8-inch in 10 feet for flatness and to slopes indicated.
- B. Concrete vibrator shall be used to assist concrete placement. Contractor shall have spare concrete vibrator on site during concrete placement.
- C. Thoroughly water and soak the subgrade of exterior concrete paving, curbs, curb and gutters, with multiple daily waterings for at least three days or as required to achieve required moisture content prior to the concrete pour in order to place the subgrade soils in full expansion.
  1. Provide damming as required to keep standing water within the formed area and to allow for proper saturation and full expansion of the subgrade soils.
  2. Remove standing water before concrete placement.
- D. Construction Joints:
  1. Keep exposed concrete face of construction joints continuously moist from time of initial set until placing of concrete; thoroughly clean contact surface by chipping entire surface not earlier than 5 days after initial pour to expose clean hard aggregate solidly embedded, or by approved method that will assure equal bond, such as green cutting.
  2. If contact surface becomes contaminated with soil, sawdust or other foreign matter, clean entire surface and re-chip entire surface to assure proper adhesion.

### 3.8 INTEGRALLY COLORED CONCRETE

- A. Maintaining consistent color in integrally colored concrete is required.
  1. The Contractor shall coordinate with its concrete producer to review color additive manufacturer's recommendations for best practices to be followed including necessary crew size, tools, and batch-to-batch color consistency.
  2. No water is to be added while the ready-mix truck is in transit and no clean-out water is to be left in trucks which may result in change in color.

3. The same type and brand of cement, sand and aggregates shall be used in each batch of concrete.
- B. Mix Design: Additives and accelerator, if required, that contain calcium chloride are not permitted.
- C. Curing shall be performed with color-matched curing compound.
- D. Follow additional requirements used to prepare the approved site mockup.

### 3.9 FINISHING

- A. Concrete Paving: Finish surface as required by ACI 302.1R using manual and vibrating screeds to place concrete level and smooth.
  1. Under no circumstances shall water be added to the top surface of freshly placed concrete.
  2. Use "jitterbugs" or other special tools designed for the purpose of forcing the course aggregate below the surface leaving a thick layer of mortar 1 inch in thickness.
  3. After tamping the concrete, wood float surface to a true and even plane.
  4. After floating with a wood bull float, make 2 passes with a steel Fresno trowel to start sealing the concrete surface.
  5. While concrete is still wet but sufficiently hardened to bear a persons' weight on knee boards, start troweling with a steel hand trowel or a machine trowel in larger areas. Use sufficient pressure to bring moisture to surface.
  6. After surface moisture has disappeared, finish concrete utilizing steel, hand or power trowel.
  7. Completed surface shall be free from trowel marks, depressions, ridges or other blemishes. Tolerance for flatness shall be 1/8-inch in 10 feet.
  8. Provide final finish as follows, unless otherwise indicated:
    - a. Medium Broom Finish: Typical finish to be used at all exterior walks, stairs and ramps. Brooming direction shall run perpendicular to slope to form non-slip surface.
- B. Curb Finish: Steel trowel.
- C. Joints and Edges:
  1. Mark-off exposed joints, where indicated, with 1/4-inch radius x 1 inch deep jointer or edging tool. Joints shall be clean, cut straight and parallel or square with respect to concrete walk edge.
  2. Tool edges of control joints, walk edges, and wherever concrete walk adjoins other material or vertical surfaces. Expansion joints shall be constructed as detailed on plans.
  3. The expansion joints shall be full depth as shown in the Drawings. Failure to do so will result in non-compliance and shall be immediately machine cut by the Contractor at its expense.
- D. Exposed Concrete Surface Finishing, Not Including Top Surface of Flatwork:
  1. Remove fins and rough spots immediately following removal of forms from concrete which is to be left exposed. Damaged and irregular surfaces and holes left by form clamps and sleeves shall be patched with grout.

2. Tie wires are to be removed to below exposed surface and holes pointed up with neat cement paste similar to procedure noted under "After patching" in subparagraph below.
    - a. Removal of tie wires shall extend to distance of 2 inches below established grade lines.
    - b. Ends of tie wires shall be cut off flush at other, unexposed locations.
    - c. Care shall be taken during pointing to match adjacent finishes of exposed concrete surface.
  3. After patching, concrete that is to remain exposed shall be sacked with a grout mixture of 1-part cement, 1-1/2-parts fine sand and sufficient water to produce a consistency of thick paint.
    - a. After first wetting the concrete surface, apply mixture with a brush and immediately float entire surface vigorously using a wood float. Keep damp during periods of hot weather.
    - b. When set, excess grout shall be scraped from wall with edge of steel trowel, allowed to set for a time, then wiped or rubbed with dry burlap.
    - c. Entire finishing operation of an area shall be completed on the same day. This treatment shall be carried to 4 inches below grade, and all patching and sacking shall be done immediately upon removal of the forms.
- E. Stair Treads and Risers: Tool exterior stair tread and landing nosings to comply with ADA and CBC accessibility requirements and as detailed.
1. Nosings shall contain no pockets, voids or spalls. Patching is not allowed. Damaged nosings shall be replaced.
  2. Provide a contrasting striping consisting of Painted grooves at leading edge area of every tread and landing in compliance with CBC Section 11B-504.4.1.

### 3.10 APPLICATION OF COLOR HARDENER

- A. General:
1. Comply with approved manufacturer's application instructions summarized in this Article.
  2. Protect adjacent paving and planting areas during the coloration process.
- B. Coordinate mix design and finishing of concrete with application requirements for color hardener.
1. Concrete mix itself must have enough water to bleed to the surface when placed but with water completely absorbed when the concrete reaches its initial set.
  2. Apply product when a thumbprint can still indent the surface, and kneeboards and application of the hardener will not alter flatness.
  3. Do not apply while bleed water is still rising or a layer of water may become trapped beneath the surface.
- C. Rate: As recommended by manufacturer for respective service environment and selected color.
- D. Apply color hardener evenly to wet plastic surface by dry-shake method.
1. Apply 1/2 of the desired dose of hardener across the surface of the concrete using an underhand or side arm motion taking care to ensure even distribution.

2. Hand or power float the hardener into the concrete surface then broadcast the remaining material from a different direction than the first to eliminate bare spots.
  3. Heavy doses to meet approved appearance may require three broadcast and float cycles.
  4. Floating must be thorough and complete so all hardener is wet-out, and completely worked into and bonded with the partially set concrete.
- E. Complete final finishing with hand or machine trowels. Do not wet tools or color alteration will result. Avoid overuse of hard steel tools that may burnish the surface and alter color.
- F. Apply a coat of curing compound after final finish to prevent cracking due to premature surface drying and shrinkage. Curing compound shall be clear or color matched to comply with method used on approved mockup.

### 3.11 APPLICATION OF SURFACE RETARDER FOR EXPOSED AGGREGATE FINISH

- A. General: Comply with approved manufacturer's application and removal instructions summarized in this Article.
- B. Shake product container well before application.
- C. Apply uniformly to the wet concrete after the initial bleed water rises to the surface.
- D. Spray with a low-pressure sprayer until the surface has a complete hiding coat. Do not apply too sparingly.
1. Use water for clean-up.
  2. Allow 1-2 hours to dry.
- E. For removal, wash away the retarded cement matrix the next day, using high-pressure water unless mix design, use of lightest etch, and ambient temperatures deem it necessary to remove the retarded matrix the same day to achieve appearance of approved mockup.
1. Exercise care, and install protective procedures, to prevent rinse water from damaging adjacent materials or entering adjacent soil and planting areas.
  2. Should rinse water contaminate soil of planting areas, affected soil shall be removed and replaced with new soil at no additional cost to Owner

### 3.12 CURING

- A. Formed Concrete:
1. Keep forms and top on concrete between forms continuously wet until removal of forms, 7 days minimum.
  2. Maintain exposed concrete in a continuous wet condition for 14 days following removal of forms.
- B. Concrete Paving, Curb, Curb and Gutter, Valley Gutter:

1. Cure utilizing curing compound. If applicable, the Contractor shall verify that the approved curing compound is compatible with the approved colorant system.
  2. Curing compound shall be applied in a wet puddling application. Spotty applications shall be reason for rejection and possibly concrete removal and replacement at the contractor's expense with no compensation from the Owner.
- C. No curing compound shall be applied to areas scheduled to receive resilient track surface including, curbs, ramps, runways, and similar items.

### 3.13 DEFECTIVE CONCRETE

#### A. General:

1. Determination of defective concrete shall be made by the Architect or Engineer whose opinion shall be final in identifying areas to be replaced, repaired or patched.
2. As directed by Architect, cut out and replace defective concrete.
  - a. Defective concrete shall be removed from the site.
  - b. No patching is to be done until surfaces have been examined by Architect and permission to begin patching has been provided.
  - c. Permission to patch an area shall not be considered waiver of right by the Owner to require removal of defective work, if patching does not, in opinion of Architect, satisfactorily restore quality and appearance of surface.
  - d. Remove and replace concrete if repair to an acceptable condition is not feasible.

#### B. Defective Concrete Is:

1. Concrete that does not match the approved mix design for the given installation type.
2. Concrete not meeting specified 28-day strength.
3. Concrete which contains rock pockets, voids, spalls, transverse cracks, exposed reinforcing, or other such defects which adversely affect strength, durability or appearance.
4. Concrete which is incorrectly formed, out of alignment or not plumb or level, or outside of the maximum tolerance for flatness and slopes indicated.
5. Concrete containing embedded wood or debris.
6. Concrete having large or excessive patched voids which were not completed under Architect's direction.
7. Concrete not containing required embedded items.
8. Concrete with excessive shrinkage, transverse cracking, crazing, curling; or defective finish.
9. Concrete that is unsuitable for placement or has set in truck drum for longer than 90 minutes from the time it was batched.
10. Concrete where expansion joint filler that is not isolating the full depth of the concrete section, and not recessed as required for backer rod and sealant where required.
11. Concrete that is excessively wet or excessively dry and will not meet the minimum or maximum slump required per mix design.
12. Finished concrete with oil stains from equipment use, and or rust spots that cannot be removed.

13. Concrete with control joints (weakened planed joints) that do not meet the required minimum depth shown on the drawings.
14. Concrete not meeting slip-resistance requirements.

C. Flatwork: The Owner reserves the right to survey the flatwork, to determine if flatwork is outside of the maximum tolerance for flatness and slopes as indicated.

1. If the flatwork is found to be out of tolerance, then the Contractor is required to replace concrete at no additional expense to the Owner.
2. Determination of flatwork flatness, surveying and remedial work must be completed far enough in advance so that the project schedule is maintained, delays are avoided, and the new flatwork or flatwork repairs are properly cured.
3. The Contractor will be responsible for reimbursing the Owner for costs associated with re-surveying to verify compliance of work remediated by the Contractor.

### 3.14 STAINING CONCRETE FLATWORK

A. Surface Preparation Prior to Staining and Sealing:

1. Allow concrete to cure prior to application of stain or sealer.
2. Surfaces shall be cleaned and free of dust, joint treatment droppings, grease, oil, and other foreign matter which would prevent necessary penetration and subsequent reaction of the stain solution with concrete surface.
3. Comply with stain and sealer manufacturer's recommendations for methods to be used for cleaning each type of contaminant.
4. Test for moisture content to ensure that surface is sufficiently dry.

B. Curing:

1. Concrete to receive stain shall be cured with new and unwrinkled, nonstaining curing paper. Do not use curing compounds. Do not overlap paper.
2. Allow to cure in accordance with recommendations of stain manufacturer prior to application of stain. Curing time may vary based on selected colors.
3. If required to achieve selected color, cure concrete with specified colored curing compound in lieu of curing paper.

C. Preparation After Curing:

1. Surfaces shall be cleaned and free of dark alkali spots, grease, oil, soap, and other foreign matter which would prevent necessary penetration and subsequent reaction of the stain solution with concrete surface to be stained.
2. Comply with stain manufacturer's recommendations for methods to be used for cleaning each type of contaminant. Cleaning methods shall include pressure washing of non-flatwork and rotary machine cleaners for flatwork as required.

D. Application of Stain:

1. Apply in accordance with the manufacturer's instructions. Apply in two coats, unless only one coat is required over color hardener to achieve selected color.
  2. Verify manufacturer's recommended drying time between coats.
  3. After second coat of stain has dried, remove residue salts from surface by wet scrubbing with a stiff brush and flushing with clean water until rinse water runs clear. Protect surrounding areas and construction from damage by runoff.
  4. Provide traffic barriers to recirculate construction traffic. Surfaces shall be allowed to dry without covering.
- E. Stained slab shall be allowed to dry completely and shall be tested for dryness acceptable to sealer manufacturer prior to application of sealer. Do not proceed until concrete meets dryness requirements.
- F. Final Sealer:
1. Use either clear or colored sealer as required to achieve accepted colors. Apply two coats of sealer to properly dried stain coats in accordance with manufacturer's instructions. Sealer shall be spray applied and rolled.
  2. Follow manufacturer's recommended time between coats.
  3. Provide dust control in area of concrete toppings for the first 48 hours after application of sealer. No carpentry or gypsum board work shall be done during this period.
  4. Verify with sealer manufacturer the use of Kraft paper covering of sealer as the work progresses. Protective covering shall be applied only after manufacturer recommends product "off-gassing" is finalized. Premature covering may contribute to a finish that looks "cloudy."
  5. Heavy equipment, scaffolding, or other activity which may damage surface shall not be allowed on the surface until sealer is fully cured.

### 3.15 INSTALLATION OF TRUNCATED DOMES

- A. General:
1. Comply with manufacturer's installation instructions as summarized in the Article.
  2. Verify concrete to receive embedded truncated dome tiles is within the slump range recommended by tile manufacturer to permit placement without mix causing tiles to float.
  3. Maintain factory-installed plastic sheeting during installation process to prevent splashing of concrete onto the finished surface of the tile.
  4. If necessary to ensure that adjacent tiles are flush to each other during the installation process, bolt tiles together using 1/4 inch or equivalent hardware or other methods recommended by tile manufacturer.
- B. The concrete shall be poured and finished true and smooth to the required dimensions and slope prior to the tile placement. Immediately after finishing concrete, the electronic level should be used to check that the required slope is achieved.
- C. Installing Tiles:
1. Install tiles into fresh concrete using techniques that will eliminate air voids under the tile.

- a. Holes in the tile perimeter allow air to escape during the installation process.
  - b. Allow concrete to flow through holes in embedment flanges on underside of tile to lock tile solidly into the cured concrete.
  2. Tiles shall be placed true and square.
  3. Tiles shall be tamped or vibrated into the fresh concrete to ensure that the field level of the tile is flush to the adjacent concrete surface to permit proper water drainage and eliminate tripping hazards between adjacent finishes.
- D. Immediately after placement, the tile elevation shall be checked with the elevation and slope permitting water drainage, to ensure that the field surface of the tile is flush with the surrounding concrete, and that no ponding is possible on the tile.
- E. While concrete is still workable, a 3/8 inch radius edging tool shall be used to create a finished edge of concrete, then a steel trowel shall be used to finish the concrete around the tile's perimeter, flush to the field level of the tile.
- F. If necessary, adjust tile before the concrete sets. Use two suitable weights of 25 pounds each if necessary to ensure solid contact of the underside of tile to concrete.
- G. During and after the tile installation and the concrete curing stage, prohibit walking, leaning, or placing of other external forces on tile that may rock the tile causing a void between the underside of tile and concrete.
- H. After concrete is cured, remove factory-applied protective plastic wrap and concrete that may have bled under the plastic following procedures recommended by the tile manufacturer.
- I. Protect tiles after installation and during remainder of construction period.
- J. Prior to Owner acceptance, clean tiles complying with manufacturer's procedures for cleaning of tile surface.

### 3.16 SEALANT

- A. Apply sealant in compliance with manufacturer's instructions, using hand guns or pressure equipment with proper nozzle size, on clean, dry, properly prepared substrates.
- B. Force sealants into joint against sides of joint to make uniform. Avoid pulling of the sealant from the sides. Fill sealant space completely with sealant.
- C. Finished joints shall be straight, uniform, smooth, and neatly finished.
- D. Remove any excess sealant from adjacent surfaces of joints utilizing the manufacturer's recommended solvent and cleaning processes. Leave the work in a neat, clean condition.

### 3.17 FIELD QUALITY CONTROL

- A. Inspection of Forms and Reinforcing:

1. Approval of forms and reinforcing steel must be received from Project Inspector prior to pouring concrete.
2. Notice of readiness to place first pour shall be given to Project Inspector, DSA, Architect, and Engineer not less than 48 hours prior to placement of concrete to allow for inspection.
3. Pouring of concrete shall not proceed prior to completing requested adjustments to forms and reinforcing and without approval of Project Inspector.

B. Testing of Concrete:

1. Frequency and Samples for Testing:
  - a. Four identical cylinder samples for strength tests of each class of concrete placed each day shall be taken not less than once a day, or not less than once for each 50 cubic yards of concrete, or not less than once for each 2,000 square feet of surface area for slabs or walls.
  - b. In addition, samples for strength tests for each class of concrete shall be taken for seven-day tests at the beginning of the concrete work or whenever the mix or aggregate is changed.
2. Testing:
  - a. Slump: Each truck's concrete shall be tested for slump before concrete is placed.
  - b. Strength:
    - 1) Tests for strength will be conducted by Testing Agency on one cylinder at 7 days and two cylinders at 28 days. The fourth remaining cylinder will be available for testing at 56 days if the 28-day cylinder test results do not meet the required design strength.
    - 2) On a given project, if the total volume of concrete is such that the frequency of specified testing would provide less than five strength tests for a given class of concrete, tests shall be made from at least five randomly selected batches or from each batch if fewer than five batches are used.

C. Slip-Resistance Testing: Owner's Testing Agency will perform testing on flatwork to verify compliance with specified slip-resistance.

1. The coefficient of friction will be measured by California Test 342 before pavement is opened to public traffic, but not sooner than 7 days after concrete placement
2. Where paving is determined to have a coefficient of friction less than 0.30, Contractor is to repair and/or replace these surfaces at no cost to Owner.

3.18 CLEANING

- A. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.
- B. Clean excess material from surface of all concrete walks and utility structures.
- C. Power wash concrete surfaces to remove stains, dried mud, tire marks, and rust spots.
- D. Comply with any additional requirements of additive manufacturer for colored concrete.

3.19 PROTECTION

A. Graffiti-resistant Coating:

1. Surface Preparation: Prepare concrete surface to receive graffiti-resistant coating specified in Section 09 9623, Graffiti-Resistant Coatings, where indicated.
2. Concrete must be clean, dry, and free of efflorescence and dust.

B. Protect work and materials of this Section prior to and during installation, and protect the installed work and materials of other trades.

C. In the event of damage during construction, make all repairs and replacements necessary to the approval of the Architect, at no additional cost to the Owner.

END OF SECTION

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Last Updated:December 9, 2021*

## SECTION 32 31 19

## DECORATIVE METAL FENCES

**PART 1 - GENERAL**

## 1.01 SECTION INCLUDES

- A. Ornamental Picket Fencing and Accessories.

## 1.02 RELATED SECTIONS

- A. Section 03 30 53 – Miscellaneous Cast-In-Place Concrete.
- B. Section 08 71 00 – Door Hardware.
- C. Section 32 31 19.16 – Swinging Decorative Metal Gates.

## 1.03 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM A653/A653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 2. ASTM B117 – Standard Practice for Operating Salt Spray (fog) Testing Apparatus.
  - 3. ASTM D523 – Standard Test Method for Specular Gloss.
  - 4. ASTM D714 – Standard Test Method for Evaluating Degree of Blistering in Paint.
  - 5. ASTM D822 – Standard Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
  - 6. ASTM D1654 – Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
  - 7. ASTM D2244 – Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
  - 8. ASTM D2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
  - 9. ASTM D3359 – Standard Test Method for Measuring Adhesion by Tape Test.
  - 10. ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

## 1.04 SUBMITTALS

- A. Submit under provisions of Division 01.

B. Shop Drawings: Layout of fences and gates with dimensions, details, and finishes of components, accessories and post foundations.

C. Product Data: Manufacturer's catalog cuts indicating material compliance and specified options.

#### 1.05 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Sufficient experience manufacturing similar products.

B. Erector's Qualifications: Sufficient experience installing similar products.

#### 1.06 PROTECTION

A. Damage to Adjoining Property and Existing Surfaces: Contractor shall assume all responsibility for damage to building surfaces and materials and shall restore them to their original condition should damage occur.

#### 1.07 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials so as to avoid damage under provisions of Division 01.

### **PART 2 - PRODUCTS**

#### 2.01 MANUFACTURER

A. Basis-of-Design: Ameristar. Product: Ornamental Picket Fence: Montage II, Majestic Style three rail.

B. Master Halco.

C. Substitutions: Under provisions of Division 01.

#### 2.02 ORNAMENTAL PICKET FENCE

A. Materials:

1. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 45,000 psi and a minimum zinc (hot-dip galvanized) coating weight of 0.90 ounces per square foot, Coating Designation G-90.
2. Material for pickets shall be 1 inch square x 14 gauge tubing. The rails shall be steel channel, 1.75 inches x 1.75 inches x 0.105 inch. Picket holes in the rail shall be spaced 4.715 inches on center. Fence posts and gate posts shall meet the minimum size requirements of Table 1 below.

B. Fabrication:

1. Pickets, rails, and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.
2. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by manufacturer's fusion welding process completing the rigid panel assembly, producing a virtually seamless appearance, equally attractive from either side of the panel.

3. The manufactured fence system shall be capable of meeting the vertical load, horizontal load, and infill performance requirements for Industrial weight fences under ASTM F2408.
- C. Finish: The manufactured panels and posts shall be subjected to an inline electrodeposition coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be Black. The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 2 below. The requirements in Table 2 meet or exceed the coating performance criteria of ASTM F2408.

#### 2.03 ACCESSORIES

- A. Rail Attachment Brackets: Pressed steel or cast malleable iron.
- B. Ornamental Picket Fence Accessories: Provide indicated items required to complete fence system. Galvanize each ferrous metal item in accordance with ASTM A653/A653M and finished to match framing.
- C. Post Caps: Formed steel, cast or malleable iron or aluminum alloy, weathertight closure cap. Provide one standard post cap for each post.
- D. Picket Tops: Provide standard steel top.

#### 2.04 SETTING MATERIALS

- A. Concrete: Minimum 28 day compressive strength of 3,000 pounds per square inch for setting fence posts. Refer to Section 03 30 53.

### **PART 3 - EXECUTION**

#### 3.01 EXAMINATION

- A. Verify areas to receive fencing are completed to final grades and elevations.
- B. Ensure property lines and legal boundaries of work are clearly established.

#### 3.02 ORNAMENTAL PICKET FENCE INSTALLATION

- A. Install fence in accordance with manufacturer's instructions.
- B. Fence post shall be spaced according to Table 3 below, plus or minus 1/2 inch. For installations that must be raked to follow sloping grades, the post spacing dimension shall be measured along the grade. Fence panels shall be attached to posts with brackets supplied by the manufacturer.
- C. Concrete Footings: Drill holes in firm, undisturbed or compacted soil. Holes shall have diameter four times greater than outside dimension of posts and depths approximately 6 inches deeper than post bottom. Excavate deeper as required for adequate support in soft and loose soils and for posts with heavy lateral loads. Set post bottom below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour. Trowel finish around post and slope to direct water away from posts. Posts shall be set in concrete footers having a minimum depth of 36 inches; refer to Drawings for footing size.

- D. Check each post for vertical and top alignment and maintain in position during placement and finishing operations.
- E. Align fence panel posts. Panels shall be attached to posts using mechanically fastened panel brackets supplied by the manufacturer.
- F. When cutting/drilling rails or posts adhere to the following steps to seal the exposed steel surfaces:
  1. Remove all metal shavings from cut area.
  2. Apply zinc-rich primer to thoroughly cover cut edge and/or drilled hole; let dry.
  3. Apply two coats of custom finish paint matching fence color. Failure to seal exposed surfaces per steps 1 and 2 above will negate warranty. Manufacturer’s spray cans or paint pens shall be used to prime and finish exposed surfaces; it is recommended that paint pens be used to prevent overspray. Use of parts or components not provided by manufacturer will negate the manufacturer’s warranty.

3.03 ACCESSORIES

- A. Install post caps and other accessories to complete fence.

3.04 CLEANING

- A. Cleaning and Finishing: Upon completion of the work, clean all exposed surfaces, removing any discoloration or foreign matter.
- B. Touch up all abraded or scraped areas with touch-up paint to match fence color. Touch-up shall not be obvious.
- C. Protect all installed work against damage from other construction work.
- D. Clean Up: Upon completion of the work of this Section, remove all surplus materials, rubbish, and debris from the fence installation area.

Table 1 – Minimum Sizes for Montage II Posts			
<u>Fence Posts</u>	<u>Panel Height</u>		
2-1/2 inches x 12 gauge	Up to and including 6 feet height		
3 inches x 12 gauge	Over 6 feet and up to and Including 8 feet height		
	<u>Gate Height</u>		
<u>Gate Leaf</u>	<u>Up to and Including 4 feet</u>	<u>Over 4 feet and up to and including 6 feet</u>	<u>Over 6 feet and up to and including 8 feet</u>
Up to 4'	2-1/2" x 12 gauge	3" x 12 gauge	3" x 12 gauge

Table 2 – Coating Performance Requirements		
<u>Quality Characteristics</u>	<u>ASTM Test Method</u>	<u>Performance Requirements</u>
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90 percent of test area (Tape and knife test).
Corrosion Resistance	B117, D714, and D1654	Corrosion Resistance over 1,500 hours (Scribed per ASTM D1654; failure mode is accumulation of 1/8 inch coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch pounds (Forward impact using 0.625 inch ball).
Weathering Resistance	D523, D822, and D2244 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60 percent loss of gloss or color variance of more than 3 delta-E color units).

Table 3 – Montage II – Post Spacing By Bracket Type						
Span	8 feet nominal for 92-5/8 inch long rail					
Post Size	2-1/2 inches	3 inches	2-1/2 inches	3 inches	2-1/2 inches	3 inches
Bracket Type	Industrial Universal 2.5 inches (BB302) 3 inches (BB303)		Industrial Flat Mount (BB301)		Industrial Swivel (BB304)*	
Post Settings ± 1/2 inch on center	96 inches	96-1/2 inches	96 inches	96-1/2 inches	*96 inches	*96-1/2 inches
*Note: When using BB304 swivel brackets on either or both ends of a panel installation, care must be taken to ensure the spacing between post and adjoining pickets meets applicable codes. This will require trimming one or both ends of the panel.						

END OF SECTION



## SECTION 32 31 19.16

## SWINGING DECORATIVE METAL GATES

**PART 1 - GENERAL**

## 1.01 SECTION INCLUDES

- A. Gates, framework, and accessories.

## 1.02 RELATED SECTIONS

- A. Section 03 30 53 – Miscellaneous Cast-In-Place Concrete.
- B. Section 08 71 00 – Door Hardware: Gate hardware.
- C. Section 32 31 19 – Decorative Metal Fences.

## 1.03 REFERENCES

- A. The publications listed below form a part of this Section to the extent referenced. The publications are referred to in the text by the basic designation only. Refer to Division 01 for definitions, acronyms, and abbreviations.
- B. Standards, manuals, and codes refer to the latest edition of such standards, manuals, and codes in effect as of the date of issue of this Project Manual, unless indicated otherwise in CBC Chapter 35 and CFC Chapter 80.
- C. Referenced Standards:
  - 1. ASTM B117 – Standard Practice for Operating Salt Spray (fog) Testing Apparatus.
  - 2. ASTM D523 – Standard Test Method for Specular Gloss.
  - 3. ASTM D714 – Standard Test Method for Evaluating Degree of Blistering in Paint.
  - 4. ASTM D822 – Standard Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus.
  - 5. ASTM D1654 – Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
  - 6. ASTM D2244 – Standard Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates.
  - 7. ASTM D2794 – Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
  - 8. ASTM D3359 – Standard Test Method for Measuring Adhesion by Tape Test.
  - 9. ASTM F2408 – Ornamental Fences Employing Galvanized Steel Tubular Pickets.

## 1.04 SUBMITTALS

- A. Submit under provisions of Division 01.

- B. Shop Drawings: Shop drawings shall show gate elevation, dimensions, all component parts, and all fabrication details.
- C. Product Data: Manufacturer's catalog cuts indicating material compliance and specified options.

#### 1.05 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Sufficient experience manufacturing similar products.
- B. Erector Qualifications: Sufficient experience installing similar products.

#### 1.06 REGULATORY REQUIREMENTS

- A. All accessible gates shall meet all applicable requirements for doors per CBC Chapter 11B, Sections 11B-206.5 and 11B-404.1.
- B. Hand-activated opening hardware, handles, pulls, latches, locks and other operating devices for accessible gates 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 per CBC Sections 11B-309.4 and 11B-404.2.7.
- C. The lever of lever actuated latches or locks for an accessible gate shall be curved with a return to within 1/2 inch of the face of gate per California Referenced Standards code, Title 24, Part 12, Section 12-10-202, Item (F).
- D. The bottom 10 inches of an accessible gate shall have a smooth, uninterrupted surface on each side. Bottom of the gates shall be within 3 inches of finish surface of the path of travel. Maximum effort to operate a gate shall not exceed 5 pounds per CBC Sections 11B-404.2.9.
- E. Gate hardware installed at exterior locations subject to moisture or other weather-related elements shall be UL listed for all-weather use in wet locations and installation shall conform to 2022 CBC/CFC Section 1010.2.9, CCR Title 19 and UL 305.

#### 1.07 PROTECTION

- A. Damage to Adjoining Property and Existing Surfaces: Contractor shall assume all responsibility for damage to building surfaces and materials and shall restore them to their original condition should damage occur.

#### 1.08 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle materials so as to avoid damage under provisions of Division 01.

### **PART 2 - PRODUCTS**

#### 2.01 MANUFACTURER

- A. Basis-of-Design: Ameristar. Product: Ornamental Picket Swinging Gates: Montage II, Majestic Style three rail. Gates, accessories, and finish shall match decorative metal fencing.

- B. Master Halco.
- C. Substitutions: Under provisions of Division 01.

## 2.02 MATERIALS

- A. Swing gates shall be fabricated using 1.75 inch x 14 gauge double channel rail, 2 inches square x 12 gauge gate ends, and 1 inch square x 14 gauge pickets. Gates that exceed 6 feet in width shall have a 1.75 inch square x 14 gauge intermediate upright. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding. Gusset plates shall be welded at each upright to rail intersection. Gate sizes as indicated on Drawings.
- B. Gate Posts: Refer to Section 32 31 19. Provide top cap at each post.
- C. Bracing: Provide cable kits for additional trussing for all gates leaves over 6 feet wide.
- D. Gate Hardware: Refer to Section 08 71 00.
  - 1. Provide metal fabrications to accept gate hardware as indicated on Drawings.
  - 2. Pedestrian swing gates shall be self-closing, having a gate leaf no larger than 48 inch width. Integrated hinge-closer set (2 quantity) shall be ADA and CBC Chapter 11B compliant that shall include a variable speed and final snap adjustment with compact design with no greater than 5 inch x 6 inch footprint. Hinge-closer set (2 quantity) shall be tested to a minimum of 500,000 cycles and capable of self-closing gates up to a maximum gate weight of 260 pounds and maximum weight load capacity of 1,500 pounds. Hinge-closer device shall be externally mounted with tamper-resistant security fasteners, with full range of adjustability, horizontal (0.5 inch to 1.375 inches) and vertical (0 inch to 0.5 inch). Maintenance free hinge-closer set shall be tested to operate in temperatures of negative 20 degrees F to 200 degrees F, and swing to negative 2 degrees to ensure reliable final lock engagement.
- E. Finish: The manufactured panels and posts shall be subjected to an inline electrodeposition coating (E-Coat) process consisting of a multi-stage pretreatment/wash, followed by a duplex application of an epoxy primer and an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be Black. The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 1 below. The requirements in Table 1 below meet or exceed the coating performance criteria of ASTM F2408.

## 2.03 FABRICATION

- A. Swinging gates shall be constructed as specified in this Section and as indicated on Drawings.
- B. Use materials of size and thickness indicated or, if not indicated, as required to produce strength and durability in finished product for use intended. Work to dimensions shown or accepted on shop drawings, using proven details of fabrication and support. Use type of materials shown or specified for various components of work.
- C. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges. Ease exposed edges to a radius of approximately 1/32 inch unless otherwise indicated.

- D. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush to match and blend with adjoining surfaces.
- E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners.
- F. Fabricate to design, dimensions and details indicated. Provide members formed of galvanized steel tube sizes indicated.
- G. Interconnect members by butt-welding or welding with internal connectors, at fabricator's option. Provide closures, flanges, miscellaneous fittings, and anchors for interconnections of tube and attachment of members to other work.
- H. Fabricate and furnish gates complete with all hardware as indicated.
- I. Bracing: Provide diagonal adjustable length truss rods on gates to prevent sag.

#### 2.04 SETTING MATERIALS

- A. Concrete: Minimum 28 day compressive strength of 3,000 pounds per square inch for setting gate posts. Refer to Section 03 30 53.

### **PART 3 - EXECUTION**

#### 3.01 EXAMINATION

- A. Verify areas to receive gates are completed to final grades and elevations.

#### 3.02 INSTALLATION

- A. Install gates in accordance with manufacturer's instructions.
- B. Gate posts shall be spaced according to the manufacturers' gate drawings, dependent on standard out-to-out gate leaf dimensions and gate hardware selected. Type and quantity of gate hinges shall be based on the application; weight, height, and number of gate cycles. The manufacturers' gate drawings shall identify the necessary gate hardware required for the application. Gate hardware shall be provided by the manufacturer of the gate and shall be installed per manufacturer's recommendations.
- C. Workmanship: All work shall be installed level and plumb and securely anchored to the wall structure.
- D. Gate: Install gate plumb, level and secure for a full opening without interference. Gate shall operate freely and without bind.
  - 1. Adjust fencing prior to anchoring to insure matching alignment at abutting joints.
  - 2. Cutting, Fitting and Placement: Perform cutting, drilling, and fitting required for installation of gate assemblies. Set work accurately in location, alignment, and elevation, plumb, level, true and free of rack, measured from established lines and levels. Install in concrete foundations as indicated.

- 3. Fit exposed connections accurately together to form tight hairline joints. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations. Grind exposed joints smooth and touch-up galvanizing and shop prime coats.
- 4. Field Welding: Comply with AWS Code for procedures of manual shielded metal-arc welding appearance and quality of welds made.

E. Coordinate installation of gates with installation of fencing.

3.03 ADJUST AND CLEAN

A. Adjusting: Adjust gate as required for smooth, unhindered operation.

B. Cleaning and Finishing: Upon completion of the work, clean all exposed surfaces, removing any discoloration or foreign matter.

C. Touch up all abraded or scraped areas with touch-up paint to match gate color. Touch-up shall not be obvious.

D. Protect all installed work against damage from other construction work.

E. Lubricate hardware and other moving parts.

F. Clean Up: Upon completion of the work of this Section, remove all surplus materials, rubbish and debris from the gate installation area.

Table 1 – Coating Performance Requirements		
<u>Quality Characteristics</u>	<u>ASTM Test Method</u>	<u>Performance Requirements</u>
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90 percent of test area (Tape and knife test).
Corrosion Resistance	B117, D714, and D1654	Corrosion Resistance over 1,500 hours (Scribed per ASTM D1654; failure mode is accumulation of 1/8 inch coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch pounds (Forward impact using 0.625 inch ball).
Weathering Resistance	D523, D822, and D2244 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60 percent loss of gloss or color variance of more than 3 delta-E color units).

END OF SECTION



SECTION 33 40 00

STORM DRAINAGE

PART 1 - GENERAL

1.1 SUMMARY

A. Summary Includes:

1. Storm drainage piping systems.

1.2 RELATED REQUIREMENTS

- A. Section 01 5000, Construction Facilities and Controls.
- B. Section 01 6116, Volatile Organic Compound (VOC) Restrictions, for VOC limits pertaining to adhesives, sealants, fillers, primers, and coatings.
- C. Section 01 8113, Sustainable Design Requirements, for CAL-Green [and Collaborative for High Performance Schools (CHPS)] general requirements and procedures.
- D. Section 31 0000, Earthwork.
- E. Section 31 2333, Trenching and Backfilling.
- F. Section 32 1200, Asphalt Concrete Paving.
- G. Section 32 1600, Site Concrete

1.3 REFERENCES AND STANDARDS

- A. California Building Code (CBC), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).
- B. California Green Building Standards Code (CAL Green), edition as noted on the Drawings, as adopted by the California Division of the State Architect (DSA).
- C. California Plumbing Code, (CPC), edition as noted on the Drawings.
- D. Local Jurisdiction: Any work within the street, highway or right-of-way shall be performed in accordance with the requirement of the governmental agencies having jurisdiction, and shall not begin until all of those governing authorities have been notified.
- E. ASTM International (ASTM):
  1. D 422-63 Test Method for Particle Size Analysis of Soil.
  2. D698-00 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures, Using 5.5 lb (2.49 Kg) Rammer and 12 inch (304.8 mm) Drop.

3. D1556-00 - Test Method for Density of Soil in Place by the Sand-Cone Method.
4. D1557-02 - Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb. (4.54 Kg) Rammer and 18 inch (457 mm) Drop.
5. D 3017-05 Test Methods for Moisture Content of Soils and Soil-Aggregate Mixture by Nuclear Methods (Shallow Depth).
6. D 4318-05 Test Method for Liquid Limit, Plastic Limit, and Plasticity Limit.

F. CALTRANS Standard Specifications.

G. CAL-OSHA, Title 8, Section 1590 (e).

#### 1.4 ADMINISTRATIVE REQUIREMENTS

A. Submittal Procedures:

1. Action Submittals and Informational Submittals shall be submitted in accordance with Section 01 3300, Submittal Procedures.
2. Closeout Submittals shall be submitted in accordance with Section 01 7700, Closeout Procedures.
3. Sustainable Design Submittals shall comply with the additional requirements of Section 01 8113, Sustainable Design Requirements.

#### 1.5 ACTION SUBMITTALS

- A. Provide supplier's descriptive literature for all products to demonstrate compliance with specified attributes.
- B. Substitution: Provide all data of proposed material being submitted as a substitution. Provide comparison with specified product data and identify all differences. Failure to provide comparison will be reason for rejection.

#### 1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: Contractor / installer.
- B. Provide sieve analysis from accredited testing lab on pipe bedding material. Analysis shall have a current date not older than project contract signing date.
- C. Sustainable Design:
1. General:
    - a. Submit information necessary to establish and document compliance with the California Green Building Standards Code.
    - b. Sustainable design submittals are in addition to other submittals.
  2. The following information shall be provided:
    - a. Adhesives and Sealants: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.

- b. Paints and Coatings: Evidence of compliance that products meet maximum VOC content limits specified in Section 01 6116.

1.7 CLOSEOUT SUBMITTALS

- A. Guarantee: Submit subcontractor's guarantee.

1.8 QUALITY ASSURANCE

- A. Contractor / Installer shall have been in business for five (5) years providing/finishing similar size projects and complexity.
- B. Contractor shall be solely responsible for all subgrades built. Any repairs resulting from inadequate compaction are the responsibility of the contractor.
- C. The representatives of the Owner's testing lab will not act as supervisor of construction, nor will they direct construction operations. Neither the presence of the Owner's testing lab representatives nor the testing by the Owner's testing lab shall excuse the contractors or subcontractors for defects discovered in their work during or following completion of the project. Correcting inadequate compaction is the sole responsibility of the contractor.
- D. Use only new materials and products, unless existing materials or products are specifically shown otherwise on the Drawings to be salvaged and re-used.
  - 1. Sun damaged or discolored PVC pipe will be rejected.
- E. All materials, components, assemblies, workmanship and installation are to be observed by the Owner's Project Inspector. Work not so inspected is subject to uncovering and replacement.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Transport, store and handle in strict accord with the local jurisdiction and manufacturer's written recommendations
- B. Deliver undamaged products to job in manufacturer's sealed containers and/or original bundles with tags and labels intact.

1.10 EXISTING SITE CONDITIONS

- A. Contractor shall acquaint himself with all site conditions. If unknown active utilities are encountered during work, notify Architect promptly for instructions. Failure to notify will make Contractor liable for damage to these utilities arising from Contractor's operations subsequent to discovery of such unknown active utilities.
- B. Existing civil, mechanical and electrical improvements are shown on respective site plans to the extent known. Should the Contractor encounter any deviation between actual conditions and those shown, he is to immediately notify the Architect before continuing work.

### 1.11 PROTECTION

- A. Adequate protection measures shall be provided to protect workmen and passers-by on and off the site. Adjacent property shall be fully protected throughout the operations. Blasting will not be permitted. Prevent damage to adjoining improvements and properties both above and below grade. Restore such improvements to original condition should damage occur. Replace trees and shrubs outside building area disturbed by operations.
- B. In accordance with generally accepted construction practices, the Contractor shall be solely and completely responsible for working conditions at the job site, including safety of all persons and property during performance of the work. This requirement shall apply continuously and shall not be limited to normal working hours.
- C. Any construction review of the Contractor's performance conducted by the Geotechnical Engineer is not intended to include review of the adequacy of the Contractor's safety measures, in, on, or near the construction site.
- D. Provide shoring, sheeting, sheet piles and/or bracing to prevent caving, erosion or gullyng of sides of excavation.
- E. Surface Drainage: Provide for surface drainage during period of construction in manner to avoid creating nuisance to adjacent areas. The contractor shall make a reasonable effort on a daily basis to provide pumps and all equipment necessary to keep all excavations and the site free from water during entire progress of work, regardless of cause, source, or nature of water.
- F. Adjacent streets and sidewalks shall be kept free of mud, dirt or similar nuisances resulting from earthwork operations.
- G. The site and adjacent influenced areas shall be watered as required to suppress dust nuisance. Dust control measures shall be in accordance with the local jurisdiction.
- H. Trees: Carefully protect existing trees that are to remain.

### 1.12 SEASONAL LIMITS

- A. No fill material shall be placed, spread or rolled during unfavorable weather conditions. When work is interrupted by rains, fill operations shall not be resumed until field tests indicate that moisture content and density of fill are satisfactory.

### 1.13 TESTING

- A. General: Refer to Section 01 4523 – Testing and Inspection Services, and Structural Tests and Inspections List, DSA-103.
- B. Geotechnical Engineer: Owner is retaining a Geotechnical Engineer to determine compliance of fill with Specifications, and to direct adjustments in fill operations. Costs of Geotechnical Engineer will be borne by Owner; except those costs incurred for re-tests or re-inspection will be paid by Owner and backcharged to Contractor.

1.14 RECORD DRAWINGS

- A. Keep a daily record of all pipe placed in ground, verified by Project Inspector.
- B. Upon completion of this Contract, furnish one tracing showing all outside utility lines, piping, etc., installed under this Contract. Locate and dimension all work with reference to permanent landmarks.
- C. All symbols and designations used in preparing "RECORD" drawings shall match those used in Contract drawings.
- D. Properly identify all stubs for future connections, as to location and use, by setting of concrete marker at finished grade in the manner suitable to Architect.

PART 2 - PRODUCTS

2.1 DESIGN AND PERFORMANCE CRITERIA

- A. Sustainable Design:
  - 1. VOC emissions for field-applied adhesives, sealants, and sealant primers must comply with limits specified in Section 01 6116.
  - 2. VOC emissions for field-applied paints and coatings must comply with limits specified in Section 01 6116.

2.2 MATERIALS

- A. Pipe: Use one of the following, unless noted on the Drawings otherwise.
  - 1. Polyvinyl Chloride Pipe (PVC): SDR35 conforming to ASTM D3034 with elastomeric joints conforming to ASTM D3212 for pipe to 12". Sun damaged pipe will be rejected.
  - 2. High density polyethylene pipe (HDPE): The pipe shall be corrugated exterior/smooth interior pipe. 12" to 60" maximum diameter shall conform to AASHTO M294, water tight per ASTM D3212 with water tight gasket fittings.
- B. Perforated Pipe (for subdrains): Shall be ADS N12 pipe, 3 hole, ASTM F 405, AASHTO M 252; PCV ASTM D3034 SDR-35 storm drain pipe
- C. Manhole: Shall be as shown on the drawing details.
- D. Drop Inlet: Shall be as shown on the drawing details.
- E. Curb Inlet: Shall be as shown on the drawing details.
- F. Mortar: For pipe connections to concrete drainage structures, conform to ASTM C270 type N mortar. Place within one half hour after adding water.
- G. Crushed Rock: Imported washed crushed rock. Minimum 100% passing 3/4 inch sieve.
- H. Trench drain: Polycast, Polydrain or equal and as shown on drawings.

- I. Area Drains: Shall be as shown on the drawing details.
- J. Floor Drains: Shall be as shown on the drawing details.
- K. Clean-outs: Shall be as shown on the drawing details.
- L. Planter drains: Shall be as detailed on the drawing details.
- M. Filter Fabric: Mirafi 140N.

### PART 3 - EXECUTION

#### 3.1 INSPECTION LAYOUT AND PREPARATION

- A. Prior to installation of the work of this Section, carefully inspect and verify by field measurements that installed work of all other trades is complete to the point where this installation may properly commence
- B. Layout all work, establish grades, locate existing underground utilities, set markers and stakes, setup and maintain barricades and protection facilities; all prior to beginning actual earthwork operations. Layout and staking shall be done by a licensed Land Surveyor or Professional Civil Engineer.
- C. Verify that specified items may be installed in accordance with the approved design.
- D. In event of discrepancy, immediately notify Owner and the Architect. Do not proceed in discrepant areas until discrepancies have been fully resolved.

#### 3.2 EXCAVATION AND BACKFILLING

- A. General: Installation shall be in strict conformance with referenced standards, the manufacturer's written directions, as shown on the drawings and as herein specified.
- B. Verify invert elevations at points of connection to existing systems prior to any excavation. If invert elevations differ from that shown on drawings, notify Architect immediately.
- C. Excavation and Bedding:
  - 1. General: Trench straight and true to line and grade with bottom smooth and free of irregularities or rock points. Trench width in accordance with pipe manufacturer's recommendations and as per the drawings. Follow manufacturer's recommendations for use of each kind and type of pipe.
  - 2. Bedding: Provide bedding as detailed on plans for the full length of the pipe. Bedding shall have a minimum thickness beneath the pipe of 4" or 1/8 the outside diameter of the pipe, whichever is greater. Provide bell holes and depressions for pipe joints only of size required to properly make joint.
  - 3. If the trenches for the site drainage fall within areas to be lime treated, the piping shall be installed prior to any lime treatment operations.
    - a. If additional piping is added to previously lime treated areas, the contractor shall backfill the trench with class 2 aggregate base and compact to 95%.

D. Laying of Pipe:

1. General: Inspect pipe prior to placing. Set aside any defective or damaged material. Do not place pipe in water nor place pipe when trenches or weather are unsuitable. Lay pipe upgrade, true to line and grade.
2. Bell and Spigot Joints: Lubricate inside of bells and outside of spigots with soap solution or as recommended by manufacture. Wedge joints tight. Bell of bell and spigot pipe to be pointed upgrade.
3. Pipe shall be bedded uniformly throughout its length.
4. Pipe elevation shall be within 0.02 feet of design elevation as shown on plans.
5. Off Site Work: All work beyond the property lines shall be done in strict conformance with the requirements of the governing agency.

E. Backfilling:

1. General: Do not start backfill operations until required testing has been accomplished.
2. Trenches and Excavations: Backfill with material as detailed on plans, filling both sides of the pipe at the same time, carefully tamping to hold pipe in place without movement. Refer to Section 31 2333 – TRENCHING AND BACKFILLING for fill above this layer.

F. Grouting of Pipes: Grout pipes smooth and water tight at drop inlet, manholes, and curb inlets. Grout back side of hood at curb inlets all grouting shall be smooth and consistent.

G. Off Site Work: All work beyond the property lines shall be done in strict conformance with the requirements of the local agency.

H. Cutting and Patching: Remove and replace existing surface features per applicable specification section (i.e. asphaltic concrete or concrete paving) where pipe is installed in areas of existing improvements.

3.3 TOLERANCES

A. Storm Drain structure grates

1. In landscape and lawn areas  $\pm 0.05'$ .
2. In sidewalk and asphalt pavement  $\pm 0.025'$ .
3. In curb and gutter application  $\pm 0.0125'$ .

B. Cleanout Boxes and Lids

1. In landscape areas; 0.10 higher than surrounding finish grade,  $\pm 0.05'$ .
2. In sidewalks and asphalt pavement; Flush with surrounding finish grade,  $\pm 0.025'$ .

3.4 DEWATERING

A. Contractor to provide trench dewatering as necessary, no matter what the source is, at no additional cost to the owner.

3.5 FLUSHING

- A. The Contractor shall thoroughly ball and flush the storm drain system to remove all dirt and debris. Discharge water to an approved location.

3.6 CLEANING

- A. Upon completion of work of this Section promptly remove from the working area all scraps, debris and surplus material of this Section.
- B. Clean the dirt, rocks, and debris from the drop inlets and storm drain manholes.

END OF SECTION



ARCHITECTURE  
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